

BCARES

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BOULDER COUNTY
AMATEUR RADIO EMERGENCY SERVICES
DISASTER COMMUNICATIONS PLAN
HANDBOOK

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Revised 12/96 - Len Koppl, KDØRC
Revised 2/05- Peter Goldman

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FOREWORD

Many amateur radio operators (HAMS) in Boulder County have made personal commitments to provide communications assistance to the public safety agencies, Red Cross and general public in the event of a disaster occurring in the county. Boulder County Amateur Radio Emergency Services (BCARES) is the local organization that coordinates these disaster activities by hams. This plan book is intended as a handbook for BCARES members. The appendices are additional resource material for officers and net control operators.

The first BCARES PLAN was written by Dave McClune, WBØZID, in 1984-85. The second BCARES PLAN book was written by Jim Andrews, WAØNHD, in 1990. Two reasons mandated that the 1985 plan be revised and expanded. The first was the “Digital Communications Revolution” which occurred in amateur radio in the late ‘80s. The introduction of packet radio now provides the public safety agencies and the Red Cross with hard copy messages from computer terminals connected via amateur radio. Hard copy significantly improves the readability and reliability of messages. The second reason was the lessons learned from 3 major forest fires, including the disastrous “Black Tiger” fire of July 9, 1989 that destroyed 44 houses and other structures.

This third revision of the BCARES PLAN was brought about by the “Video Revolution” in amateur radio. Hams are now transmitting their own live color TV pictures. The public safety agencies in Boulder County have been very impressed with the possibilities of using TV for emergency management, particularly for forest fires and crowd control situations.

Portions of this third PLAN have been reprinted from the previous PLANS. Contributors to this edition were Len Koppl, KDØRC, BCARES Chairman, Bob Schneider, NØOUX, BCARES Vice-Chairman, Rich Ferguson, KAØDXM, Colorado Section ARES Emergency Coordinator, and Jim Andrews, WAØNHD, BCARES Video Coordinator.

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INTRODUCTION

PURPOSE:

BCARES is a non-profit corporation chartered to provide emergency and public service radio communications to Boulder County. The primary served agencies are the Boulder County Office of Emergency Management (OEM), and the Public Safety Answering Point. Many other public service agencies in the county may be served by BCARES, but only with the permission of the OEM or PSAP. The use of BCARES is covered in the Boulder County Emergency Operations Plan and the Boulder Incident Command System.

HISTORY and ORGANIZATION:

BCARES was created as part of Boulder County's response to the lessons learned in the disastrous 1976 Big Thompson Canyon Flood. All members of BCARES are volunteers and are FCC licensed amateur radio operators. BCARES is governed by a Board of Directors consisting of representatives from the following organizations: OEM, sheriff and police, Boulder Amateur Radio Club (BARC), Longmont Amateur Radio Club (LARC), and the Rocky Mountain VHF Society (RMVHFS). In addition, two directors are elected at large from the membership. The officers, Chairman, Vice Chairman, Secretary, and Treasurer are elected by the Board of Directors. The registered office of BCARES is the Office of Emergency Management in the Boulder Public Safety Building. OEM serves as the treasurer of BCARES.

ACTIVATION:

The officers of BCARES carry pagers. In the event of a major disaster, the PSAP pages BCARES requesting communications assistance. The Chairman or designee calls the communications center or paging agency to get details of the assignment, and if appropriate, begins the callout process. Activation is primarily accomplished via telephone and two meter repeaters.

COMMUNICATIONS CAPABILITIES:

All members of BCARES have their own handheld and/or mobile VHF, two meter, radios. BCARES has several voice radio repeater frequencies available, which provide excellent coverage of the entire county. The availability of these extra radio channels helps relieve the overloading of the limited number of public safety frequencies. BCARES can supply two meter FM voice, television, packet, and HF voice.

Television allows live, color pictures of the scene of an emergency to be transmitted to the incident command post. BCARES has three portable TV transmitters complete with cameras, antennas and batteries. BCARES has a fixed TV repeater at Chautauqua Park and a portable TV repeater for relaying pictures from remote locations.

Packet radio is a Local Area Network (LAN) of portable computer terminals, which are linked via radio. This radio LAN also includes a digital radio repeater network and a central computer which functions as an electronic mail system for message storage and

retrieval. Packet radio is ideal for transmitting formal messages, which require “hard-copy”. Examples are lists of fire-fighting supplies and lists of victims.

EQUIPMENT:

BCARES has a permanent voice and packet radio base station in the PSAP 911 Dispatch Center. The Situation Room at the PSAP includes a BCARES TV receiver and a two meter FM radio. The Sheriff’s communications van includes BCARES voice and packet radio operating positions along with a TV receiver. BCARES also maintains a cache at the Public Safety Building of three packet radio sets, three TV transmitters, a TV receiver, a portable TV repeater and an HF SSB transceiver. Also, a limited cache in Longmont.

UNIFORMS:

BCARES members do not wear uniforms. They do wear a baseball style BCARES cap and a photo ID card issued by the Sheriff’s Dept.

FINANCES:

BCARES is a non-profit corporation, and does not currently charge dues to members. BCARES’ funding consists of non-taxable, charitable donations and government grants from the agencies served and F.E.M.A. BCARES’ funds are used solely to purchase and maintain communications equipment and supplies. None of the directors, officers, or members receives compensation for their services.

TRAINING:

BCARES holds at least two Simulated Emergency Tests (SET) every year as training exercises. Members are called out via radio and/or telephone to provide communications for a simulated disaster. A formal net is established. Members are then dispatched to actual sites that they would likely be called upon to staff in an actual emergency. Examples are the disaster site, 911 Dispatch Center, Sheriff’s Communication Van, Hospitals, and evacuation centers. The members practice handling simulated voice and packet emergency messages and transmitting live TV pictures. The SETs are often integrated with disaster training exercises held by other public safety agencies.

MEETINGS:

BCARES holds an annual meeting early in the year for all members. BCARES does not hold other regularly scheduled meetings. However, BCARES does hold weekly radio net meetings. In these radio nets, members and other interested amateurs in Boulder County meet for “On The Air Meetings” using their own VHF FM radios from their homes. These are controlled nets for the purposes of making announcements of general interest, training in formal message handling procedures, and round-table discussions on topics of mutual interest. The BCARES NET is held every Monday evening at 8 p.m. The frequency is 146.76 MHz RMVHFS repeater. Immediately following the voice net, other nets occasionally follow for training in the use of packet radio, practice on HF techniques, or ATV training.

RACES:

The OEM has designated BCARES as the official Radio Amateur Civil Emergency Service (RACES) organization in Boulder County. In the event of a national emergency in which the President of the USA invoked his War Emergency Powers, all radio amateurs would be required to cease operations. Only those RACES radio amateurs providing emergency communications would be allowed to continue operations.

BCARES MEMBERSHIP REQUIREMENTS

1. Have a genuine interest in providing volunteer communications assistance to public service agencies on behalf of the PSAP and OEM.
2. Submit a signed application form.
3. Have a valid FCC Amateur Radio License, technician class or higher.
4. Be 18 years of age or older to comply with insurance requirements.
5. Be approved by the Boulder County Sheriff's Department, which includes a background check, for a Boulder County Emergency Services ID card.
6. Complete 2 hours of introductory training. This consists of an introduction to BCARES organization and procedures and a tour of the PSAP 911 dispatch center and com-van.
7. Members are expected to also receive training in Packet Radio and/or Television operations, preferably both.
8. Actively participate in various BCARES training exercises. These include the weekly radio nets, meetings, and SETs.
9. Own a 2m FM hand-held radio or mobile radio (preferably both). The radio should be capable of operating on at least the following frequencies: 146.76, 147.27, 146.70, 146.73, 146.40, and 146.43 MHz. Suggested accessories for hand-held radios include spare battery packs, 12 VDC power cord with cigarette lighter plug, magnetic mount antenna, and headphones.
10. Be approved by the BCARES Board of Directors.

HAZARDOUS DUTY WARNING:

BCARES members are cautioned to consider that many BCARES activities involve hazardous situations such as forest fires, floods, and riots. They also may include carrying heavy loads of equipment. Members should be aware of their physical limitations, and refuse any assignment that they do not feel is appropriate. BCARES is an organization of volunteers - no one is obligated to do anything they do not want to do.

OTHER SERVED AGENCIES:

BCARES serves the public safety agencies of Boulder and Broomfield Counties. This includes the US Forest Service, Boulder Sheriff's Department, Boulder Police, Longmont Police, CU Police, Broomfield Police, and the Boulder County Red Cross and the hospitals of the counties. All agencies access BCARES via the PSAP or OEM.

BCARES SAFETY POLICY

The priority of every BCARES member must be personal safety and the safety of BCARES members. No BCARES service is so important to justify risking the lives of

BCARES members. Each member must remain alert to potential hazards in their area. If a situation appears hazardous, the member should leave first and tell net control when there is an opportunity. Any BCARES member can refuse any assignment for any reason.

In virtually all cases, BCARES provides support and logistics communications, rather than life and death communications. Further, BCARES members are not extensively trained in emergency response. Therefore, BCARES members have neither the reason nor the training to operate in dangerous situations or locations.

It is very important that BCARES members be aware of, and communicate their own limitations. We do attempt to match assignments to a member's capabilities, but in the rush of events, errors may be made. If at any time it appears that a particular assignment is inappropriate, the member should immediately request a reassignment. If in doubt, ask!!

Members are encouraged to ask questions about any assignment, especially those near a hazardous area.

If practical, a safety briefing should be arranged for members going to "front line" sites in a hazardous area.

Of course, BCARES members should not engage in hazardous activities or create hazards for others. Examples of this kind of activity might be a person with a bad back carrying a heavy load, creating a tripping hazard with cables, or a precarious climb up a tree to find a better site for an antenna.

BCARES members injured during emergencies or training exercises may be covered by workman's compensation. To protect your rights to workman's compensation, injuries must be reported to a BCARES officer within 24 hours. The BCARES officer will contact the appropriate agency.

Approved at BCARES executive board meeting, August 16, 1993.

BCARES MOBILIZATION PROCEDURES

ACTIVATION:

Any public service agency such as Police, Sheriff, Fire, Rescue, or Red Cross requiring communications assistance from BCARES will call the PSAP at (303) 441-4444 (or 911 if within the E-911 area). PSAP will then page BCARES (pager #2296) and relay the assistance request. The Chairman or designee then calls the PSAP to get details of the assignment, and if appropriate, begin the callout process. Activation is primarily accomplished via telephone and two meter repeaters.

No BCARES member, except the Chairman or his designee, is authorized to contact PSAP or any other public service agency offering the services of BCARES. Any member that has concerns regarding a possible emergency situation should call the Chairman and apprise him of the situation.

If this BCARES plan is put in action, it may start with an ALERT followed by a MOBILIZATION depending upon the situation.

ALERT

Announcements are made on local repeaters advising of a potential emergency situation. Operators will be asked to monitor the BCARES frequency (146.76 MHz repeater). Transmissions made during this time should be brief. Everyone is encouraged to monitor the repeater to keep aware of the situation. Check ins may or may not be taken at this time.

MOBILIZATION

Announcements will be made on local repeaters advising of an emergency situation. BCARES members will be requested to change frequency to 146.76 MHz where a controlled net will be placed in operation. Net Control will either take check ins or make announcements, as appropriate. If an insufficient number of BCARES members check in, Net Control will initiate a telephone call out. Net Control will likely assign this task to other operators. Depending upon the situation, additional nets may then be set up on other frequencies. If you know that a disaster has occurred, but do not hear any activity on 146.76, then you should check other BCARES frequencies. *Do not call the PSAP to find out what is going on.*

DETAILED RESPONSE PLANS

LARGE SCALE DISASTERS:

The basic procedures in the Flood plan will also be used with minor modifications for any large-scale disaster. A large-scale disaster is one that involves a large number of victims and/or covers a large geographical area and involves multiple public safety agencies. A large-scale disaster will likely include PSAP traffic, Red Cross traffic and BARC, LARC and NTS handling Health and Welfare inquiries from outside the county. BCARES will coordinate all amateur radio activity within Boulder County during a large-scale disaster. If necessary, BCARES may also request “mutual-aid” assistance from the state (ARES District 0) and other county ARES groups.

SMALL SCALE DISASTERS:

The basic procedures in the Forest Fire plan will also be used with minor modifications for any small-scale disaster. A small-scale disaster is one that involves few or no victims and is geographically confined. This may only require BCARES response to handle special communications needs of PSAP, Police or Sheriff. Or, it might only require BCARES response to handle special communications needs of the Boulder County Red Cross. Small-scale disasters generally will not involve Health and Welfare inquiries from outsiders. Thus, the services of BARC, LARC or NTS are usually not required.

BCARES ASSIGNMENTS

BCARES attempts to assign each ham to a position in which they can most effectively assist in an emergency. The staffing committee tries to assign the available hams in the most advantageous manner, keeping in mind such factors as skills, experience, and physical restrictions. If it appears that you are being assigned to a task that you may have difficulty performing, please notify the staffing committee or net control *immediately*.

Anyone can refuse any assignment for any reason. Members are normally assigned first, with non-members being used only if needed.

The normal shift, or work period, is 6 ½ hours, though individuals can volunteer to work two shifts. If you have time limitations, be sure to apprise net control when you volunteer for a shift. We will attempt to schedule a ½ hour overlap in shifts to allow the new shift crew to be briefed by the previous shift crew. In most cases, 2 or 3 members are assigned to a site with one of them designated as the team leader.

In the first hour or so of an emergency, assignments are made as people become available and check into the 146.76 operations net. If the emergency extends for many hours or days, the staffing net usually moves to 146.70. The staffing officers will usually have a daily net on 146.70 MHz each evening around 9 PM. This net is used to finalize assignments for the next day. The staffing officers will normally maintain this separate net for the duration of the emergency. If you become aware of an emergency before you are called by telephone, listen to the operational net on 146.76 for instructions. If you are available to work a shift, call the staffing officers on the 146.70 coordination frequency.

BCARES members should bring their own emergency kits, including BCARES ID card and hat, radio with spare batteries, cigarette lighter DC power cord, coax and antenna(s), food and water, suitable clothing and shoes. (See the personal equipment checklist). Since changes in assignments and conditions are possible, bring more rather than less; you can always leave any excess gear in your vehicle.

When you receive a specific assignment, you should also receive directions to your assigned location. The staffing officers will often ask you to meet at a staging area for carpooling. Carpools are often necessary because parking and access to the disaster site are usually limited. The staging area is often the parking lot at the Public Safety Building. Listen to the operations net on 146.76 before leaving and while en route. Notify the net control that you are on the way, your assignment, and destination. Always notify net control upon arrival at an assignment.

BCARES POLICY ON TEAM LEADERS

Each site should have a team leader. The team leader should be a responsible ham, with several years of experience with BCARES. The team leader is in charge of the hams at the site; however, the team leader should consult with the other members of the team on important decisions.

RESPONSIBILITIES OF A TEAM LEADER:

1. The most important responsibility of a team leader is safety. This is most important when the hams are in a potentially hazardous situation. Changing conditions may require a full-time “safety man”, continuously monitoring a fire. A basic rule of fire safety is to have two escape routes open at all times; if you are down to one escape route, it is time to use it! This could also include not creating dangers for yourself or others, such as cables that are tripping hazards, exposed high voltages, or falling from a high place while trying to set up an antenna.

2. The second responsibility of a team leader is to ensure that his team remains in contact with net control at all times. If there are significant changes in the situation at your location, report this promptly to net control.
3. The third responsibility is your assignment. If your assignment is transmitting messages, switch to voice if the packet system breaks down.
4. The fourth responsibility is maintaining a good relationship with the agency at your site.

COMMON ERRORS:

1. The most common error is failing to maintain a close listening watch on the voice net control frequency. In many cases, the person monitoring the voice frequency is distracted by conversations. An earphone or headset may help.
2. The next most common error is working on equipment at the expense of your assignment. Most hams are equipment hobbyists, and are inclined to drop whatever they are doing to work on the equipment, particularly if they do not think that the equipment is working well. It is best to have only part of your team working on the equipment, with one or two hams continuing to pass messages, monitor the voice frequency, and interact with the served agency.
3. On rare occasions, hams have overstepped their bounds, often through being over eager. Past examples include hams giving orders to the press or others. BCARES is a volunteer communications group, and is not in a position to tell other people what to do. Keep your team focused on their assignment.

Approved at BCARES executive board meeting, 11/9/92, KA0DXM

HEALTH AND WELFARE TRAFFIC

Health and Welfare Traffic (H&W) is message traffic, which occurs when people want to know the status of relatives or friends in or near a disaster area, or a person in a disaster wants to inform relatives or friends of his status. It may also consist of lists of victims or survivors.

NOTE: In the Red Cross, H&W traffic is designated as Disaster Welfare Inquiry (DWI). Do not confuse this with the police definition of Driving While Intoxicated.

TYPES OF H&W TRAFFIC (listed by priority)

1. INTERNAL H&W --- This occurs when a person in the disaster area is trying to locate another person(s), such as their family, also in the disaster area. This may consist of lists of victims and/or survivors. Such lists are for use by Public Service agencies and Red Cross ONLY. Do not pass information about individuals or situations to anyone except for the intended message recipient.
2. OUTGOING H&W --- This occurs when a person in the disaster area wants to inform someone outside the disaster of his or her status.
3. INCOMING H&W --- This occurs when someone outside of the disaster area wants to inquire of the status of a person(s) within the disaster area. This traffic is typically held for many hours or days before responses are attempted.

VARIOUS GROUPS HANDLING H&W:

RED CROSS --- will handle all types of H&W traffic, as the situation dictates. After 24 hours into a disaster, prime responsibility for outgoing and incoming H&W (DWI) traffic rests with Red Cross.

BCARES --- will only handle Internal H&W in cooperation with the Public Safety agencies and the Red Cross. BCARES will provide communications for the Red Cross when so directed by either the PSAP or OEM.

BOULDER AMATEUR RADIO CLUB --- BARC will handle outgoing and incoming H&W traffic during the first 24 hours of a disaster. They are responsible for all of Boulder County with the exception of the St. Vrain School District (N.E. Boulder County).

LONGMONT AMATEUR RADIO CLUB --- LARC will handle outgoing and incoming H&W traffic for the northeast portion of Boulder County during the first 24 hours of a disaster.

NATIONAL TRAFFIC SYSTEM --- The ARRL NTS will provide the transmission routing for both incoming and outgoing H&W. They will interface with the Red Cross, BARC & LARC stations.

BCARES POLICY STATEMENTS REGARDING HEALTH AND WELFARE

1. H&W Traffic will have a lower priority than any disaster relief or emergency operations traffic. When H&W traffic is handled, it will be given the following priority: #1 Internal, #2 Outgoing, #3 Incoming.
2. Prime responsibility for all H&W traffic rests with the Red Cross. The Red Cross Communications Officer shall be the final authority in questions regarding H&W traffic.
3. Amateur radio operators are not given the authority to issue statements on their own regarding the extent and details of a disaster nor on the status of any victims in a disaster. The only announcements that may be made on the radio are those statements released by the Public Relations Officer of the Red Cross, the PSAP, or the OEM. On or off the air, avoid making any unnecessary statements about the emergency situation, number of victims, or the conditions of any individuals. Many members of the public and of served agencies can hear what is being said over our ham radios. A flippant remark at a disaster scene (on or off the air) about someone else's tragedy is inexcusable.
4. Amateur radio operators are not given the authority to send any outgoing replies to Incoming H&W inquires without the express permission of the Red Cross.
5. Lists of victims, in particular, fatalities and injuries are to be considered extremely confidential. These lists are only to be transmitted by packet radio (as a Private message) for use by Public Service agencies and/or the Red Cross. Such lists are not to be released to the general public via open broadcast, NTS or any other means.
6. Internal H&W traffic may be carried on the BCARES frequencies (146.76 voice) and/or the Red Cross frequency (147.27 voice).

7. Incoming and Outgoing H&W traffic will be handled through the ARRL National Traffic System (NTS). This traffic will not be handled on the BCARES frequencies without permission from net control.
8. In a major emergency, the large quantity of incoming H&W traffic may overload the NTS. Outgoing H&W traffic will have priority over incoming. If circumstances dictate, BCARES and the NTS may restrict incoming H&W traffic through means such as a 24-hour moratorium.

VOICE NET AND TRAFFIC PROCEDURES

Controlled nets are a means of ensuring orderly use of limited frequency resources. Controlled nets have someone on a frequency who determines who talks to whom, and when. The person in control of the frequency is called Net Control. In general, when someone wishes to talk to someone else during an emergency it is because he or she has traffic (a message or an inquiry) for the other person or someone at the other person's location. Control of the frequency is exercised by Net Control by granting permission for one operator to talk to another.

When acknowledging receipt of packet messages, do not ask for net control permission (unless net has specifically requested you to do so). Simply wait for an appropriate break in the traffic to say '<their tactical call> this is <your tactical call>', acknowledge your message <message number>'. The other station responds with 'Thank you'. This fast, easy protocol works well, and keeps voice channel congestion to a minimum.

1. Traffic on a net is handled in the order of request depending upon the priority of the message. For PSAP/BCARES traffic we use the following priorities: (note: these are not exactly the same as used in ARRL radiograms) #1 is EMERGENCY with life and death urgency. #2 is PRIORITY, which is used for official messages with a specific time limit. #3 is ROUTINE, which is used for official messages with no time limit. #4 is HEALTH AND WELFARE (H&W) inquiries and replies. #5 is PERSONAL traffic for ham operators. When calling net control always specify your message priority by words, not by number.
2. If there is an emergency and a controlled net is in progress, do not check into the net simply to say that you are listening. Only check in if you are actually available for an assignment or can give direct assistance. Otherwise, do NOT transmit but simply monitor the net.
3. When first checking into a net, give your complete call sign. For all additional transmissions use only your call sign suffix until you have been assigned a tactical call. Example: the suffix of WAØNHD is simply NHD. Short calls are easier to remember.
4. In an emergency, we will use TACTICAL CALL SIGNS. These are short, easily remembered names, which identify a location, agency or function. Examples are: "Fire Base", "Red Cross", and "TV-1". Their use promotes efficiency and coordination with all individuals or agencies that are monitoring the net. When operators change shifts or locations, the set of tactical calls remains the same. The use of tactical call signs greatly reduces the confusion when various hams operate the same station. Net Control will designate the call signs to be used on a net. If net

- control has assigned a tactical call to your crew, you are to discontinue using individual call signs. The use of tactical calls does not fulfill FCC ID requirements.
5. The FCC only requires a full ID every 10 minutes. This FCC ID is your own individual call sign, not your tactical call. The Net Control will do the 10 minute ID for the net. During an emergency, we must keep the use of ID to an absolute minimum as it consumes valuable channel time. Do not use the typical HF ham exchange of both parties' call signs after every transmission. It is never necessary to give the other ham's call sign.
 6. All participants in a net are required to continuously monitor the net frequency. At a location where there are several hams present, one ham will be assigned to continuously monitor the net frequency for any calls to that location. Always keep the volume on your radio turned up. If you are in a noisy environment, or the radio traffic bothers others in your vicinity, use headphones. If you must leave the net frequency or your operating position, inform Net Control. When you return to the net, check back in.
 7. If you have a long voice message to transmit, inform net control when requesting permission to contact another station. For long messages, or if the traffic load is very heavy, then net control might direct stations to change to another repeater or simplex frequency to pass the traffic. Both stations should shift to the other frequency to pass their traffic. After the traffic is passed you are to immediately return to the net frequency and check in with net control and inform him that you have returned. If after one minute on the other frequency, you are unable to establish contact, return back to the net frequency and check in and report the problem. When returning to the net frequency, do not interrupt the net, but wait until there is at least a 10 second pause in the traffic before checking back in.
 8. If the traffic load is very light, then net control might announce that stations no longer need to call net control for permission to contact other stations. In this case, simply call the other station. If the traffic load picks up again, then net control will step back in and start controlling the flow of traffic. Sometimes this is called an 'informal' net.
 9. Plan all of your transmissions. Know what you are going to say before pressing the mike button. Keep all transmissions very brief. Transmit only facts. If there is a need to make an educated guess or deduction about a situation, then make this very clear. Scanners are everywhere and we do not want to start rumors with the general public.
 10. When necessary to spell out words and names, use the standard ITU phonetic alphabet (adopted by the ARRL). There is no such thing as "common spelling". Send all groups of numbers as individual numbers. "104" would be "one, zero, four" NOT as "one hundred and four." "Q" signals are for CW use only and are NOT to be used on voice nets. If you need to have a message repeated use "SAY AGAIN" as "repeat" can sound like "received" when conditions are poor. If conditions are really bad, use "SAY AGAIN, WORDS TWICE." This is very effective. Acknowledge all transmissions directed to your station. Use "ROGER" to acknowledge receipt of all information or formal traffic. Do not say "QSL".
 11. To hear a good controlled net in operation, monitor the PSAP dispatch GREEN and RED 1 channels some evening. Green (155.415 MHz) is law enforcement dispatch. Red 1 (154.325 MHz) is fire dispatch.

FORMAL MESSAGE PROCEDURES

One of the two major services BCARES supplies to the Public Safety Agencies in Boulder County is the transmission of formal written messages via Packet Radio. Packet is a Local Area Network (LAN) of computers linked by radio and using a central master computer (cluster) as a bulletin board for message storage. The major advantage of packet is that an actual printed message can be delivered to the recipient. This eliminates many errors due to poor handwriting, or confusion in relaying the message. In emergencies, packet radio is used to transmit lists of victims, resource requests and other logistical, list oriented messages. It is usually not used for “instantaneous”, real time tactical messages (voice is much better suited to these circumstances).

BCARES, in consultation with the PSAP, has developed a “standard” message form. You will find on the next page a copy of this PSAP Packet Radio Message form with a sample message. These forms are available in a notebook at each of the BCARES packet radio stations. Whenever a policeman, fireman, Red Cross worker, or any representative of a served agency wants you to send a message, hand them one of these forms to fill out. The person wanting to send a message fills out the top portion. You, the packet operator, fill in the bottom portion. Do not accept a partially filled out message form. All of the elements on the form are vital, especially the signature. These are carbonless, two copy forms. Immediately upon receipt, you are to fill in the date, time filed with you and your name and give the second copy to the person originating the message as their copy. You are to keep the original.

When the message is actually transmitted via packet (or voice) it then must follow the BCARES “standard” format. Long distance NTS traffic will use the standard ARRL NTS message format. Do not use the WØIA packet cluster to send any of this traffic, as it is NOT connected to the national forwarding system. The BCARES format is to be used for all BCARES operations.

This is an example of a message as sent via packet radio:

MESSAGE #1234 PRIORITY - CHOPPER NEEDED

7/29 14:35

TO:	(PSAP) Lt. Stern, Situation Room
FROM:	(COMVAN) Eldora Fire Base, Sgt. J. Doe, Badge 543
	REPLY TO MSG.#1230
TEXT:	We confirm that we need a helicopter at the fire base. It will be used to do an aerial survey of the extent of the fire. Please advise of availability and time of arrival.

END MESSAGE SENT 14:42 BY COMVAN

The following is a detailed description of the key elements of this message:

LINE 1, ID NUMBER: Every message must have a unique number to identify it. When sending the message via the WØIA packet cluster, the cluster will automatically assign the message number. If you are sending a voice message, then you must assign and log your own message ID number.

LINE 1, CLASSIFICATION: Each message is given a rating, depending upon its urgency. #1 is EMERGENCY with life and death urgency. #2 is PRIORITY, which is used for official messages with a specific time limit. #3 is ROUTINE, which is used for official messages with no time limit. #4 is H&W, which is for health and welfare inquiries or relies.

LINE 1, SUBJECT: This is a very brief description of the message contents.

LINE 2, DATE & TIME: This is the local date and time (*NOT* UTC) that the message was given to your packet station by the person writing the message. Note this is *NOT* the time that you actually sent the message. (see line 7)

LINE 3, TO ADDRESS: The first element in the “To” address is always the call-sign of the recipient amateur radio station. BCARES always uses “tactical” call signs and not amateur radio call signs. The remainder of this line is the complete address required to properly deliver the message. Sometimes the message will be addressed to a particular individual, other times it will be addressed to a particular office.

LINE 4, FROM ADDRESS: The first element in the “FROM” address is always the “tactical” call sign of your packet station. This is important so that a reply message can be addressed back to your station.

LINE 5, REPLY: This is an optional line. It is only used if your message is a reply to a previous message. If it is a reply, then you include the other party’s original message number here.

LINE 6, TEXT: This is the actual message to be sent. This could consist of many lines of text. Enter the text EXACTLY as given to you by the originator. Do not edit the text, make up abbreviations, or change spelling. Remember you are passing communications only. You are not expected to always understand what you are transmitting or receiving. That is the responsibility of the originator and recipient. If you cannot read the handwriting or you have questions, ask for clarification from the message originator prior to starting to send it. Always read the entire message prior to starting the transmission.

LINE 7, END: We always send an “end of message” line. This is an assurance to the recipient that he has in fact received the entire message. If only a partial message were delivered, then perhaps the entirely wrong actions might be taken. Also included on this line is the actual time that the message was sent. This allows the recipient to compare the time filed with the time the message was actually sent to determine the appropriate response. If you are sending the message via the WØIA packet cluster S/F or S/FR command, then you do not type this line. The cluster automatically inserts it for you when you type in the message terminator control character.

BOULDER REGIONAL COMMUNICATIONS CENTER
PACKET RADIO MESSAGE
(please print)

TO: Sit Room

FROM: Eldora Fire Base - J. Doe

CLASSIFICATION: 1. EMERGENCY (life & death urgency)
(circle one) 2. PRIORITY (official msg. with specific time limit)
3. ROUTINE (official msg. with no time limit)
4. H & W (health & welfare inquiry or reply)

REPLY TO PREVIOUS MESSAGE ? NO YES If yes, Message No.? 1230
(circle one)

SUBJECT: Chopper Needed
(brief description of message)

TEXT:
We confirm that we need a helicopter at the fire base. It will be used to do an aerial survey of the extent of the fire. Please advise of availability & time of arrival.

SIGNATURE: J. Doe TITLE: Syk BADGE NO: 573

do not write below this line

This portion to be completed by Packet Radio Operator

MESSAGE NUMBER: 1234 DATE: 7/29 TIME FILED: 14:35
ORIGINATING STATION: CMVAN OPERATOR: NDONX TIME SENT: 14:42
DESTINATION STATION: BRCC QSL rcvd: (es) / No TIME RECEIVED: 14:50

LOG SHEET: BCARES operators are required to keep a log sheet of all messages sent and received. A sample log sheet is shown below. Fill in your location, tactical call sign, date and the names and call signs of all the operators at your location. Record the call sign of the station contacted along with the time of contact. Check REC or XMT depending upon whether you received or sent the message along with the message number. The commented section would include the brief message "subject" and any other relevant notes. When the other station acknowledges receipt of your message, check the QSL column. Likewise, when you have acknowledged an incoming message, check this QSL column.

BCARES MESSAGE LOG SHEET:

LOCATION: Five Base TACTICAL CALL SIGN: COMVAN DATE: 7/29
 OPERATORS: Ken Kopp, KDØRC, C1 Bob Schneider, NØ4UX
C2

STATION	TIME	REC	XMT	MSG#	SUBJECT, COMMENTS, NOTES	QSL
BRCC	14:42		✓	1234	Prior-Chopper Needed 20015 1230	✓ 14:50

BCARES PACKET PROCEDURES

Portable Packet Set 1.

Setup.

Find the half wave collapsible antenna.

Carefully attach it to the BNC connector on the aluminum suitcase. (Near the handle.) Do not force fit this antenna. Over the years the parts have been bent, so the connector may not fit all the way on.

Do not remove the entire contents of the suitcase. It is OK to put the printer and computer outside the suitcase, but leave everything else alone.

Plug the AC line into the wall, and then turn the switch to 'AC'.

Apply power.

Turn on the computer and printer. (TNC and radio should already be turned on.)

If you are close to (or at) the PSAP, put the packet radio on the secondary frequency, otherwise use the primary frequency.

The computer program will load and start automatically.

Set the time and date.

These computers sit inactive for long periods, and the internal clocks lose track of time.

Press the CTRL and 'T' keys simultaneously to bring up the DOS date and time window.

Enter the correct time in the format HH:MM, then tab to the date box.

Enter the date in the format MM/DD/YY then press the ENTER key.

Note: This will also reset the TNC to the correct date and time.

Leave it alone.

Once things are working properly, please don't 'fiddle' with the station. More often than not, a working station will become inoperable.

Log on to WØIA.

Press the ALT key then the 'C' key to bring up the Connect window.

In the box labeled 'Station to connect to:' key in WØIA and press the ENTER key.

The WØIA 'Welcome' message will display followed by the prompt: 'WØIA-6 de WØIA 8-May 1015Z >

Press the ALT key then the 'T' key to bring up the Tactical call window.

Key in your tactical call followed by the ENTER key. If you don't know your tactical call, ask net control. (Do not make up your own tactical call without net control permission).

WØIA will change the prompt to indicate your tactical call.

Notify net control that you are logged on to WØIA, and confirm your tactical call.

Press the CTRL and 'P' keys simultaneously to turn on printing. (Make sure the word 'PRINTER' appears in the upper right hand corner of the screen).

Sending messages.

Press the ALT key followed by the 'B' key to get into the BCARES message formatter.

Use the TAB key to move among the fields (data entry boxes) on the screen. The date will be automatically filled in, but can be changed if needed.

When filling in the TO: field, be sure to use the exact spelling of the other station's call (or tactical call) so that they will get automatic notification of their new mail.

When entering text in the TEXT: box, you will be able to use the ENTER key to get new lines. You will also be able to use the arrow keys and the PAGE UP and PAGE DOWN keys to move around. The TAB key will take you out of the TEXT: box, so don't try to include tabs in the text.

When the text is the way you want it, press the ALT key followed by the 'S' key.

A message will display briefly to let you know that the TNC is getting the message.

An information window will display to let you know that the message is now being sent over the air. Press the ENTER key to remove this window.

Press the ALT followed by the 'F' and 'X' keys to return to the main communications screen. At this point, all of the prompts from the cluster will come back. You may ignore them, as the formatter put everything in the right order automatically.

When you get the prompt back from WØIA, you may send the next message or read a message.

Reading messages.

Make the printer is selected, (the word 'PRINTER' will appear in the upper right hand corner).

Press the CTRL and 'P' keys simultaneously to select the printer if it is not selected.

If you get a message stating that you have new mail, simply press the 'R' key followed by the ENTER key. The message will come back to your terminal from the cluster.

If you are told to read a particular message number, key in 'R' followed by a space followed by the message number followed by the ENTER key.

Avoid using the 'DIR' command to find messages. It wastes packet channel capacity and your time. Use this command only if absolutely necessary.

Getting help.

Attempt to resolve problems yourself first, but do not spend too much time trying to get a stuck system working.

Try to isolate the problem.

Is it a radio related problem?

Squelch and volume control settings are likely culprits.

Is it a TNC related problem?

An antenna radiating 50 watts into the TNC may require you to reset it. (You will move that antenna away from the computer, TNC, and people, won't you?)

Is it a computer related problem?

See the TNC related problem above.

Look for loose cables, or a failing power supply.

Is it a software related problem?

Press the F1 key to get help about the screen that is currently displayed.

Use the Page Up/Page Down keys to scroll through help.

Turn off the computer, then turn it back on if it seems completely unresponsive.

Call net control.

They will talk you through your problem, or dispatch someone to help you.

Portable Packet Sets 2 and 3.

Setup.

Carefully remove the contents of the suitcase.

Connect the components.

Pay close attention to the color-coding and cable labels - **DO NOT ASSUME THAT ALL BARREL CONNECTORS CONTAIN THE SAME VOLTAGE OR POLARITY!**

Make sure that the voice and packet antennas are separated as far as possible (there is a roll of coax in the suitcase for this purpose). It is worth the effort to put them at different heights, if possible.

It is usually not necessary to remove the battery from the toolbox, but it may be taken out if needed. (Please do not pick it up by its leads.)

Apply power.

Turn on the computer, printer, TNC, and both radios.

If you are close to (or at) the PSAP, put the packet radio on the secondary frequency, otherwise use the primary frequency.

The TNC needs to be on for the program to load.

The computer program will load and start automatically.

Set the time and date.

These computers sit inactive for long periods, and the internal clocks lose track of time.

Press the CTRL and 'T' keys simultaneously to bring up the DOS date and time window.

Enter the correct time in the format HH:MM, then tab to the date box

Enter the date in the format MM/DD/YY then press the ENTER key.

Note: This will also reset the TNC to the correct date and time.

Leave it alone.

Once things are working properly, please don't 'fiddle' with the station. More often than not, a working station will become inoperable.

Log on to WØIA.

Press the ALT key then the 'C' key to bring up the Connect window.

In the box labeled 'Station to connect to:' key in WØIA and press the ENTER key.

The WØIA 'Welcome' message will display followed by the prompt: 'WØIA-8 de WØIA 8-May 1015Z >

Press the ALT key then the 'T' key to bring up the Tactical call window.

Key in your tactical call followed by the ENTER key. If you don't know your tactical call, ask net control.

WØIA will change the prompt to indicate your tactical call.

Notify net control that you are logged on to WØIA.

Press the CTRL and 'P' keys simultaneously to turn on printing. (Make sure the word 'PRINTER' appears in the upper right hand corner of the screen).

Sending messages.

Press the ALT key followed by the 'B' key to get into the BCARES message formatter.

Use the TAB key to move among the fields (data entry boxes) on the screen. The date will be automatically filled in, but can be changed if needed.

When filling in the TO: field, be sure to use the exact spelling of the other station's call (or tactical call) so that they will get automatic notification of their new mail.

When entering text in the TEXT: box, you will be able to use the ENTER key to get new lines. You will also be able to use the arrow keys and the PAGE UP and PAGE DOWN keys to move around. The TAB key will take you out of the TEXT: box, so don't try to include tabs in the text.

When the text is as you want it, press the ALT key followed by the 'S' key.

A message will display briefly to let you know that the TNC is getting the message.

An information window will display to let you know that the message is now being sent over the air. Press the ENTER key to remove this window.

Press the ALT followed by the 'F' and 'X' keys to return to the main communications screen. At this point, all of the prompts from the cluster will come back. You may ignore them, as the formatter put everything in the right order automatically.

When you get the prompt back from WØIA, you may send the next message or read a message.

Reading messages.

Make the printer is selected, (the word 'PRINTER' will appear in the upper right hand corner).

Press the CTRL and 'P' keys simultaneously to select the printer if it is not selected.

If you get a message stating that you have new mail, simply press the 'R' key followed by the ENTER key. The message will come back to your terminal from the cluster.

If you are told to read a particular message number, key in 'R' followed by a space followed by the message number followed by the ENTER key.

Avoid using the 'DIR' command to find messages. It wastes packet channel capacity and your time. Use this command only if absolutely necessary.

Getting help.

Attempt to resolve problems yourself first, but do not spend too much time trying to get a stuck system working.

Try to isolate the problem.

Is it a radio related problem?

Squelch and volume control settings are likely culprits.

Is it a TNC related problem?

An antenna radiating 50 watts into the TNC may require you to reset it. (You will move that antenna away from the computer, TNC, and people, won't you?)

Is it a computer related problem?

See the TNC related problem above.

Look for loose cables, or a failing power supply.

Is it a software related problem?

Press the F1 key to get help about the screen that is currently displayed.

Use the Page Up/Page Down keys to scroll through help.

Turn off the computer, and then turn it back on if it seems completely unresponsive.

Call net control.

They will talk you through your problem, or dispatch someone to help you.

PSAP Roll-Away Packet Set.

Setup.

Roll the cart into the office specified by the PSAP director. (Will either be the office near the door or the next one over.)

Pull the AC line cord out of the back and plug it in to the wall.

Pull the two coax lines out of the back and plug them into the two SO-239 jacks on the wall.

One is for the voice radio and the other is for the packet radio. (There is no difference which jack is used.)

Apply power.

Turn on the computer, printer, TNC, and both radios.

Leave the packet radio on the secondary frequency unless there are problems that require you to go to the primary frequency.

The computer program will load and start automatically.

Set the time and date.

These computers sit inactive for long periods, and the internal clocks lose track of time. Press the CTRL and 'T' keys simultaneously to bring up the DOS date and time window.

Enter the correct time in the format HH:MM, then tab to the date box

Enter the date in the format MM/DD/YY then press the ENTER key.

Note: This will also reset the TNC to the correct date and time.

Leave it alone.

Once things are working properly, please don't 'fiddle' with the station. More often than not, a working station will become inoperable.

Log on to W0IA.

Press the ALT key then the 'C' key to bring up the Connect window.

In the box labeled 'Station to connect to:' key in W0IA and press the ENTER key.

The W0IA 'Welcome' message will display followed by the prompt: 'W0IA-6 de W0IA 8-May 1015Z >

Press the ALT key then the 'T' key to bring up the Tactical call window.

Key in your tactical call followed by the ENTER key. If you don't know your tactical call, ask net control.

W0IA will change the prompt to indicate your tactical call.

Notify net control that you are logged on to W0IA.

Press the CTRL and 'P' keys simultaneously to turn on printing. (Make sure the word 'PRINTER' appears in the upper right hand corner of the screen).

Sending messages.

Press the ALT key followed by the 'B' key to get into the BCARES message formatter.

Use the TAB key to move among the fields (data entry boxes) on the screen. The date will be automatically filled in, but can be changed if needed.

When filling in the TO: field, be sure to use the exact spelling of the other station's call (or tactical call) so that they will get automatic notification of their new mail.

When entering text in the TEXT: box, you will be able to use the ENTER key to get new lines. You will also be able to use the arrow keys and the PAGE UP and PAGE DOWN keys to move around. The TAB key will take you out of the TEXT: box, so don't try to include tabs in the text.

When the text is as you want it, press the ALT key followed by the 'S' key.

A message will display briefly to let you know that the TNC is getting the message.

An information window will display to let you know that the message is now being sent over the air. Press the ENTER key to remove this window.

Press the ALT followed by the 'F' and 'X' keys to return to the main communications screen. At this point, all of the prompts from the cluster will come back. You may ignore them, as the formatter put everything in the right order automatically.

When you get the prompt back from WOIA, you may send the next message or read a message.

Reading messages.

Make sure the printer is selected, (the word 'PRINTER' will appear in the upper right hand corner).

Press the CTRL and 'P' keys simultaneously to select the printer if it is not selected.

If you get a message stating that you have new mail, simply press the 'R' key followed by the ENTER key. The message will come back to your terminal from the cluster.

If you are told to read a particular message number, key in 'R' followed by a space followed by the message number followed by the ENTER key.

Avoid using the 'DIR' command to find messages. It wastes packet channel capacity and your time. Use this command only if absolutely necessary.

Getting help.

Attempt to resolve problems yourself first, but do not spend too much time trying to get a stuck system working.

Try to isolate the problem.

Is it a radio related problem?

Squelch and volume control settings are likely culprits.

Is it a TNC related problem?

Is it a computer related problem?

Look for loose cables.

Is it a software related problem?

Press the F1 key to get help about the screen that is currently displayed.

Use the Page Up/Page Down keys to scroll through help.

Turn off the computer, then turn it back on if it seems completely unresponsive.

Call net control.

They will talk you through your problem, or dispatch someone to help you.

COM VAN Packet Set.

Setup.

Apply power.

Turn on the computer, printer, TNC, and both radios.

If you are close to the PSAP, put the packet radio on the secondary frequency, otherwise use the primary frequency.

The TNC needs to be on for the program to load.

The computer program will load and start automatically.

Set the time and date.

These computers sit inactive for long periods, and the internal clocks lose track of time. Press the CTRL and 'T' keys simultaneously to bring up the DOS date and time window.

Enter the correct time in the format HH:MM, then tab to the date box

Enter the date in the format MM/DD/YY then press the ENTER key.

Note: This will also reset the TNC to the correct date and time.

Leave it alone.

Once things are working properly, please don't 'fiddle' with the station. More often than not, a working station will become inoperable.

Log on to W0IA.

Press the ALT key then the 'C' key to bring up the Connect window.

In the box labeled 'Station to connect to:' key in W0IA and press the ENTER key.

The W0IA 'Welcome' message will display followed by the prompt: 'W0IA-6 de W0IA 8-May 1015Z >

Press the ALT key then the 'T' key to bring up the Tactical call window.

Key in your tactical call followed by the ENTER key. If you don't know your tactical call, ask net control.

W0IA will change the prompt to indicate your tactical call.

Notify net control that you are logged on to W0IA.

Press the CTRL and 'P' keys simultaneously to turn on printing. (Make sure the word 'PRINTER' appears in the upper right hand corner of the screen).

Sending messages.

Press the ALT key followed by the 'B' key to get into the BCARES message formatter.

Use the TAB key to move among the fields (data entry boxes) on the screen. The date will be automatically filled in, but can be changed if needed.

When filling in the TO: field, be sure to use the exact spelling of the other station's call (or tactical call) so that they will get automatic notification of their new mail.

When entering text in the TEXT: box, you will be able to use the ENTER key to get new lines. You will also be able to use the arrow keys and the PAGE UP and PAGE DOWN keys to move around. The TAB key will take you out of the TEXT: box, so don't try to include tabs in the text.

When the text is as you want it, press the ALT key followed by the 'S' key.

A message will display briefly to let you know that the TNC is getting the message.

An information window will display to let you know that the message is now being sent over the air. Press the ENTER key to remove this window.

Press the ALT followed by the 'F' and 'X' keys to return to the main communications screen. At this point, all of the prompts from the cluster will come back. You may ignore them, as the formatter put everything in the right order automatically.

When you get the prompt back from WOIA, you may send the next message or read a message.

Reading messages.

Make the printer is selected, (the word 'PRINTER' will appear in the upper right hand corner).

Press the CTRL and 'P' keys simultaneously to select the printer if it is not selected.

If you get a message stating that you have new mail, simply press the 'R' key followed by the ENTER key. The message will come back to your terminal from the cluster.

If you are told to read a particular message number, key in 'R' followed by a space followed by the message number followed by the ENTER key.

Avoid using the 'DIR' command to find messages. It wastes packet channel capacity and your time. Use this command only if absolutely necessary.

Getting help.

Attempt to resolve problems yourself first, but do not spend too much time trying to get a stuck system working.

Try to isolate the problem.

Is it a radio related problem?

Is it a TNC related problem?

Is it a computer related problem?

Is it a software related problem?

Press the F1 key to get help about the screen that is currently displayed.

Use the Page Up/Page Down keys to scroll through help.

Turn off the computer, and then turn it back on if it seems completely unresponsive.

Call net control.

They will talk you through your problem, or dispatch someone to help you.

BCARES TELEVISION OPERATIONS

Jim Andrews, WA0NHD-TV, TV Coordinator

Television is one of the radio communication services that BCARES provides to the public safety agencies in Boulder County. In recent years, TV has been the most requested service we provide. TV allows the Police or Sheriff situation commanders both in the field at the incident command post and also at the main headquarters to actually see what is happening instead of relying solely upon voice radio reports. TV has proven to be particularly valuable for large forest fires and monitoring large, potentially riotous crowds. It can also be used to monitor severe weather.

BCARES has two video pack sets. Each pack set consists of a SONY color, hi-8mm video camcorder (with night vision capability), camera tripod, 1 watt 70 cm TV transmitter, vestigial side-band filter, antenna, a 7 Amp-Hour gel-cell battery for about 5-6 hours continuous operation, plus other accessories. The TV transmitters transmit live, fast-scan, color pictures along with audio. The transmitters are designed to meet commercial broadcast standards. We also have a large Canon model L-2, hi-8mm camcorder with excellent telephoto optics. We have a 13" color SONY TV receiver to receive our signals. For mobile operations we have 70cm mag-mount antennas plus a 10 watt, 70cm transmitter. We also have several high gain, 70 cm yagi antennas plus masts and antenna tripods. BCARES has two TV repeaters. One is located in Chautauqua Park and provides coverage of most of the City of Boulder plus most of the eastern half of Boulder County. The other is a portable 10 watt repeater for use in difficult mountainous terrain. This portable repeater can also originate its own pictures from a local camera if desired. BCARES has permanently installed TV receivers and VCRs in the Boulder and Longmont 911 dispatch centers along with the Sheriff's Communications van (Com-Van) and the mobile Incident Command Vehicles (ICVs) of the Sheriff, Boulder Police Dept. and the Longmont Police Dept.

All BCARES TV operations are on the 70 cm amateur radio band (420-450 MHz). Modern, digital tuned, cable-ready TV receivers will receive these TV transmissions directly without using any additional converters. BCARES' frequencies are chosen to closely match standard cable TV channels 57, 58 & 60. The TV pack sets transmit on C58 (427.25 MHz) and C60 (438.75 MHz). The TV repeaters' outputs are on C57 (421.25 MHz) while the inputs are C60 (438.75 MHz). The Chautauqua Park TV repeater's input is normally on the 23 cm band (1277.25 MHz). For BCARES operations, its input frequency must be switched to 70 cm by a control operator. Antenna polarization is vertical. Coordination of BCARES TV operations is done using voice radios on the 2 meter amateur band. This is done either on a designated simplex frequency or on one of the area 2 m repeaters.

BCARES TV POLICY STATEMENTS

1. BCARES sole TV role is to document the event and present it in real time to the public safety officials at the incident command post. BCARES TV crews are expected to take a low-key, passive, observer role. BCARES TV crews are expressly forbidden from staging pictures or inciting a crowd to act up and perform for the camera. No "cute", tricky camera shots are allowed.
2. For safety purposes, it is BCARES's policy that there will always be two people in a TV crew. One person to operate the camera and the other to act as a look-out and radio communicator with net control. BCARES TV crews must always keep in mind their safety. Some emergency situations could possibly expose the TV crew to hazardous situations. Examples include a run-away forest fire, a rioting crowd, a flash flood, etc. Use common sense and avoid these situations. If the command post requests you to take pictures of a dangerous situation and you fear for the safety of yourself and your crew, you are obligated to refuse the assignment and remove your crew from danger.
3. If a BCARES TV crew observes any significant event occur, such as a forest fire flare-up or a crime in progress, they are required to immediately start their TV camcorder recording the event and notify the TV net controller for permission to start transmitting.
4. Even when a particular camera is not transmitting, the camcorder should still be recording the event. These tapes will be useful later for event critiques and legal records.
5. It is BCARES policy that for historical and legal reasons we will always have both the date and time continuously recorded on every tape.
6. It is forbidden to rewind and re-record over a tape while on a mission. Every tape is a legal record of the event. If you are running low on your supply of tapes, you should request that Net Control send you additional tape supplies. BCARES does re-use old video tapes, but only after our served public safety agency has determined they no longer need to be retained for legal or historical records.
7. All tapes must be labeled. When starting a new tape, record on the beginning leader photos of the TV crew with an audio identification of the situation and the crew's names. After a tape is removed from the camera, the red erase prevention tab must be set. A label identifying the tape must immediately be attached directly to the tape cassette (not its box!). The label must completely identify the tape, including event name, location, date, time period, camera operator(s), etc. At the end of the event, or your shift, you are required to turn in all of your recorded tapes to the TV net controller.
8. The FCC requires radio amateurs to identify their transmissions every 10 minutes. For ham TV transmissions, it is legal to identify with either a voice announcement or a video call sign ID or both. A simple video ID could be a 3"x5" index card with the

operator's call sign written on it in large bold letters. To ID, simply hold this card in front of the camera's lens for a couple of seconds.

BCARES TV 2 m VOICE COORDINATION NET PROCEDURES

The coordination of BCARES TV activities is done using 2 m FM voice radios. We use a simplex frequency for short distances or a 2 m repeater when necessary. Each BCARES TV crew member is expected to supply his own 2 m hand-held, pack-set radio. It is helpful if at least one crew member is also able to monitor the police or fire radio channel for the event. Because of the nature of our "product" usually being a single TV picture presented at the command post, our voice net procedures are different from those used by other hams passing health & welfare traffic between shelters, scheduling assignments or coordinating packet traffic. The TV Net Controller is the TV ham in the command post with the police or fire officials. He is the "Director" much the same as the director on a motion picture set. He calls the shots by requesting various views and coordinating the on/off switching between different camera crews. He works with the public safety officials and supplies whatever pictures they want. Do not turn off your TV transmitter until TV Net Control gives you the command. The TV net controller will typically have another TV crew turn on their transmitter at exactly the same instant that you turn yours off. If you are not transmitting, but notice some event occur that should be of interest to the command post, immediately call net control on 2m and request permission to start transmitting TV pictures.

The remainder of this document deals with the setup and operation of the BCARES portable, 1 watt, video pack-sets and the operation of their new SONY camcorders. All TV trained members of BCARES are expected to be totally familiar with the operation of these pack-sets and the Sony camcorders.

There are separate documents detailing how to use the TV Repeaters and the TV installations in the Boulder & Longmont 911 centers, the Sheriff's Com-Van and the Sheriff, Boulder Police and Longmont Police Incident Command Vehicles (ICVs).

BCARES VIDEO PACK-SET OPERATING INSTRUCTIONS

The BCARES video pack-sets are complete, self-contained, portable, video broadcast stations. They contain the following items:

SONY model CCD-TRV67, color, hi-8mm, video Camcorder
SONY model DCC-L50, 12V/8V car battery adapter
Camera Tripod

P.C. Electronics, 1 watt, 2 chan, 70cm AM-TV Transmitter
Spectrum International, interdigital, Bandpass Filter, for 70cm 6 MHz wide channel
Diamond model RH77CA, 70cm, BNC, rubber duck, ½ wave, gain, whip antenna

12 Volt, 7 Amp-Hour, sealed lead-acid battery

plus accessories: BNC RG-58 coax cable, Dual RCA type Audio/Video coax cable, 4-way DC power outlet box, DVM, flashlight, umbrella, video tapes, padded case for camera, back pack, Boulder County topo map, compass, Sony manual and this set of instructions.

1. Unpack the backpack and verify that all of the above items are included. Notify the BCARES equipment officer of any missing items.
2. Set up the camcorder on the camera tripod. Note that the tripod is designed with a "quick-release" clamp. A quick-release adapter plate is mounted on the bottom of the camcorder. Never remove this adapter from the camcorder.
3. Next find the camera power/audio/video cable. It contains in the middle the SONY 12/8V car battery adapter. Connect this cable to the camcorder. The 8V, DC power plug is an unusual flat bladed, keyed connector. It attaches on the back of the camcorder behind a rubber plug labeled "DC IN". The other end (12V) of the DC power cable has a Molex style connector. Plug it into the 4-way DC power box. The RCA style A/V cable attaches to the RCA connectors found on the right side of the camcorder. Insert the Red cable connector into the Yellow Video connector. Insert the Black cable connector into the Black Audio connector.
4. Next locate the TV Transmitter, Band-Pass Filter and the Antenna. Use the BNC coax cable to connect the transmitter output to the band-pass filter. Attach the antenna to the other BNC connector on the filter. Connect the audio/video cable to the transmitter. Connect the Red connector to the Video "V" input. Connect the Black connector to the Audio "A" input. The third RCA connector labeled "MON" is not used. It is a baseband video output to drive a video monitor to view the transmitted signal. Connect the transmitter's DC power cable to the 4-way DC power box.

5. Attach the DC power box to the top of the 12 Volt battery using the attached velcro strips. Connect the battery's Molex connector to the power box.
6. Open up the fold-out LCD monitor screen on the camcorder. Turn on the camcorder. Note: see separate operating instructions for the new SONY camcorders.
7. Now examine the controls on the TV transmitter. It is very simple to operate and only has a minimal number of switches. There are only 4 toggle switches. There is a master power switch with a miniature LED next to it. There is a channel switch with two channels (58 or 60). There is a Sound Sub-Carrier (SSC) switch. There is also a Day/Night (D/N) switch. Normally the SSC switch is set ON and the D/N switch is set to D (Daytime). Consult the bandpass filter and determine its channel. It will either be labeled as 58 or 60. Set the channel switch to match the filter channel. Now set the Power switch to the ON position. Two LEDs should light up. Congratulations! You are now transmitting a TV signal.
8. Pull the Red RCA connector out from the camcorder. The red LED next to the antenna BNC connector should go out. Did it ?? The transmitter is turned on, but now is not transmitting. The TV transmitters include a built-in VOX circuit. This means Video Operated Xmit. When a video signal is present on the Red video cable, the transmitter is turned on automatically. Reconnect the red connector. This XMIT-LED should again light. The VOX circuit allows you to turn off the transmitter simply by pulling out the red video cable connector from the camcorder. Otherwise, you would have to take the backpack off to get at the on/off switch.
9. If the TV net control ever asks you to deactivate your audio transmissions, set the SSC switch to off. This turns off the transmitter's 4.5 MHz, FM Sound Sub-Carrier generator.
10. If the TV net controller complains of very dark video pictures at night, then set the D/N switch to the N (night) position. This switch controls the video gain of the transmitter and can be used to compensate for very dark pictures. If the net controller complains of bleached out pictures, then return this control to the D (daytime) position.
11. The transmitters can be operated on either channel 58 or 60. The bandpass filter is not required to operate the transmitter. If, for example, you are supplied with a filter for channel 58 and you want to operate on channel 60, then you remove the filter and BNC cable and connect the BNC antenna directly to the transmitter's antenna connector. Without the filter, the transmitter emits double sideband AM-TV signals. Double sideband AM will cause adjacent channel interference. With the filter, the transmitters emit TV broadcast industry standard, Vestigial Upper SideBand (VUSB) TV signals.
12. Now turn off all of the equipment, but do not disconnect the cables. Pack all of the equipment, except for the camcorder and tripod into the backpack. The transmitter is designed to fit in the outside pocket with its cables going thru holes to the interior of the backpack. The bandpass filter sits vertically behind the transmitter with its BNC

connectors on the top. There is a cut-out in the back pack to allow the BNC antenna to extend vertically from the back pack. Next put the battery in the bottom of the pack. Position the excess cables in the bottom of the pack. Be careful to not get these cables wrapped around, nor in the vicinity of the BNC antenna. If this happens, RF feedback will get into the camcorder's audio/video circuits and create distorted pictures. The back pack is designed to be worn on the back with the camera cables exiting the right side and with the camcorder being held in the operator's right hand.

13. When operating, occasionally check your battery voltage with the DVM. Never let the voltage drop below 11.9 Volts, otherwise the battery will be damaged. The camcorder and transmitter contain voltage regulator circuits and will operate properly for all battery voltages from full charge (14.5V) to minimum (11.9V) voltage. If your transmitter starts to malfunction, your battery is discharged and its voltage is dropping fast.

14. When you are finished using the video pack-set, you do not need to disconnect any of the cables. The only exception is the plug between the 12 V battery and the power box. If the battery is left connected while in storage, the 12/8V power adapter will discharge the battery. Notify the BCARES equipment officer after you have used this equipment so he can check it out, replace videotapes and recharge the batteries.

ALTERNATIVE MODES OF OPERATION BCARES also has additional accessories in our equipment cache that allow other modes of TV operation. There is a bag of additional accessories, plus more videotapes, 7 A-hr & 20 A-hr batteries and antennas.

MOBILE TV For operation in an automobile, the camcorder and transmitter can be operated from the car's 12 V cigarette lighter DC power outlet. An adapter plug is in the accessory bag. There is also a 70cm, 5/8 wave, gain, magnetic mount, mobile antenna in the accessory bag. If 1 watt is insufficient power to get a clear picture to the receive site, BCARES also has a 10 watt, 70cm TV transmitter available in the equipment cache. It is identical to the 1 watt units, but includes a 10 watt linear power amplifier. It has the same connectors and switch controls as the 1 watt units.

120-VOLT AC If you are operating from a fixed location that has 120 Volt AC power available, you do not need to use the battery. The accessory bag contains the SONY camcorder AC power adapter along with a wall transformer plug-in power supply for the 1-watt transmitter.

HIGH POWER If you are operating in a fixed location and need a higher power signal, you can use the 10-watt transmitter and also a beam antenna. Also consider using the TV repeaters. We have 6 element and 10 element, yagi, high gain antennas in our equipment cache. We also have antenna tripods and mast sections for these antennas.

SONY CAMCORDER OPERATING INSTRUCTIONS

The new SONY model CCD-TRV67 Camcorder is an excellent camera for BCARES operations. It is a full featured, lightweight, hi-8mm, color camcorder. It includes wide angle / telephoto lens, fold-out LCD monitor screen and infrared night vision capability. It is a new, super-efficient, low battery drain design.

In most ham radio operations, learning to operate the radio is the most complex part. For crystal controlled, channelized TV operations, operating the transmitter is very simple. The complex part is learning to operate the TV camera. The SONY camcorder is a very complex instrument with a large number of features. However, for BCARES operations, we will not use most of its advanced features. We ask that you not even attempt to use them. This will greatly simplify the learning curve. A copy of the detailed SONY instruction manual is included in the video pack set. You may consult it for camera drawings to identify various controls. Otherwise, hopefully these abbreviated instructions will be sufficient to teach you how to operate the important controls.

1. **BATTERY** The camcorder needs a source of DC power. It comes supplied with a 7 V, Li-Ion battery (model NP-F330) which is capable of operating the camera for about 90 to 120 minutes when fully charged. For normal BCARES operations, we do not rely upon this battery, but instead power the camera from our 12 V, sealed, lead-acid batteries. For external DC or AC operation, plug the DC power cord into the socket on the lower back of the camera. You do not need to remove the Li-ion battery when using external power. The battery will be re-charged if external power is applied and the camcorder is turned off.

2. **POWER SWITCH** To turn on the camcorder requires the operation of two separate switches. On the front left is found the master power switch. It is a 3 position switch labeled: Camera - Off (charge) - Player. In the "Player" position, the camcorder acts as a VCR for playing back recorded tapes. Set the power switch to the "Camera" position. This now opens up the protective lens cover. Now locate the rotary switch on the rear panel. It has a red button in the center. Place the rotary switch in the "Stand-By" position. This turns on the camera and an image will now be seen in the viewfinder.

3. **VIEWFINDER** The camcorder is equipped with two monitor viewfinders. The first is the classical, peep-hole, miniature, B&W CRT. The second is a swing-out LCD screen. The CRT has the highest resolution. The LCD is more convenient to use, but is unusable in bright sunlight.

4. **WIDE ANGLE / TELEPHOTO LENS** The control for the lens is located on the top of the camcorder. It is a slider control labeled "W - T". It is in a position convenient to operate with your right index finger while holding the camcorder in its grip with your right hand. Experiment with its use. The max. optical zoom is 20 X. Beyond 20 x, digital zoom (max. 40 x or 360 x) is used. The pixel resolution diminishes with increasing digital zoom.

5. **CASSETTE TAPE** Before recording, a videotape cassette must be put into the camcorder. Find the "EJECT" button on the top rear of the camcorder. Push this button in the direction of the arrow and release it. The tape compartment will rise out of the camcorder and an access door will open. Insert a hi-8mm videotape. Note: ordinary 8 mm videotapes can also be used, but will record at lower VHS resolution. Always insist upon using hi-8mm tapes whenever possible. Insert the tape upside down with the mfgr. labels facing outward. Now gently push on the door where it is labeled "PUSH". The door will lock into position and the compartment will automatically lower and properly position the tape in the recording mechanism. A standard 8mm or hi-8mm, 120 tape will give you 2 hours of recording time.

6. **RECORD** Swing open the LCD display screen. The only text on the screen will probably say "STBY", i.e. Stand-By. There might also be some numbers, text or icons elsewhere on the screen. Now press and release the red button on the back of the camcorder. The screen text will change from "STBY" to "REC", i.e. Record. The camera is now recording on the tape cassette. Push again and release the red button. The camera will stop recording and the text will again say "STBY".

7. **DISPLAY INDICATORS** The monitor display will give the operator a lot of additional information. With the LCD swung out, now examine the switches it covered up when it was closed. Push and release several times the button labeled "DISPLAY". A tape counter will appear in the upper right hand corner of the screen. It displays total recorded time on the tape in Hours.Minutes.Seconds. If you have just loaded a new, rewind, tape, then push the "COUNTER RESET" button to reset the elapsed time to 0.00.00 For a detailed explanation of what some of the other icon symbols that might appear on the screen, consult the SONY manual.

8. **DATE & TIME** It is BCARES policy that we always continuously record on our tapes the actual date and time. To activate these push the "DATE" and "TIME" buttons until both appear on the display screen. The words "AUTO DATE" should not appear on the screen.

9. **FOCUS** The camcorder has an excellent auto-focusing system that normally works great. Under certain unusual conditions, you might need to manually focus the camera. Locate the focus controls on the lower front, left side of the camcorder. Normally this control should be left in the "AUTO" position. Experiment with the different settings of these controls. Return the control back to the AUTO setting for normal operations.

10. **AUTO EXPOSURE** The camera has built-in circuits that automatically correctly set the exposure to usually give you a good quality picture. If the auto exposure fails to give you a good picture, there are some exposure controls found on the rear panel that can be used to enhance the picture. They are labeled BACK-LIGHT, A-E PROGRAM and EXPOSURE. There is also a small rotary control associated with the Program and Exposure controls. When any of these controls are activated, small icons appear on the

LCD screen. Experiment with these controls. For details, see the SONY manual. Always disable these controls when you do not need them to put the camera back in the normal Auto Exposure mode.

11. **AUDIO** The camcorder has a built-in microphone. It is located on the front under the lens. This is a very sensitive microphone, which will pick up sounds over a long distance. Audio is automatically recorded on the tape. There is nothing the operator can do to adjust the microphone or turn off the audio.

12. **NIGHT VISION** New SONY camcorders have a useful feature called "0 Lux Nightshot". The control for this function is found on the left side of the camcorder. The normal light sensitivity of the camera is 0.4 lux. When night vision is activated, the camera is converted from a color camera to a monochrome camera with enhanced infrared, low light sensitivity. Practice with this feature in a dark room.

13. **TIME-OUT TIMER** If the camera is left in the standby mode and is not recording, it will automatically shut itself off after a couple of minutes. If you need to keep the camera turned on, but not be recording, then the tape cassette must be removed from the camcorder.

14. **TAPE PLAYER** A recorded tape can be played back on the camcorder. Set the Power switch to the **PLAYER** position. Conventional VCR controls are found on the top of the camcorder. They are the functions **STOP**, **REW** (rewind), **PLAY**, **FF** (fast forward) & **PAUSE**.

15. **MENU & Other Controls** There are some other physical controls on the camcorder, plus a Menu of advanced feature software controls. Please do not activate any of these controls, nor the Menu. Otherwise, the normal operation of the camera may be impaired.

TECHNIQUES FOR TAKING GOOD QUALITY TELEVISION PICTURES

The key thing to remember when using the BCARES TV cameras is that you are transmitting "live", hi-quality, color pictures and sound with several high-ranking police, sheriff, and fire officials watching your pictures. If we act like real "amateurs" and transmit non-professional pictures, these officials will quickly lose interest and dismiss BCARES's TV pictures as not useful and may even have our crews removed from the incident scene. Your pictures are supposed to document the action at the scene of the emergency incident. Do not attempt any fancy "trick" shots. We will always attempt to keep a picture on the air. If the ICV's TV receiver's screen loses a picture and just shows "snow" and gives out a loud audio "hiss", then the officials will turn off the TV receiver. Our TV pictures must never show rapid, jerky movements. Rapid, jerky movements will actually cause the viewer to feel "sea-sick" and rapidly lose interest in your pictures. Likewise, the camera must always be held vertically.

1. **ALWAYS HOLD THE CAMERA STEADY.** The SONY camcorders include electronic movement stabilization circuits, but they will not remove all camera vibrations and jiggling. Whenever possible use the tripod instead of holding the camera in your hand. Always have the camera tripod with you, even when walking around with the TV pack-set. When providing mobile pictures from a car, it is a good idea to set up the tripod on the front seat and strap it down with a seat belt.

2. **WHEN "PANNING" USE THE WIDE-ANGLE LENS.** Position your body firmly in one position. Slowly rotate your body at the waist. Pan much slower than you think necessary. Remember that your eyes take in a very wide angular field of view, but your viewers are looking through a small box with a much narrower angular field of view. If you must pan while using the tele-photo lens, then you must rotate much slower than normal. Try to avoid panning with the tele-photo lens.

3. **WHEN WALKING USE THE WIDE-ANGLE LENS.** When moving, it is safer to use the LCD viewing screen rather than the peep-hole CRT view finder. If you are moving any distance, or at any speed, you should not try to watch the viewfinder, otherwise you might trip and fall. The best position to hold the camera when walking is at shoulder level and beside the right side of your head facing forward. In this way the camera will see what you are seeing as you walk forward. This will also tend to stabilize the camera and it will not bounce around as much.

4. **USE THE TELE-PHOTO LENS FOR DETAILED CLOSE-UPS.** When doing a tele-photo close-up, always start from the wide-angle position looking at the particular subject, zoom slowly in for the close-up, and then slowly zoom back to the wide-angle position before changing scenes or looking at other subjects. The SONY camcorders are capable of huge tele-photo magnifications up to 360X (40X max. optional). Their actual optical lens max. magnification is 20 X. Beyond 20X, they start

using digital zoom, which in reality only uses the pixels in the center of the screen. Thus very high digital zoom has much fewer pixels and as a result poorer resolution. Avoid using the digital zoom (i.e. >20X) except when absolutely necessary. The viewfinder gives an indication when digital zoom is being used.

5. LENS CAP. If you must make drastic changes in the camera position, for example when getting in or out of a car, setting it on a tripod, etc. then cover the lens with a lens cap or your hand. A black screen is much more acceptable to your viewers than a wildly gyrating camera.

6. LIVE MIKE Remember that you are also transmitting sound along with your picture. Whenever your camcorder and transmitter are on you have a "live - open" mike. The microphone on the SONY camcorder is much more sensitive than on your 2 m hand-held and will pick up voices from a considerable distance. It has an omni-directional pattern and will pick up your voice and people around you in addition to the scene your camera is looking at. Your "idle" chatter conversation will be heard in the command post and recorded on tape! !

7. NIGHT TIME In low light situations, such as night time, or inside a dark room, use the SONY camcorder's "Night Shot" feature. Activating "Night Shot" converts the color camera into a monochrome camera with much more light sensitivity. Street scenes with ordinary streetlights may become fully illuminated with this feature.

BOULDER POLICE DEPARTMENT INCIDENT COMMAND VEHICLE TV SYSTEM OPERATION

Jim Andrews
3 Oct 2002

The Television system in the Boulder Police Dept.'s Incident Command Vehicle (ICV) consists of two TV receivers, each with its own VCR. One TV/VCR is mounted in the forward radio/command compartment and another TV/VCR in the rear conference room compartment. These are conventional home type, Panasonic, all-channel, 13" color TV receivers and VCRs and require Remote Controls to operate them. Both TV receivers may be operated independently of each other and view any of the available, desired TV signals. TV signals can be received from five different sources. They are: Broadcast TV, Cable TV, BCARES TV, SWAT TV or external, hard-wired TV cameras. When receiving BCARES TV, SWAT TV or ext. hard-wired cameras, a quad processor is used to allow up to 4 different channels to be simultaneously displayed on the monitor screen.

TV/VCR: Remote controls are required to operate these instruments. Do NOT lose these remotes. Broadcast or Cable TV signals do not pass thru the VCR. To receive these signals, the A/B antenna selector switch is used to select the desired signal source and then the TV is set to the desired channel using the remote control. BCARES, SWAT and Camera signals pass thru the VCRs. To view them, the Panasonic TV must be set to the MONITOR mode and the VCR must be set for Line Input. The TVs are wired up to allow either TV to display the output of either VCR, per the following table:

TV/MONITOR Selector	<u>Video 1</u>	<u>Video 2</u>	<u>Video 3</u>
Radio Room TV	<i>radio rm VCR</i>	<i>conf rm VCR</i>	<i>not used</i>
Conf Room TV	<i>conf rm VCR</i>	<i>radio rm VCR</i>	<i>not used</i>

BROADCAST TV: To receive VHF & UHF Broadcast TV (i.e. channels 2, 4, 6, 7, 9, etc. from Denver), you must first raise the ICV's broadcast TV antenna. This antenna is permanently attached to the ICV's roof. Its elevation crank and directional controls are on the ceiling of the ICV's forward compartment. To view broadcast TV, set the Antenna Selector Switch to "A." Set the TV receiver channel selector to the desired channel. Rotate the antenna to get the best picture. Note: to receive UHF broadcast channels, the TV's menu must be accessed and the mode set to "Broadcast".

CABLE TV: To receive Cable TV, a cable must be run from the ICV to a cable hook-up in an adjacent building. A spool of 75 Ohm, RG-6, coax cable with F connectors is stored in one of the ICV's storage compartments. The attachment point to the ICV is found on the TV connector panel on the outside of the ICV, driver's side. It is labeled as "Cable IN." To view cable TV, set the Antenna Selector Switch to "B". Set the TV receiver channel selector to the desired channel. Note: to receive cable channels, the TV's menu must be accessed and the mode set to "Cable"

BCARES, SWAT, Ext. CAMERA: Live, transmitted, TV pictures of the local Boulder Police or Fire incident can also be viewed in the ICV. These pictures are provided by radio amateurs (Hams) affiliated with either BCARES (Boulder County Amateur Radio Emergency Services) or the Boulder County Sheriff's SWAT team. These radio amateurs are equipped with portable TV pack sets that include small, hi-8mm video camcorders, 1-watt TV transmitters, antenna and battery (5hr capacity). BCARES also has a 70cm, TV repeater located at Chautauqua Park in Boulder, plus a portable, 10 watt, 70cm, TV repeater. The signal from the Chautauqua Park TV repeater can be seen almost everywhere within the City of Boulder and in much of the eastern half of Boulder County. The repeater signal cannot be seen in the western part of Table Mesa. The TV signals transmitted by BCARES are on the amateur radio 70cm band (420-450MHz). They are conventional Vestigial Upper Side-Band (VUSB) TV signals. They can be received on any cable ready TV receiver on cable channels 57 thru 60. BCARES uses channels 57, 58 & 60. These pictures are not secure and could be viewed by the general public or the media using ordinary home TVs and rabbit ear antennas.

BCSO-SWAT TV signals are transmitted on a higher frequency microwave band. They are unconventional, non-standard signals. They cannot be received on a conventional TV receiver. They must be received by a special, microwave receiver. Thus these SWAT TV signals have a higher level of security from reception by the general public, press or TV media. The BCSO-SWAT TV transmitters are capable of transmitting on 3 channels (A, B & C). The ICV is set up to receive only channels A & C.

To obtain the services of BCARES, they must be called out through the Boulder 911 center. The BCARES pager # is 1890. BCSO-SWAT TV services must be requested through the Boulder Sheriff's office.

In addition to the transmitted BCARES or BCSO-SWAT TV signals, pictures can also be viewed from TV cameras connected directly to the ICV. For example, a TV camera on a tripod could be placed on the observation deck on the roof of the ICV. Provisions have been made to attach video cables directly to the ICV from three external TV cameras. These cameras are connected to the TV connector panel on the outside of the ICV. The connections are labeled as "Camera 1 IN", "Camera 2 IN" and "Camera 3 IN".

TV SYSTEM CONTROL PANEL: The bank of TV receivers for the various BCARES and SWAT channels are located on a shelf in the equipment closet in the center of the van. Also located here is the Quad Processor and the TV Control Switch Box. See the photograph below. The master TV receiver power switch on the switch box must be turned on. Also the Digital Color Quad Processor power switch must be turned on. It is located on the rear panel of the quad processor. The TV channels displayed in the four quadrants (LU = left upper) (RU= right upper) (LL = left lower) & (RL = right lower) are selected by the four rotary switches labeled as Video Quadrants. C1, C2 & C3 designate the three external, hard-wired camera inputs. 57, 58 & 60 designate the

three available BCARES 70 cm channels. A, B & C designate the SWAT TV channels. (note: at this time ch. B is unavailable, due to only two microwave TV receivers being installed at present). Audio from only one TV channel at a time can be monitored in the ICV. The audio source rotary selector switch is used to make this selection. Audio from camera microphones is transmitted along with video from the BCARES and SWAT TV transmitters. (note: at this time, no provisions were made to bring audio signals into the van from the three external cameras, C1, C2 or C3.)



Photograph of Quad Processor and the TV Control Switch Box

QUAD PROCESSOR: The Quad Processor has several control buttons. They will allow you to either view four separate cameras simultaneously, or sequentially, or individually.

Quad Mode: The quad processor normally displays four quadrant pictures on the monitors when power is first turned on. If the monitor is not displaying quad pictures, then momentarily press the left side button labeled "Quad/Auto".

Sequential Mode: To view each of the four cameras a full screen at a time in a continuously looping sequence, then momentarily press the left side button labeled "Quad/Auto".

One Camera Mode: To continuously view only a single camera on the full screen, first put the unit in the Sequential (Auto) mode (see above). Next push the switch for the desired camera

Menu: Please do not ever push the *Menu* button. The quad processor has already been preset by a TV tech. to the proper operating conditions.

EXT TV MONITOR: Provisions have also be made in the ICV TV system to allow TV signals to exit the ICV and be viewed on one or more TV receivers set up outside of the van. The use of additional, external, TV receivers are a valuable aid in keeping unnecessary personnel out of the ICV. This allows these people to monitor what is going on in the field without needlessly cluttering up the interior of the ICV. These connections are made at the TV connector panel on the outside of the van. A short piece of TV coax cable for this connection is stored in the equipment locker. The external TV receiver must be set to Channel 3.

EXT TV PANEL: This panel is accessed through an outside compartment located on the left (driver's) side towards the rear of the van. Five type "F" TV and one PL-259 connections are available. They are labeled as:

CAMERA 1 IN
CABLE IN

CAMERA 2 IN
CH 3 OUTPUT

CAMERA 3 IN
Ext. 70cm Beam Ant.

2 M RADIO: A 2 meter, amateur band radio transceiver is installed in the ICV. This is an ICOM IC-2100H, 50 watt, fully synthesized, mobile radio covering from 144 to 148 MHz. It has been pre-programmed with all of the local, commonly used amateur radio simplex and repeater frequencies. This radio is mounted in the equipment cabinet on the shelf directly above the TV quad processor equipment. This radio allows a BCARES amateur radio operator in the ICV to communicate with the TV camera operators. The operating position for a BCARES person can be moved from the equipment cabinet to the front passenger seat of the ICV. Wiring provisions were made to transfer the microphone and a headset to that location. A mike and headset connector panel are located on the overhead cabinet immediately behind the passenger seat. To transfer operation the mike needs to be disconnected from the ICOM radio and the jumper connector installed. It is recommended that the ICOM radio frequency first be locked before making this transfer.

TROUBLE SHOOTING: The TV receiving equipment and quad processor are located in the equipment closet in the center of the van.

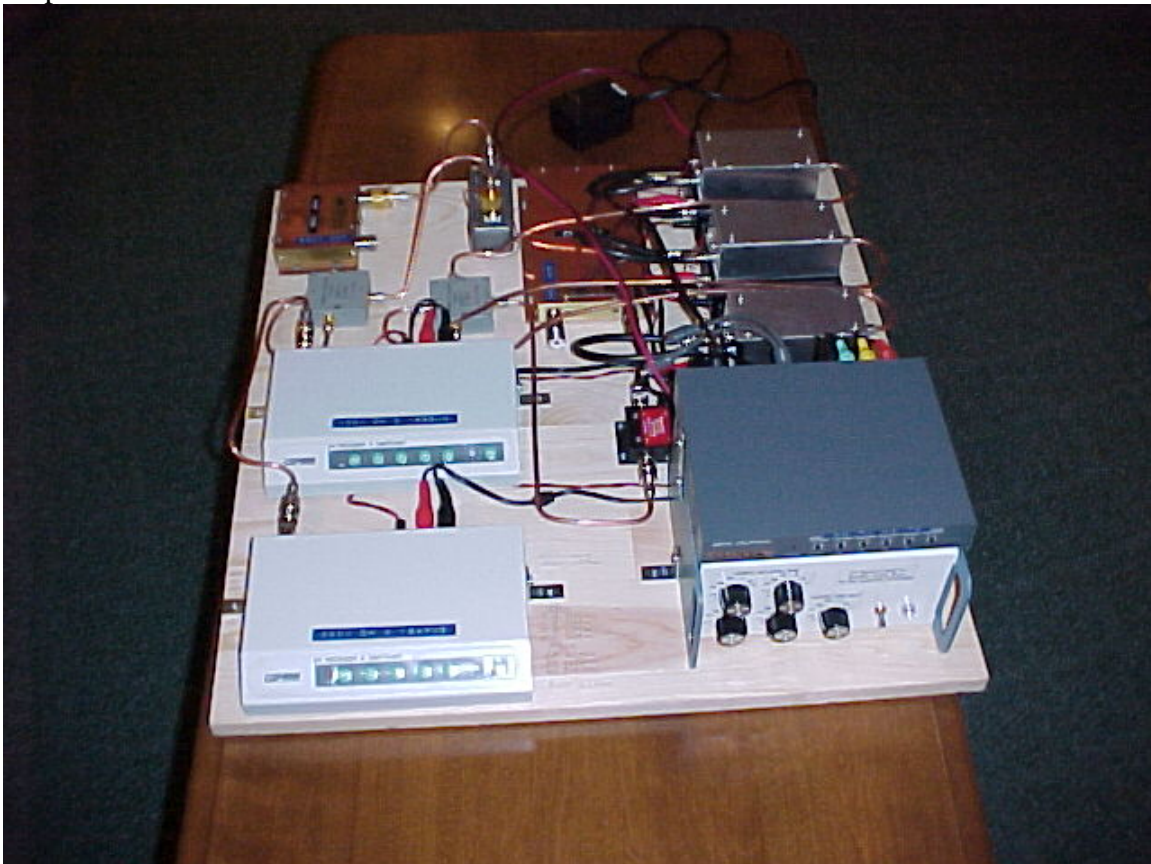
- (1) The most common failure encountered with the ICV TV system is due to a broken or missing antenna. In particular, the microwave whip antenna is more prone to being broken due to its rather rigid construction.
- (2) Verify that the master power switch for this TV equipment is in the "ON" position and that the power indicator LED is illuminated. Also verify that the quad processor is turned on. It is controlled by a separate power switch, which is located on its rear panel.
- (3) Verify that the video quadrant selector switches have been set to active channels.
- (4) Verify that all of the TVs and VCRs are turned on and set for the correct inputs.
- (5) Verify that the remote controls are working. Replace their batteries.
- (6) Verify that the TV crews are actually transmitting pictures.
- (7) If the TV crews are a long distance from the ICV and the pictures are too weak and snowy, then you might need to set up a beam antenna.

If there are additional problems, it is recommended that only a qualified TV ham engineer work on this equipment. Technical details are described in detail on the following pages.

BOULDER POLICE DEPARTMENT INCIDENT COMMAND VEHICLE TV TECHNICAL DETAILS

Jim Andrews
3 October 2002

The vast majority of the TV system equipment is mounted on a wooden board, which is installed on a shelf in the equipment closet in the center of the ICV. See photograph below. There is a large bundle of coaxial cables, which come to this equipment board. Most all of these cables are 75 Ohm, RG-6 cables with type "F" TV style connectors. There are three 50 Ohm cables, which come from two antennas mounted on the roof of the ICV along with an aux. antenna cable from the TV connector panel box. Five of the 75 Ohm cables go to a TV connector panel mounted inside an outside undercarriage storage compartment located on the driver's side of the ICV. These cables provide external inputs for Cable TV, Camera #1, Camera #2, & Camera #3 plus a channel 3 output from one of the VCRs.



Photograph of TV system equipment

CABLE TV: Cable TV signals are obtained by dropping a coax cable land-line to a cable TV hook-up in a nearby building. The incoming cable TV signal is split in a 3dB splitter to feed the two Panasonic TV receivers.

BROADCAST TV: Broadcast TV signals are picked up by the ICV's built-in, commercial TV antenna, which was part of the ICV manufacturer's standard equipment. This is a horizontally polarized, erectable, rotatable antenna mounted on the ICV's roof. The broadcast TV signal is passed thru an antenna amplifier and then to the two Panasonic TV receivers. Beside each Panasonic TV there is an A/B antenna selector switch to select either Cable or Broadcast TV.

AMATEUR TV: The incoming 70cm, BCARES TV signals on channels 57, 58 & 60 are received by a vertically polarized, gain, whip antenna on the ICV roof. They are then passed thru a band-pass (420-450MHz) filter and a 70cm, low noise, pre-amplifier. The amplified signal is then split three ways in a signal splitter. These three outputs then are routed to three separate, single channel, TV tuner receiver modules. One each for channels 57, 58 & 60. The outputs from these receivers are baseband audio and video (A/V), identical to those obtained from a TV camera (or camcorder). These A/V outputs are then routed to the TV control panel box.

SWAT TV: A vertically polarized, microwave, gain antenna on the ICV's roof receives the incoming BCSO-SWAT signals. They then pass thru a band-pass filter, followed by a pre-amplifier. The signals are then split by a 2-way splitter and go into two separate, microwave TV receivers. One receiver is fixed tuned to channel A, while the other is tuned to channel C. The outputs from these receivers are baseband audio and video (A/V), identical to those obtained from a TV camera (or camcorder). These A/V outputs are then routed to the TV control panel box.

TV CONTROL PANEL: All of the A/V outputs from the various TV receiver modules are input to the TV Control Panel box, Fig. 1. Inside this box there are no active amplifiers. It only consists of a bank of front panel rotary selector switches along with a bank of RCA type audio & video connectors on the rear panel. A/V inputs are provided for a total of 9 different sources. Three from the 70cm TV receiver modules, two from the microwave TV receivers and three from the external, hard-wired TV cameras. There are 4 video outputs, which go to the 4 camera inputs to the quad processor. There are 2 audio outputs, which go to each of the two VCRs in the van. This box also contains a fuse and the master 12 Volts DC power switch for the two preamps, three 70cm TV receiver modules and the two microwave TV receiver modules.

QUAD PROCESSOR: This unit sits on top of the TV control panel box, Fig. 1. It does not operate off of the van's 12 Vdc battery power. Instead it requires 5 Vdc. This is provided by a 120Vac / 5Vdc wall transformer type power supply. The power switch for the processor is located on its rear panel. There are 6 RCA type video connectors on the rear panel. Four of these are designated as the four quadrant camera inputs. There are two outputs, which go to the VCRs. One output designated "VCR Out" provides only the quad screen picture. The other output designated "Mon Out" provides the full

selection of display modes, namely quad, sequential full-screen or single camera - full-screen.

BOULDER COUNTY SHERIFF INCIDENT COMMAND VEHICLE TV SYSTEM OPERATION

**Jim Andrews, 1611
3 October 2002**

The Television system in the Boulder Sheriff's Incident Command Vehicle (ICV) consists of a single SONY 13" color TV receiver, a Panasonic VHS-VCR, a microwave TV receiver, antenna and misc. accessories. With this system, the ICV is capable of receiving BCARES TV transmissions on the ham 70 cm band (420-450MHz) or Sheriff's SWAT microwave TV transmissions. Pictures can also be received over direct coax cable connections from remote cameras.

BCARES TV: Live, transmitted, TV pictures of the local Boulder County Sheriff or Fire incident can be viewed in the ICV. These pictures are provided by radio amateurs (Hams) affiliated with either BCARES (Boulder County Amateur Radio Emergency Services) or the Boulder County Sheriff's SWAT team. These radio amateurs are equipped with portable TV pack sets that include small, hi-8mm video camcorders, 1-watt TV transmitters, antenna and battery (5hr capacity). BCARES also has a 70cm, TV repeater located at Chautauqua Park in Boulder, plus a portable, 10 watt, 70cm, TV repeater. The signal from the Chautauqua Park TV repeater can be seen almost everywhere within the City of Boulder and in much of the eastern half of Boulder County. The repeater signal cannot be seen in the western part of Table Mesa. The repeater signal can reach as far as the Longmont Police Dept. EOC. The TV signals transmitted by BCARES are on the amateur radio 70cm band (420-450MHz). They are conventional Vestigial Upper Side-Band (VUSB) TV signals. They can be received on any cable ready TV receiver on cable channels 57 thru 60. BCARES uses channels 57, 58 & 60. These pictures are not secure and could be viewed by the general public or the media using ordinary home TVs and rabbit ear antennas. To obtain the services of BCARES, they must be called out through the Boulder 911 center. The BCARES pager # is 1890.

BCSO-SWAT TV signals are transmitted on a higher frequency microwave band. They are unconventional, non-standard signals. They cannot be received on a conventional TV receiver. They must be received by a special, microwave receiver. Thus these SWAT TV signals have a higher level of security from reception by the general public, press or TV media. The BCSO-SWAT TV transmitters are capable of transmitting on 3 channels (A, B & C).

SYSTEM DESCRIPTION: There is a single SONY, 13", color TV/Monitor installed in the ICV. There is also a Panasonic VCR installed in the ICV to make permanent video tape recordings of the various incoming signals. The TV, VCR, microwave receiver and control switches are all suspended from the ceiling immediately behind the driver's seat. Additional electronics are mounted behind a wall panel under the desk behind the driver's seat. A TV cable connector panel is located in a box outside the ICV on the driver's side. All incoming signals are routed through the VCR. The SONY TV set is only to be used in the "Monitor" mode to view the output signals from the VCR. There are two selector switches to select the TV signal to be recorded by the VCR and viewed on the TV monitor. One is an Antenna Switch to select RF inputs from either the BCARES 70cm antenna, the Commercial Broadcast antenna (not yet installed) or the external Channel 3 input. The other switch is the Audio/Video (A/V) switch, which selects video inputs from the SWAT microwave TV receiver, or one of the three external camera inputs. Two channel 3 outputs from the VCR are provided. One ch. 3 signal output is to be used to send the selected TV picture over a long coaxial cable to a remote location, such as a CP or forward observation post. The other ch. 3 signal output is to be used for an additional TV receiver set up outside of the ICV. Setting up an additional TV monitor outside of the ICV helps to reduce overcrowding in the ICV. Audio signals will also be available from the BCARES, SWAT, Commercial and Ch.3 TV inputs. Audio is not available from the TV cameras connected to the ICV via coax cable.

OPERATION: These instructions assume that the operator is familiar with the operation of modern TV receivers and VCRs. This includes using remote controls and accessing menu operations. The remote controls for the SONY 13" TV and PANASONIC VCR are required for many operations. DO NOT LOSE THE REMOTES!

- (1) Turn on the SONY 13" TV. Set it to the "Monitor" mode by pushing the "VIDEO" button on either the front panel or the remote control. The word "VIDEO" will briefly appear on the screen when this mode is selected.
- (2) Turn on the Panasonic VCR. Whatever the VCR is receiving will be displayed on the SONY TV screen.
- (3) To receive BCARES TV, use the VCR remote control to toggle the "INPUT" button to a channel number. Next set the Antenna Switch to 70CM. Use the VCR channel buttons on the remote control to select the desired channel (57, 58 or 60).
- (4) To receive SWAT TV, use the VCR remote control to toggle the "INPUT" button to "LINE". Set the Audio/Video Switch to SWAT. Next set the SWAT TV Receiver channel selector switch to the desired channel (A, B or C). There is also a "Tune" position with a "Tuning" control, which can be used for fine-tuning if the picture quality is not satisfactory.

(5) To view pictures from the TV cameras connected to the ICV via coax cables, first use the VCR remote control to toggle the "INPUT" button to "LINE". Use the Audio/Video Switch to select the desired camera (1, 2 or 3). No audio is available from these cameras.

(6) To receive a Ch. 3 TV from a remote VCR or camera, use the VCR remote control to toggle the "INPUT" button to a channel number. Next set the Antenna Switch to Ch.3. Use the VCR channel buttons on the remote control to set the channel to "3".

(7) To record or playback VHS videotapes, use the VCR as a conventional home VCR. The output of the VCR is always viewed on the SONY 13" TV. It is also sent on ch. 3 to TVs outside of the ICV.

(8) In case of failure of the VCR, the SONY TV can be used to receive directly TV signals. Switch it to the "TV" mode. You will only be able to view the BCARES, Commercial or Ch.3 signals.

EXT TV MONITOR: It is recommended that an extra TV receiver be set up outside of the ICV. This helps greatly in reducing the number of personnel within the van. 120 Vac power is available from outlet boxes on the exterior of the van. Use a TV coax cable to connect the ext. TV receiver's antenna input to one of the two Ch. 3 outputs in the outside TV connector box found on the driver's side of the van.

TAPE RECORDING: It is the Sheriff's policy that we are to always tape record every operation. The SP, 2 hour recording mode should be used to obtain the highest resolution recordings. A supply of VHS tapes is in the equipment locker.

2 METER RADIO: The ICV is not equipped with any 2 m, ham band radio. Funding was not provided for this radio. BCARES operators will have to supply their own radio for communicating with the TV camera crews. However, a 2 m antenna is provided. A tri-band antenna is used for TV reception. This antenna covers 2 m, 70cm and the microwave band. It is used in conjunction with a triplexer to split out the antenna signals. A length of RG-58 coax is coiled up behind the SONY TV. This coax connects to the 2 m antenna via the triplexer.

TROUBLE SHOOTING:

(1) The most common failure is the Panasonic VCR losing its memory due to not being connected to ac power for extended periods of time. If this happens, the VCR must be “re-initialized” for “first-time operation”. Follow the instructions, which appear on the screen to select language, auto select channels, and set the calendar and clock. The VCR remote control is required to program the VCR. After setting the clock, then use the remote “menu” function to select “Cable” and also program the VCR to receive channels 57, 58, & 60 (BCARES).

(2) Another common failure encountered with the ICV TV system is due to a broken or missing antenna. In particular, the microwave whip antenna is prone to being broken due to its rather rigid construction.

(3) Verify that the batteries in the remote controls are good. Replace the batteries.

(4) Verify that the TV crews are actually transmitting pictures.

(5) If the TV crews are a long distance from the ICV and the pictures are too weak and snowy, then you might need to set up a beam antenna.

If there are additional problems, it is recommended that only a qualified TV ham engineer work on this equipment. Technical details are described in detail on the following pages.

BOULDER SHERIFF INCIDENT COMMAND VEHICLE TV TECHNICAL DETAILS

Jim Andrews
4 October 2002

The SONY 13" color TV, the Panasonic VCR, the microwave TV receiver and control switches are suspended from the ceiling directly behind the driver's seat. The remainder of the electronics is mounted on a false wall panel found under the workbench below the SONY TV. A external TV cable connector panel is on the outside wall of the van directly adjacent to the electronics panel.

ANTENNA: A single antenna is used. It is a tri-band, gain, mobile whip antenna mounted on the roof of the ICV. It covers the 2m, 70cm and microwave bands. Microwave quality, type N, coax cable is used from the antenna. The antenna is connected to a triplexer. The triplexer contains low-pass, band-pass and high-pass filter elements to separate out the 2 m, 70cm and microwave signals. The 2m signal is used for voice radio communication between the ICV and the TV camera crews.

BCARES TV: All BCARES TV operations are on the ham, 70cm, (420-450MHz) band. This signal from the triplexer goes to a 420-450MHz band-pass filter, then to a pre-amplifier. From the pre-amp, the signal goes to the A-B-C antenna switch, then to a 3dB power splitter. The two outputs from the power splitter feed the antenna inputs of the SONY TV and the Panasonic VCR. To view BCARES TV, the operator must select either cable channel 57, 58 or 60 as appropriate.

SWAT TV: The BCSO SWAT TV operations are on a relatively secure microwave band. The microwave signal from the triplexer goes directly to the microwave TV receiver. This receiver consists of two modules. The first is the Down Converter module, which outputs a 70 MHz IF signal. This down converter is tunable. It has a choice of three fixed channels (A, B or C) -- or -- it is continuously tunable over the whole microwave TV band. The 70 MHz IF signal is then input to the DeModulator module. The outputs from this module are the baseband audio and video (A/V) signals, which are identical to those obtained from a TV camera (or camcorder). These A/V signals are then routed to a four position A/V selector switch. The output from this A/V switch goes to the ext. line A/V inputs for the VCR. To view SWAT TV, the A/V selector switch is placed in the "SWAT" position and the VCR is placed in the ext Line input mode.

EXT. TV CAMERAS: Provision has also been made to connect up to three TV cameras directly to the ICV via hard-wired, TV coax cables. The signals from these

cameras would be baseband video. No provision was made for audio inputs from these cameras. These baseband video cables are connected to the ICV at the connector panel found on the driver's side of the van. To view any of these cameras, the appropriate button on the A/V selector switch must be pushed. Provision has also been made for a single input of a channel 3 TV signal. Some TV cameras and all VCRs provide a channel 3 output. To view this ch. 3 signal, it must be selected by the antenna switch and the VCR and/or TV must be set to channel 3.

EXT TV MONITOR: Provision has also been made to send TV signals out of the ICV to one or more external TV monitors. The ch. 3 output signal from the VCR is passed thru a 20dB amplifier. Two outputs of this amplified, ch. 3 signal are available at the TV connector box on the outside of the van. 120Vac power outlets are also available on the outside of the van.

DC & AC POWER: The SONY 13" TV, Panasonic VCR and the ch. 3 output amplifier all require 120Vac power. The 70cm pre-amp and the microwave TV receiver modules are permanently wired to the ICV's 12 Vdc batteries. The ICV's AC generator and 12Vdc radio batteries must be activated. The power switches for the TV, VCR and microwave receiver modules must be turned on. The amplifiers are hidden behind the false wall and are permanently turned on.

BOULDER 911 CENTER BCARES TELEVISION OPERATING INSTRUCTIONS

Jim Andrews, WA0NHD
Video Coordinator
15 June 1994

SUMMARY of INSTRUCTIONS

NOTE: This is a very condensed summary of commands. For additional details and trouble-shooting, please read the following pages of detailed instructions.

SITUATION ROOM ---- RCA TV RECEIVER

- (1) Turn on the TV set. Set channel to Cable 57.
- (2) Select "TV Viewing" = "ANT" on Archer Amplified Video Selector
- (3) Set antenna rotator to point "West-South-West"
- (4) For test signal, turn on TV repeater color bar test patterns.
- (5) To view BCARES TV pictures relayed through Chautauqua Park TV repeater, turn off test patterns and activate the channel 60 receiver.
- (6) To talk to BCARES camera crews, use the TV simplex frequency of 144.37 MHz or a local 2m repeater.

CHAUTAUQUA PARK TV REPEATER

CONTROL FREQUENCY:	XXX
TO TURN ON TEST PATTERNS:	send touch tones "xxxxx"
TO TURN OFF TEST PATTERNS:	send touch tones "yyyyy"
TO VIEW BCARES TV PICTURES: (turns on repeater channel 60 receiver)	send touch tones "zzzzz"

Note: Control frequency, password and control codes are classified. Do not disclose to unauthorized users. They are subject to change if compromised.

GENERAL EQUIPMENT DESCRIPTION

The BCARES TV equipment in the Boulder Public Safety Building is set up to only receive TV pictures from the field. There is no TV transmit capability. A vertically polarized beam antenna is mounted on an antenna rotator on the top of the penthouse. The coax cable from the antenna goes to a 420-450 MHz bandpass filter and then a low-noise, GaAs FET preamplifier which are located on the wall just inside the door of the penthouse. The preamp output is then run via 75 Ohm coax down into the situation room. This coax comes into a video source selector box, which contains multiple inputs, outputs, switches and rf amplifiers. It is labeled as the Archer Amplified Video Selector. This is the master video source selector switch for the TV receiver in the dispatch center plus the TV and VCR in the situation room. It is located on top of the VCR on the shelf on the east wall of the situation room. A video coax cable has also been installed from the penthouse into the situation room. This cable is used when we want pictures from a camera on the roof. A camera is not permanently installed on the roof.

The primary TV receiver in the situation room is the 19" RCA TV mounted on the shelf on the east wall. BCARES TV signals must first be received on this RCA TV. Baseband audio and video outputs from the RCA TV are connected to the external AUX A/V inputs of the VCR. The VCR is used as the driver for the SONY monitors. The VCR is used to record incoming TV signals and can also function as a second TV receiver. There are two SONY TV monitors on the north and west walls of the situation room. These are monitors only and can not receive transmitted TV signals. The video displayed on these monitors is selected by the 3 position video selector switches sitting on top of the VCR. The 3 choices for the monitors are the VCR, Color Radar and STORRM.

Also located on the shelf on the east wall of the situation room is a ham radio, 2 meter, voice transceiver. This radio is connected to an antenna on the penthouse tower. This radio is used to communicate with the BCARES TV crews out in the field and also to remotely control the Chautauqua Park TV Repeater. The normal frequency for this radio is 144.37 MHz. A set of headphones are attached to this radio and must be used to minimize noise in the situation room.

For initial set-up and familization, it is recommended that the Chautauqua Park TV repeater beacon transmission of test patterns be used. To turn-on the test patterns, see the TV repeater operating instructions.

SITUATION ROOM ----- RCA 19" TV PRIMARY RECEIVER

1. Either use the front panel controls or the remote control to turn on the RCA TV.
2. Set the channel to 57. This can be done using the up/down buttons or by direct number entry from the remote control. Channel 57 is the output frequency of the Chautauqua Park TV repeater.

(NOTE: For practically all BCARES operations, we will use channel 57. For some operations in the immediate vicinity of the Boulder Public Safety Building (i.e. within ¼ to 1/2 mile) we might also use channels 58 and/or 60. To receive a picture from a TV camera mounted on the roof of the Public Safety building, set the channel selector to channel 91)

3. Make sure the roof top antenna is in fact connected to the RCA TV. This is done via the Archer Amplified Video Selector. This is located on top of the VCR. One bank of switches is labeled as "TV Viewing". Push in the switch labeled "ANT". This connects the rooftop antenna to the RCA TV.
4. TV ROTATOR: Turn the dial indicator to the direction of the desired TV transmitter. For the Chautauqua Park TV repeater, set the dial to "west-south-west". When receiving pictures from other transmitters, adjust the antenna direction as necessary for the best picture.
5. TEST SIGNAL: To test out your reception, it is recommended that you use the test patterns, which can be transmitted by the Chautauqua Park TV repeaters. To turn on the test patterns, see the TV repeater operating instructions.

TROUBLE SHOOTING: NO PICTURE on the RCA TV

1. The most common problem is you are on the wrong channel. Push the channel up/down button the remote control or the front panel of the TV receiver. This will turn on the channel display indicator and change the channel. Set the channel to 57.
2. The second most common problem is the antenna is not connected to the TV. Check that the "ANT" switch is pushed in on the "TV Viewing" video selector box.
3. The third common problem is that the RCA TV receiver "SETUP" has been changed, either by a power failure or someone messing with the controls. Press "SETUP" on the front panel of the TV or on the remote control. Continue to push "SETUP" until the screen displays the CABLE / AIR menu. To receive BCARES TV, this must be set to "Cable". If it reads CABLE / AIR = AIR, then push the "+" or "-"

button on the TV or the remote to changes to CABLE / AIR = CABLE. Now push the "CLEAR" button on the remote control.

SITUATION ROOM -----SONY MONITORS --- NORTH & WEST WALLS

1. These are monitors only. They cannot receive broadcast TV signals.
2. The monitor power switch is a small green button on the control panel. It is a push on / push off control. Note: if the monitor fails to turn on, check the light switch located on the wall directly below the monitor. This switch controls the AC outlet for the monitor.
3. The signal displayed on the monitor is determined by the Video Selector Switches. These are located above the VCR. They have 3 positions: VCR, Color Radar and STORRM. Select radar of Storm to first verify operation of the monitor. To view BCARES TV pictures, set the selector to VCR.
4. To display BCARES TV pictures you must first obtain a picture on the RCA TV receiver. Next you must turn on the VCR. Now use the VCR remote control to select "AU". This selects the external A/V inputs, which are connected to the RCA TV A/V outputs. You should now see on the SONY monitor, the same picture as is displayed on the RCA TV receiver.

SITUATION ROOM ---- VCR

1. To view the output of the VCR use one of the two SONY monitors located on the north and west walls. On the monitor Video Selector Switch boxes on top of the VCR, push the button labeled VCR. Turn the power on to the monitor.
2. Turn on the VCR power. The VCR picture will now be displayed on the SONY monitor. The VCR controls function the same as your home VCR.

TO TAPE RECORD THE BCARES TV PICTURES

1. First get a picture on the RCA TV.
2. Turn on one of the SONY monitors to view the VCR output.
3. Use the VCR remote control to select "AU" which is the output from the RCA TV receiver.
4. Insert a VHS videotape. Select the tape speed. Push the "Record" button. Note: for best picture quality, we prefer that the 2 hour "SP" recording mode be used.

HOW TO RECEIVE 2 SEPARATE BCARES TV PICTURES SIMULTANEOUSLY

NOTE: Use the VCR to receive the strongest TV signal and the RCA TV to receive the weaker TV signal. Usually the Chautauqua Park TV signal on channel 57 will be the strongest signal. The TV tuner in the VCR is not as sensitive as in the RCA TV receiver and it will only work with a strong signal. The VCR has a built-in automatic video squelch circuit. If the TV signal is too weak, then the VCR will only display a blue screen on the Sony monitors. This video squelch cannot be turned off.

1. Connect the roof top antenna to the VCR via the Archer Amplified Video Selector. This is the switch box mounted above the VCR. On the bank of switches labeled "VCR Recording" push in the ANT button.
2. Turn on the Sony monitor and set the video selector switch to VCR.
3. Turn on the VCR. On the remote control use the TV/AU button to select "TV". Also on the VCR make sure that the "CABLE" function is selected. Use the remote to enter the desired BCARES channel number (57, 58 or 60). Channel 57 is the Chautauqua Park TV repeater. You should now see a picture on the Sony monitor. If you only have a blue screen, try switching the up/down channel control to get the VCR to lock onto the BCARES TV signal. Good Luck!

BOULDER 911 DISPATCH CENTER TELEVISIONS

The BCARES TV signal comes from the roof top antenna into the situation room and the Video Selector box in the sit room on top of the VCR. From there the signal is then routed into the dispatch center and through the VCR in the cabinet directly underneath the Sony 27" TV mounted on the south wall.

1. Archer Amplified Video Selector Box: This is located in the Situation room directly above the VCR. One bank of switches is labeled COM Center. Push in the button labeled ANT. This will route the TV signal from the rooftop antenna directly to the 27" Sony TV in the dispatch center.
2. TV ROTATOR The rotator control is also in the situation room next to the VCR. Turn the dial indicator in the direction of the desired TV transmitter. For the Chautauqua Park TV repeater, set the dial to West-South-West. When receiving pictures from other transmitters, adjust the antenna direction as necessary for best picture.
3. DISPATCH CENTER VCR: The TV signal from the selector panel in the situation room is routed through the VCR mounted in the equipment cabinet directly

underneath the dispatch center's Sony TV. To insure proper operation of the Sony TV, turn off the power on this VCR.

4. SONY 27" TV RECEIVER Next set the following controls on the dispatch center Sony 27" TV (a) turn on the power (b) set the TV/Video switch to TV (c) open the access door directly below the controls & (d) set the Cable switch to ON.

5. Set the Sony TV receiver to channel 57. This can be done using the up/down buttons or the direct number entry from the remote control. On the remote push "5" "7" "enter" Channel 57 is the output frequency of the BCARES Chautauqua Park TV repeater.

(NOTE For practically all BCARES operations, we will use channel 57. For some operations in the immediate vicinity of the Public Safety building (within ¼ to ½ mile) we might also use channels 58 or 60)

6. TEST SIGNAL To test out your reception, it is recommended that you use the test patterns, which can be transmitted by the Chautauqua Park TV repeater. To turn on the test patterns, see the TV repeater operating instructions.

ALTERNATE ARRANGEMENT for Dispatch Center 27" Sony TV

Note: Only use this if the picture quality is unacceptable using the above procedure. With this alternate arrangement you will only get the same TV picture as is being displayed on the wall monitors in the situation room. With above arrangement, you would be able to select the various BCARES TV signals independent of what was being viewed in the situation room.

1. Turn on the RCA 19" TV, VCR and a Sony monitor in the situation room. Follow the situation room TV instructions to obtain a BCARES TV picture on both the RCA TV and Sony monitor.

2. Archer Amplified Video Selector: One bank of switches is labeled COM Center. Push in the button labeled VCR. This will now send the VCR channel 3 output signal to the Sony TV in the dispatch center.

3. Dispatch Center Sony TV: (a) set the TV/VIDEO switch to TV (b) set the Sony TV channel selector to channel 3. note: turn off the power on the dispatch center VCR.

LONGMONT POLICE DEPARTMENT

MOBILE COMMAND CENTER TV SYSTEM OPERATION

Jim Andrews

4 July 2002 (rev. 3 Oct. 2002)

The Television system in the Longmont Police Dept.'s Mobile Command Center vehicle (MCC) consists of a bank of three TV receivers, plus a VCR, mounted on the front bulkhead above the driver's seat in the forward compartment and another TV/VCR in the rear compartment. These are conventional home type, all-channel, color TV receivers and VCRs and require Remote Controls to operate them. All four TV receivers may be operated independently of each other and view any of the available, desired TV signals. TV signals can be received from three different sources, as selected by the 3-position antenna switches. They are labeled as:

A = Amateur TV (i.e. BCARES) B = Broadcast TV C = Cable TV

TV/VCR: The main TV receiver is a 19" GE mounted in the center of the front bulkhead. To the left are two smaller, 9", Phillips TVs. The 19" GE TV's signal is first routed through a GE VHS-VCR. This VCR is mounted inside the overhead locker to the right of the 19" GE TV. Also located in this overhead locker are three A-B-C antenna selector switches for the forward compartment TVs. Located in the rear compartment is a 13" Phillips combo TV/VCR. Immediately adjacent to it is its own A-B-C antenna switch. The remote controls for all of the TVs & VCRs are in the storage bin on the front dashboard.

EXT TV MONITOR: Provisions have also be made in the MCC TV system to allow TV signals to exit the MCC and be viewed on one or more TV receivers set up outside of the MCC. The use of additional, external, TV receivers are a valuable aid in keeping unnecessary personnel out of the MCC. This allows these people to monitor what is going on in the field without needlessly cluttering up the interior of the MCC. These connections are made at the TV connector panel on the outside of the MCC.

EXT TV PANEL: This panel is accessed through an outside compartment having a swing-up panel door located on the left (driver's) side towards the rear, behind the gas tank. Six type "F" TV connections are available. They are labeled as:

CAMERA 1 IN (#21)	CAMERA 2 IN (#22)	CABLE IN (#23)
AMATEUR OUT (#24)	BROADCAST OUT (#25)	CABLE OUT (#26)

"C" CABLE TV: To receive Cable TV, a cable must be run from the MCC to a cable hook-up in an adjacent building. A spool of 75 Ohm, RG-6, coax cable with F connectors is stored in one of the MCC's undercarriage storage compartments. The attachment point to the MCC is found on the TV connector panel on the outside of the MCC. It is labeled as "Cable IN." To view cable TV, set the Antenna Selector Switch to "C". Set the TV receiver channel selector to the desired channel.

"B" BROADCAST TV: To receive VHF Broadcast TV (i.e. channels 2, 4, 6, 7 & 9 from Denver), you must first raise the MCC's broadcast TV antenna. This antenna is permanently attached to the MCC's roof. Its elevation crank and directional controls are on the ceiling of the MCC's forward compartment. To view broadcast TV, set the Antenna Selector Switch to "B." Set the TV receiver channel selector to the desired channel. Rotate the antenna to get the best picture. Note: UHF broadcast channels (channels 14 & higher) are not available.

"A" AMATEUR TV: Live, transmitted, TV pictures of the local Longmont Police or Fire incident can also be viewed in the MCC. These pictures are provided by radio amateurs (Hams) affiliated with either BCARES (Boulder County Amateur Radio Emergency Services) or the Boulder County Sheriff's SWAT team. These radio amateurs are equipped with portable TV pack sets that include small, hi-8mm video camcorders, 1-watt TV transmitters, antenna and battery (5hr capacity). BCARES also has a 70cm, TV repeater located at Chautauqua Park in Boulder, plus a portable, 10 watt, 70cm, TV repeater. The signal from the Chautauqua Park TV repeater can be seen at the Longmont PD headquarters. The Chautauqua Park repeater can be accessed from the western half of Longmont using a 10 watt transmitter and beam antenna. BCARES TV signals are transmitted in the amateur radio 70cm band (420-450MHz). They are conventional Vestigial Upper Side-Band (VUSB) TV signals. They can be received on any cable ready TV receiver on cable channels 57 thru 60. BCARES uses channels 57, 58 & 60. These pictures are not secure and could be viewed by the general public or the media using ordinary home TVs and rabbit ear antennas.

The TV signals transmitted by BCSO-SWAT are on a microwave band. They are unconventional, non-standard TV signals. They cannot be received on a conventional TV receiver. They must be received by a special microwave receiver. Thus these SWAT TV signals have a higher level of security from reception by the general public, press or TV media. The BCSO-SWAT TV transmitters transmit on 3 channels (A, B & C). The MCC is set up to receive only channels A & C.

To obtain the services of BCARES, they must be called out through the Boulder 911 center. The BCARES pager # is 1890. BCSO-SWAT TV services must be requested through the Boulder Sheriff's office.

In addition to the transmitted BCARES or BCSO-SWAT TV signals, pictures can also be viewed from TV cameras connected directly to the MCC. Provisions have been made to attach video cables directly to the MCC from two TV cameras. These cameras are connected to the TV connector panel on the outside of the MCC. The connections are labeled as "Camera 1 IN" (#21) and "Camera 2 IN" (#22).

The TV signals from BCARES transmitters, BCSO-SWAT transmitters and also the hard-wired cameras are all combined into the equivalent of a small-scale cable TV system. There are fixed antennas on the MCC's roof for both the 70cm and 23cm bands. To view any of these pictures, set the antenna selector switch to position "A." Next set the TV receiver's channel selector to the desired channel per the following table:

<u>Channel #</u>	<u>TV Signal</u>
57	BCARES (TV repeater output)
58	BCARES
60	BCARES (also TV repeater input)
70	BCSO-SWAT channel A
75	BCSO-SWAT channel C
80	Camera # 1
85	Camera # 2

2 M RADIO: A 2 meter, amateur band radio transceiver is installed in the MCC. This is an ICOM IC-2100H, 50 watt, fully synthesized, mobile radio covering from 144 to 148 MHz. It has been pre-programmed with all of the local, commonly used amateur radio simplex and repeater frequencies. This radio is mounted on the bulkhead immediately behind the driver's seat. This radio allows a BCARES amateur radio operator in the MCC to communicate with the TV camera operators.

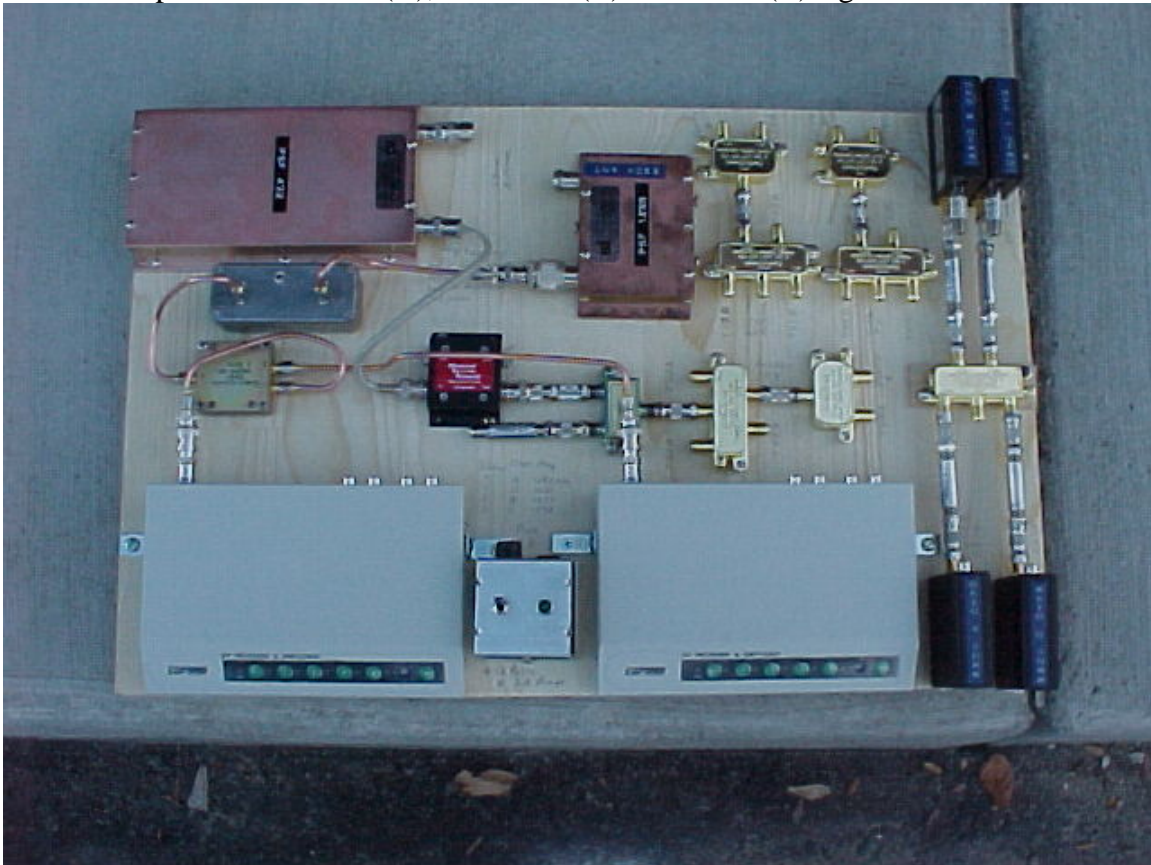
TROUBLE SHOOTING:

- (1) The most common failure encountered with the MCC TV system is due to computer memory loss in the TV receivers. To operate properly, they must all be programmed to receive CABLE only. If they inadvertently get programmed to receive BROADCAST or AIR or VHF/UHF then they will not receive any of the "A" Amateur TV 70cm signals. The most troublesome are the smaller Phillips TV receivers. Unfortunately, the Phillips receivers can only be programmed by re-initializing them by receiving live cable TV signals. This is done by connecting the MCC directly to a cable TV hook-up, setting the antenna switch to "C" and then reprogramming the receiver. To reprogram activate the "menu," then "set-up" and "auto-setup."
- (2) Another common failure is the loss of the antenna. In particular, the microwave antenna is fairly rigid and susceptible to being broken when the MCC is driven under a low hanging obstacle, such as a tree branch.
- (3) Verify that the remote controls are working. Replace their batteries.
- (4) Verify that the TV crews are in fact transmitting pictures.
- (5) If there are additional problems, the TV receiving equipment is located behind a swing-up panel on the rear wall of the MCC's restroom. Verify that the master power switch for this TV equipment is in the "ON" position and that a green LED is illuminated. It is recommended that only a qualified TV ham engineer work on this equipment. Technical details are described in detail on the following pages.

LONGMONT POLICE DEPARTMENT
MOBILE COMMAND CENTER
MCC TV TECHNICAL DETAILS

Jim Andrews
4 July 2002 (rev. 3 Oct. & 18 Oct 2002)

The vast majority of the TV system equipment is mounted on a wooden board, which is installed behind a swing up panel on the rear wall of the MCC's restroom. See photograph below. The 4 channel video amplifier is mounted on the ceiling behind this same wall. There is a large bundle of coaxial cables, which come to this equipment board. Most all of these cables are 75 Ohm, RG-6 cables with type "F" TV style connectors. There are two 50 Ohm cables, which come from two antennas mounted on the roof of the MCC. Six of the 75 Ohm cables go to a TV connector panel mounted inside an outside undercarriage storage compartment located on the driver's side of the MCC. These cables provide external inputs for Cable TV, Camera #1 & Camera #2 plus external outputs for Amateur (A), Broadcast (B) and Cable (C) signals.



Photograph of TV System Equipment

CABLE TV: Cable TV signals are obtained by dropping a coax cable land-line to a cable TV hook-up in a nearby building. The incoming cable TV signal goes to a 20dB CATV amplifier. (note: amp. will be installed Nov 02) The signal is then split 5 ways to feed the 4 TV receivers in the MCC, plus an external TV receiver. A 4-way splitter is used, plus another 2-way splitter. The signals to the front TVs 1, 2 & 3 have 13dB gain. The signals to the rear TV 4 and the ext. TV have 10dB gain.

BROADCAST TV: Broadcast TV signals are picked up by the MCC's built-in, commercial TV antenna, which was part of the MCC manufacturer's standard equipment. This is a horizontally polarized, erectable, rotatable antenna mounted on the MCC's roof. The broadcast TV signal is passed to the various TV receivers through signal splitters in a similar fashion to the cable TV signal.

AMATEUR TV: The equipment arrangement for receiving amateur TV is more complex. All of the amateur ("A") TV signals are mixed together into the equivalent of a small-scale cable TV system.

SWAT: A vertically polarized, gain antenna on the MCC's roof receives the incoming BCSO-SWAT signals. They then pass thru a band-pass filter, followed by a pre-amplifier. The signals are then split by a 2-way splitter and go into two separate, microwave TV receivers. One receiver is fixed tuned to channel A, while the other is tuned to channel C. The outputs from these receivers are baseband audio and video, identical to that obtained from a TV camera (or camcorder). The receiver video outputs are next routed to a 4 input / 4 output video amplifier. There are individual gain and high frequency peaking controls for each video channel. The de-modulated SWAT signals from the video amplifier are then modulated by micro-transmitters onto cable channels 70 (SWAT-A) and 75 (SWAT-C).

EXT CAMERAS: The incoming, hard-wired, TV camera pictures are first input to the 4 input / 4 output video amplifier. They are then modulated by micro-transmitters onto cable channels 80 (Camera #1) and 85 (Camera #2). The 4 in/ 4 out video amplifier allows the video gain and hf peaking to be optimized for each camera. They are preset for cameras on short cable runs. If a very long cable run is used for an external camera, then the video gain and high frequency peaking should be readjusted to improve the picture quality. Also for nighttime operation, it might be beneficial to boost the video gain. The outputs from these 4 micro-transmitters (channels 70, 75, 80 & 85) are then mixed together by a 4-way combiner.

BCARES: The incoming BCARES TV signals on channels 57, 58 & 60 are received by a vertically polarized, gain antenna on the MCC roof. They are then passed thru a 420-450MHz band-pass filter and a pre-amplifier before being mixed in a 2-way combiner with the channels 70, 75, 80 & 85. This composite mini-cable signal of (channels 57 - 85) is then split 5 ways to feed the 4 internal TV receivers, plus the

external TV receiver using the same 4-way and 2-way splitter arrangement as was used for the Cable TV and Broadcast TV signals.

BCARES PORTABLE TV REPEATER

OPERATING INSTRUCTIONS

Jim Andrews, WA0NHD-TV
22 March 1994

The BCARES portable TV repeater is a completely self-contained, small, in-band, 70 cm repeater. The input frequency is cable channel 60. The output frequency is cable channel 57. The transmitter's output power is 10 watts peak on sync tips. It transmits both video and audio on a 4.5 MHz sound sub-carrier. Interdigital, 6 MHz channel bandpass filters are used on both the receiver input and the transmitter output. The repeater includes a built-in color bar generator for ID purposes and also as a test signal generator. The repeater operates on 12 Vdc (2 amps).

NORMAL CONTROL SETTINGS FOR REPEATER OPERATION

<i>S/BAT</i>	=	<i>"S"</i>	<i>MONITOR</i>	=	<i>"RCVR"</i>
<i>POWER</i>	=	<i>"ON"</i>	<i>VOLUME</i>	=	<i>"as desired"</i>
<i>ID</i>	=	<i>"AUTO"</i>	<i>AUDIO SQUELCH</i>	=	<i>12 o'clock</i>
<i>XMIT</i>	=	<i>"RPT"</i>	<i>VIDEO SQUELCH</i>	=	<i>12 o'clock</i>
<i>CAMERA/RCVR</i>	=	<i>"RCVR"</i>			

REPEATER CONTROLS

There are 6 toggle switches, 3 pots and a circuit breaker on the repeater front panel. There are also 2 BNC antenna connectors, 3 RCA A/V connectors and 3 Molex 12 Volt outlets along with a meter. From left to right across the front panel, the controls are as follows:

CIRCUIT BREAKER Push to reset if necessary

S / BAT This controls the meter function. In "S" position, it is a receiver signal strength meter useful for aligning the receiver antenna. The meter saturates at levels greater than 150 microVolts. Full scale is 200 uV. In the "BAT" position, the meter reads the battery voltage. Full scale is 20 Volts. Normal reading is 12 to 14 V.

PWR ON / OFF This is the main power switch. It also controls the power to the three Molex 12 V power jacks on the top panel. Immediately above this switch is the Power On LED. If the LED is flashing, this is a warning that the battery voltage is low, i.e. below 11.6 V with less than 10% battery capacity remaining.

ID AUTO / ON This switch controls the built-in color bar test pattern with the repeater call sign WA0NHD. In the ON position, this color bar signal overrides any other video input. In the AUTO position, a timer circuit activates every 10 minutes for 2 seconds to automatically ID the transmitter with the color bar signal. When the color bar ID is on, the ID LED is lit.

XMIT ON / RPT / OFF This is a 3 position toggle switch which controls the transmitter. In the OFF position, the transmitter is disabled. In the ON position, the transmitter is permanently turned on. In the center RPT position, the transmitter is keyed on only when an incoming TV signal opens the video squelch. The XMIT LED is lit whenever the transmitter is on.

CAMERA / RCVR This switch selects the transmitter video / audio source from either the repeater's TV receiver or a local camera connected to the A/V inputs directly above the switch. The camera can be powered from one of the 12 V Molex power jacks.

MONITOR RCVR / XMTR This switch selects the video output to the monitor from either the repeater TV receiver or detected RF output from the transmitter. Audio is not sent to the monitor. The 5" B&W TV monitor is powered from one of the 12 V Molex power jacks.

VOLUME This pot controls only the audio volume of the loudspeaker in the repeater. This does not control the audio level of the transmitter. No audio will be heard unless the audio squelch circuit opens.

AUDIO SQUELCH This pot controls the threshold of the audio squelch circuit. Normal setting is 12 o'clock.

VIDEO SQUELCH This pot is the threshold s/n level adjust for the video squelch circuit. To open video squelch, video sync pulses must be present and the video signal to noise ratio must exceed the level set by this control. Normal setting is 12 o'clock.

SET - UP of PORTABLE TV REPEATER

1. Set up two 70 cm antennas. We will normally use the 10 element yagi beam antennas. However, 70 cm, mag. mount antennas may also be used. Use the tripods to support the antennas. Use vertical polarization. Point the transmitting antenna toward

the command post that wants to receive the TV pictures. Point the receive antenna toward the TV transmitter that needs to be relayed. If you cannot visually see the other location(s), then use the topo map and compass to align your antennas. Position the antennas so they are not "looking at each other".

2. Use the supplied 25 foot, RG-8 coax cables to connect the antennas to the repeater BNC antenna connectors on the top of the repeater. BNC / N adapters are supplied and attached to these RG-8 cables. Do not remove these adapters.

3. Connect the 5" B&W TV monitor to the repeater. The DC power for the monitor is supplied from one of the 12 V Molex power jacks on the top of the repeater. Connect a video coax cable from the repeater MONITOR jack to the input on the monitor. Set the monitor TV's switches to MON and 75 Ohms. For daylight operation, shield the monitor CRT screen from direct sunlight with the Velcro mounted sunscreen. When you are not actually using the monitor, turn its power switch off to conserve the battery.

4. Connect the repeaters' power plug to a 12 V power source. If you are operating from an automobile, use the cigarette lighter jack for power. Otherwise, connect the Molex power plug to the 20 Amp-Hour, sealed, lead-acid battery.

5. If you are also going to use a local TV camera, then connect the camera's audio & video outputs with a dual coax cable to the A & V camera inputs on the repeater front panel. 12 V power for the camera can be obtained from one of the 12 V Molex power jacks on the repeater top panel. To conserve the battery, turn off the camera power except when actually using it.

6. An additional 12 V Molex power jack is available on the repeater top panel. This may be used to power your 2 meter hand-held radio. Note: try to avoid transmitting between 146 - 148 MHz. The third harmonic of your 2 m signal will land on the repeater's input frequency of channel 60.

TRANSMIT ANTENNA FINAL ALIGNMENT

1. The initial transmit antenna alignment is done visually or using a map and compass.

2. Set the repeater to transmit its own ID continuously for this alignment. Set the following controls: POWER = ON, ID = ON, XMIT = ON, and MONITOR = XMTR.

3. The final alignment is done using "talk-in" from the command post receive site. Slowly rotate your transmit antenna until the C.P. reports the best possible signal. Tell the C.P. to not rotate their antenna while you are adjusting your antenna.

4. The C.P. should then also rotate their antenna for best picture.

5. CAUTION: To avoid exposing personnel to potentially hazardous RF fields, do not let anyone stand in front of the transmitting antenna when the repeater is in operation.

RECEIVE ANTENNA FINAL ALIGNMENT

1. The initial receiver antenna alignment is done visually or using a map and compass.

2. Set the repeater controls as follows: S / BAT = S, POWER = ON, ID = AUTO, XMIT = OFF, CAMERA / RCVR = RCVR, MONITOR = RCVR, AUDIO SQUELCH = CCW, VIDEO SQUELCH = CCW, VOLUME = as desired.

3. Call on 2 meters the TV crew whose signal is to be relayed by your repeater. Ask them to start transmitting and point their antenna at you. Tell them to not move their antenna while you are making adjustments.

4. Rotate and move the position of your receive antenna while observing the received signal strength on the "S" meter and simultaneously watching the quality of the received picture on the monitor. The best picture with the fewest "ghosts" may not always give the strongest "S" meter reading. Remember that the "S" meter saturates at about 150 microvolts (full scale is 200 uV).

5. After you have optimized your antenna orientation, and then ask the originating TV crew to move their antenna while you talk them into their best orientation. Do not move your antenna while they are moving their antenna.

6. After the antenna positions are optimized, ask the originating TV crew to turn off their transmitter. Now adjust the audio and video squelches to turn off their LEDs. The normal settings are at 12 o'clock. Ask the other TV crew to again turn on their transmitter. Your video and audio squelches should open and turn on their LEDs. You should see their picture on your monitor and hear their audio on the repeater's loudspeaker. If their signal is too weak to hold the squelch circuit open, you may find it necessary to set the squelch controls to the CCW position and manually control the transmit switch on the repeater.

NORMAL REPEATER OPERATION

1. After completing the transmit and receive antenna alignment, you are now ready to start repeating TV signals.

2. Set the repeater controls as follows: S / BAT = S, POWER = ON, ID = AUTO, XMIT = RPT, CAMERA / RCVR = RCVR, MONITOR = XMTR,

VIDEO SQUELCH = as set previously, AUDIO SQUELCH = as set previously, VOLUME = as desired.

3. You should now be repeating TV signals. The 5" B&W TV monitor will show what you are actually transmitting. The local loudspeaker will be the incoming and outgoing audio. The repeater will automatically ID itself every 10 minutes. You will see the ID appear on the monitor.

TRANSMITTING LOCAL PICTURES

1. Sometimes the repeater may be located where you can also see the emergency situation (such as a forest fire). In these cases, a local camera at the repeater site will be valuable. When the command post (CP) requests that you furnish a picture locally, disable the repeater and transmit your own picture.

2. Connect the audio and video outputs from your camera to the A & V inputs on the repeater. Connect 12 V power to your camera. Turn on your camera.

3. Set the repeater controls as follows: S / BAT = BAT, POWER = ON, ID = AUTO, XMIT = ON, CAMERA / RCVR = CAMERA, MONITOR = XMTR. The volume, audio squelch and video squelch controls are not used. Do not change their settings from those used for repeater use.

4. You are now transmitting your own local camera's pictures. Your monitor shows you what you are transmitting. The repeater will automatically ID for you every 10 minutes.

BCARES PORTABLE 70 cm TV REPEATER SPECIFICATIONS

CALL SIGN: WA0NHD -- TVR
LICENSE HOLDER: James R. Andrews, WA0NHD (extra class)
 3940 Chippewa Drive, Boulder, Colo, 80303
 303-494-1417 or 303-594-2547 (cell)
INPUT FREQUENCY: 438.75 MHz cable ch. 60 (uncoordinated)
OUTPUT FREQUENCY: 421.25 MHz cable ch. 57 (coordinated)
 note: same as Chautauqua Park TV repeater
OUTPUT POWER: 10 watts, peak sync
OUTPUT MODULATION: NTSC Television, Vestigial Upper-Sideband
 with +4.5 MHz, 25 kHz dev. FM sound sub-carrier
 also 5 kHz dev. FM sound on video carrier
ANTENNAS: 70 cm transmit & receive, KLM-440-10X
 10 element yagis, 11 dB gain
POLARIZATION: Vertical, both transmit & receive
KEY-UP ACCESS: PL required of 15.75 kHz, i.e. TV horiz. sync
ID: Video color bars with call letters every 10 min.
POWER REQD: 12 Volts dc @ 2 Amps
TRANSMITTER: P.C. Electronics TXA5-70 exciter, FMA5-F sound
 sub-carrier & PA5-70 10 watt amplifier
RECEIVER: P.C. Electronics TVCX-70 xtal downconverter
 & VRC54b 45 MHz IF amp & a/v detector
FILTERS: Spectrum International PSF-421 & 439
 6 MHz interdigital bandpass
VIDEO IDer: Elktronics VDG-1
CONTROLLER: Custom designed & built by WA0NHD, includes
 audio & video squelches, audio amp., lo-battery
 indicator, 10 min ID timer
LOCAL CAMERA: provision to connect ext. local camera
MONITOR: 5" B&W min. TV receiver modified by AD0I
SYSTEM DESIGN: by Jim Andrews, WA0NHD
BUILDER: built by Rip VanWinkle, NV0M
DATE BUILT: summer, 1992

BOULDER COUNTY BCARES EMERGENCY FREQUENCIES

FREQUENCY	GROUP/USE	LOCATION	COVERAGE	EMER. POWER
146.76 (-.600)	BCARES - PRIMARY VOICE NET (call-out)	Gunbarrel	county wide	YES

	(packet net control, tactical ops)			
146.70 (-.600)	BCARES - COORD & ASSIGNMENTS	NCAR	plains	YES
147.27 (+.600)	Red Cross - Primary voice net (Autopatch and Rev patch accessible by LARC members only)	Longmont	county wide	YES
146.73 (-.600)	ARES Secondary - Back up and Autopatch (Use if any of the above fail. Control op required for autopatch)	Pinebrook	county wide	YES
146.745 (-.600)	ARES Mountain Secondary - Special coverage situations	Eldora Ski	Boulder mtns	YES
147.03 (+.600)	ARES Boulder Secondary - Back up and Autopatch (PL required, Control op required for autopatch)	Table Mesa	plains	NO
145.46 (-.600)	CRA - Back up and autopatch (CRA member required for autopatch)	Lee Hill	county wide linkable	
145.31 (-.600)	COARES - Colorado Connection State-wide linked repeater system	Mt. Thorodin	State-wide	YES
145.115 (-.600)	NTS - Northern Colorado Traffic Net (Daily at 2000 hours local time)	Horsetooth		

BCARES PERSONAL EQUIPMENT LIST

REQUIRED ITEMS:

2m FM Hand-Held Transceiver or FM mobile Transceiver. Best situation is to have both. An HT is more versatile while a high power mobile with good antenna will have better radio coverage.

Extra battery packs for HT. Alkalines are preferred.

12 VDC power cord for HT with cigarette lighter plug.

Mag. mount antenna with coax for mobile and base use of HT.

Earphone or headset.

BCARES ID card with clip to attach to shirt pocket.

BCARES cap.

BCARES telephone call list.

BCARES Disaster Communications Plan Handbook (current edition).

Clipboard, paper, pencils and watch.

Map of Boulder County including city streets and mountain roads.

Flashlight with extra batteries.

Pocket knife (Swiss army preferred).

Suitable clothing and shoes for anticipated weather.

Food and water for 24 hours plus money including change for pay phones.

RECOMMENDED, BUT NOT REQUIRED ITEMS:

Telescoping whip antenna for HT.

Battery charger.

Gel-Cell 12V battery with appropriate connector.

AC power supply for HT or mobile rig use as portable base station.

2m beam antenna with mast, tripod and guy rope.

Coax cable.

BNC / UHF coax adapters.

AC extension cord with 2/3 wire adapter.

PSAP/BCARES message forms and log sheets.

Topographical maps and compass.

Scanner.

Toolbox with assortment of tools, electrical tape, soldering iron, fuses and DVM.