UARC Club Station - On the Air at Last!

Photo: Alan Seyboldt, K7OPT

Home of the new UARC Club Station - The Greater Sale Lake Area Chapter of the American Red Cross Building. Some might recognize this as the old IRS building located at 465 South 400 East in downtown Salt Lake City.

Volume XLII Issue 9, October 1998

The MICROVOLT

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Prologue

The Utah Amateur Radio Club was organized under it's present name in 1927, although its beginnings may date back as early as 1909. In 1928, it became affiliated with the American Radio Relay League (club #1602) and is a non-profit organization under the laws of Utah. It holds a club station license with the call W7SP, a memorial call for Leonard (Zim) Zimmerman, an amateur radio pioneer in the Salt Lake City Area.

The club meets each month except July and August. The meetings are held on the first Thursday of the month at 7:30 PM in the Doxey-Hatch Medical Building located at 1255 East 3900 South in Holladay, across the street from St. Marks Hospital.

Club membership is open to anyone interested in amateur radio; a current license is not required.. Dues are $15 per year, including a *Microvolt* subscription. *The Microvolt* and membership cannot be separated. Those living at the same address as a member who has paid $15 may obtain a membership without a *Microvolt* subscription for $9. ARRL membership renewals should specify ARRL Club #1602.

Monetary contributions are gladly accepted. Send directly to the Club Treasurer: Chuck Johnson, 1612 W. 4915 S., Taylorsville, UT 84123-4244. For in kind contributions, please contact any board member to make appropriate arrangements.

UARC maintains the following repeaters: 146.62 (-), 146.76(-), and 449.10. The repeaters are administered by the UARC Repeater Committee. Comments and questions may be directed to any Committee member. The Lake Mountain repeater 146.76(-) has Autopatch facilities on both the Orem exchange (covering Santequin to Lehi) and the Salt lake City exchange (covering Draper to Layton). The 449.10 repeater has autopatch facilities into Salt Lake City only. Due to the volume of traffic, only mobiles should use this autopatch. Autopatch use is open to all visitors to our area and to all club members. Non members who wish to use the Autopatch are encouraged to help with the cost of maintaining the equipment by joining the club.

THE MICROVOLT: *The Microvolt* is the official publication of the club. Deadline for submissions to the Microvolt is the 10th of each month prior to publication. Submissions by email are preferred (bbergen@xmission.com), but other means including diskettes and typewritten submissions can be mailed directly to: Bruce Bergen, 3543 Fieldstone Cir., SLC, UT 84121. In order to maintain ease of conversion it is suggested that you contact Bruce at 943-1365, or via e-mail before making electronic submissions.. All submissions are welcome but what is printed and editing are the responsibility of the UARC board. Reprints are allowed with proper credits to *The Microvolt*, UARC, and authors. ❑

UARC 1998 Board - Partial Listing

President: Tom Schaefer, NY4I	569-2664
Exec VP: Ray Allen, N7TEI	963-0790
Vice Pres: Gordon Smith, K7HFV	582-2438
Secretary: Russell Smith, KC7ZDZ	463-2568
Treasurer: Chuck Johnson, WA7JOS	268-0153
Microvolt Editor: Bruce Bergen, KI7OM	943-1365
Book "Lady": Fred DeSmet, KI7KM	485-9245

Note: Detailed listing of board members addresses, phone numbers, and email addresses will not appear in every issue. For current information refer to the club's web-page www.xmission.com/~uarc ❑

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For late breaking news listen to the UARC Information Net Sundays at 21:00 on 146.62 or set your browser to:
www.xmission.com/~uarc/announce.html

We are grateful to the management of Xmission for the donation of this Web-Page service. ❑

The Microvolt
The Official Publcation of the Utah Amateur Radio Club, Salt lake City, Utah

Volume XLII, Issue 9 October 1998

Photo: Bruce Bergen, KI7OM

QST from the Prez

UARC needs your help!!! As you may know, we currently have several projects underway along the Wasatch Front. UARC is installing a repeater system on Scott's Hill, installing the club station, and still dealing with continuing repeater issues on the Farnsworth Peak '62 site (although, Fall and Winter may give us a reprieve there). Of course, these projects do cost money. Yes, we all pay dues. Unfortunately, these projects cost a large chunk of money and we are interested in soliciting additional monetary donations from the membership to help defray the costs of these projects. Now, please don't get the wrong idea. This is not a "Newslinesque" plea for help. We do have quite a bit of money in savings (I think it is around $12,000 now), but these projects, that have been approved by the membership; will cost about $7000-$10000 in the future. We generally try to reserve our savings for large capital projects like new repeaters, etc, but since we are taking on several projects at once, we certainly do not want to dip down too far. Of course, we could forego these projects but I feel these will truly add value to our club. We had a dues increase in April to help defray the cost of the Microvolt printing. I am sure everyone can see the value of the extra two dollars per year in the quality publication we now have. Please consider helping out the club to provide a better service to its members. If you would like to make a donation, you have two options. You can make a donation to the UARC Treasurer for the UARC Repeater Fund, or you can make a tax-deductible donation to the Greater Salt Lake Chapter of the American Red Cross to help defray the cost of the club station. The Red Cross will gladly give you a receipt for your cash (or equipment in good shape) for tax purposes. UARC has already put about $1000 into the club station, so the more money donated, the more that can come back to UARC. In both cases, please send your checks to the UARC address printed on the cover. Please be sure to mark them correctly. If you would like to donate equipment to the Red Cross, please call me at 569-2664 evenings to arrange this.

73, Tom, NY4I

PS By the way, I noticed on the ARRL web site that Marv, W7MR is running for Assistant Director of the ARRL Rocky Mountain Division. When you get your ballot in the mail (ARRL members, that is), please make sure you read the ballots and the biography of each candidate and vote for your candidate of choice. I guess Utah **is** in the Rocky Mountain Division after all! ▫

Featured Member Of The Month

This month we are featuring Joel Neal KC7UBP, who has been a ham since January 1997. His neighbor Bill Oberg AA7XS got him interested in the hobby. Joel and his wife, Cindy, KC7UUW, have two daughters and one grandson. He is employed by Chevron Refinery doing PC maintenance.

Joel is a member of UARC and Salt Lake County ARES. As the 1998 chairman for the UARC Field Day activity he did an outstanding job, especially with the organizational details. It seemed that everyone wanted to have a turn at manning one of the HF stations. Joel enjoyed it so much that he said he would consider doing it again next year. He enjoyed the fellowship of other hams and learning more about ham radio. The only thing he said he would change would be to provide for more separation of the antennas. This would help enable the CW station and the phone station to simultaneously use the same band. Joel feels that there may be other locations which might serve us better for Field Day.. He plans on bringing his ideas to the UARC board when it gets closer to Field Day 1999. Joel was really excited to get on the low bands at Field Day. He related that 10 meters was really booming at 11:30 at night. He was thrilled to make a contact in Quebec, Canada. He said he made quite a few contacts on 20 meters and also enjoyed 40 meters. Most importantly, though, his experience at field day gave him an incentive to upgrade. Joel said he enjoys helping people and wants to learn as much as he can about amateur radio and plans on upgrading soon.

Joel said he would like to thank Tom Schaefer NY4I, Alan Seyboldt K7OPT and Garth for their support and all of those who helped with Field Day.

Joel, you did such a wonderful job with Field Day this year.

Good luck in your endeavors.

73 N7HVF Linda Reeder ❑

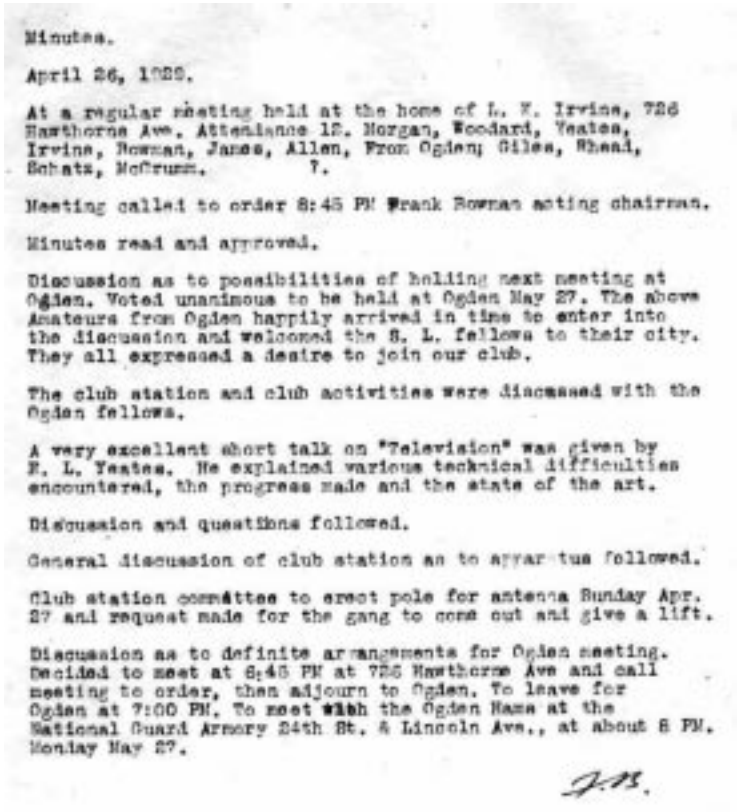
A Blast from the Past

Hello to all,

It seems that there is no word on the whereabouts of the Utah Radio Association's former treasurer or the association's funds. These minutes from April 26, 1929 tell of the visit to the monthly UARC meeting of a group from Ogden. Plans are detailed for a reciprocal visit of the Salt Lake UARC group to meet with the Ogden group. The Ogden Radio Amateur Club (OARC) seems to have been organized in the spring of 1921 (see the OARC history webpage http://www.lgcy.com/users/k/kellyv/History.html) but had functioned only for a few years, and at this time was apparently not functioning.

Of special interest is the talk presented on Television. This is especially of interest in view of the Utah connection of Philo T. Farnsworth. He had just successfully displayed and patented the first TV picture system only two years before in January of 1927.

Alan, K7OPT ❑



Minutes.

April 26, 1929.

At a regular meeting held at the home of L. F. Irvine, 726 Hawthorne Ave. Attendance 18. Morgan, Woodard, Yeates, Irvine, Bowman, James, Allen, From Ogden; Giles, Rhead, Schatz, McCrumm. ?.

Meeting called to order 8:45 PM Frank Bowman acting chairman.

Minutes read and approved.

Discussion as to possibilities of holding next meeting at Ogden. Voted unanimous to be held at Ogden May 27. The above Amateurs from Ogden happily arrived in time to enter into the discussion and welcomed the S. L. fellows to their city. They all expressed a desire to join our club.

The club station and club activities were discussed with the Ogden fellows.

A very excellent short talk on "Television" was given by F. L. Yeates. He explained various technical difficulties encountered, the progress made and the state of the art.

Discussion and questions followed.

General discussion of club station as to ayyar tus followed.

Club station committee to erect pole for antenna Sunday Apr. 27 and request made for the gang to come out and give a lift.

Discussion as to definite arrangements for Ogden meeting. Decided to meet at 6:45 PM at 726 Hawthorne Ave and call meeting to order, then adjourn to Ogden. To leave for Ogden at 7:00 PM. To meet with the Ogden Hams at the National Guard Armory 24th St. & Lincoln Ave., at about 8 PM. Monday May 27.

J.B.

The UARC Club Station

By Tom Schaefer, NY4I

Introduction

The Utah Amateur Radio Club **has** a club station. With the help of many members, the Greater Salt Lake chapter of the American Red Cross, Salt Lake County ARES, and local hams, UARC has made a contact from our permanently installed antennas on the Red Cross building in downtown Salt Lake City. While that may not seem such a feat, the story of how this came about provides interesting insight into managing a project with several interests involved. It also shows what can happen when a group of people are determined to see a project to fruition.

Background

As you may know, the American Red Cross is charged with the responsibility to maintain emergency shelters in times of local disasters. These disasters can be as localized as a building fire, or as complex and far-reaching as a large earthquake or chemical spill in downtown Salt Lake. To better manage their shelters, the Red Cross depends upon amateur radio to provide communications. Back in May 1997 (yes, 17 months ago), our then UARC president, Alan, K7OPT, mentioned that the club had found a place to install a club station. Alan explained to the club that the new downtown Red Cross location could be used to install a station jointly with the Salt Lake ARES group. The station would serve two purposes: First it would be a place that ARES could assist the Red Cross during disasters and practice exercises, and second, it would provide UARC a place to establish a club station. Little did anyone know what would be required to get this project underway. Work officially began on the project in June of 1998. So, if we do the math, we can see that it only took a little over one year to clear all the obstacles to getting the project completed. In a nutshell, there was some uncertainty about how the building was to be used. Also, since the Red Cross does not actually own the building, the owner's approval had to be obtained for the installation plan. Fortunately, that is all behind us. To facilitate the owner's approval, a site plan was submitted on March 8, 1998. After about two months of discussion and deliberation, the building owners approved the plan. Then, came the legal work. The building owners (rightfully so) wanted to amend the Red Cross; lease such that they would agree to remove the antennas, etc, if they moved. Subsequently, UARC agreed to do the same. Next, the lawyers had to properly amend the lease and other legal things. All that being said -- in the middle of June 1998, we obtained the final go-ahead to start work on the project. It should be noted that this only took place with diligence of all parties involved including the Red Cross Disaster Services Chief, Jerrianne Kolby, and the Assistant to the Red Cross' CEO, Debra Rogers. Now for the fun stuff…

The Plan

The installation plan involves placing a station in the disaster services area of the Red Cross building. This is approximately 115 feet (as the cable runs) from the roof. Therefore, in order to get a signal to the roof, some 130 feet of COAX must be run for each antenna. Plans calls for at least 4 simultaneous ham stations and one Red Cross radio to be operational at all times. SO, the challenge becomes how to run 5 runs of coax, plus a spare, to the roof. Fortunately, UARC being the club it is, we have quite a few helpful members that work in the communications field. John Buttles, N7NTZ, was able to acquire about 500 feet of ½-inch hard-line and 500 feet of 7/8-inch hard-line for the project. John also donated the connectors to put on the end of the cables as well as a very large junction box to hold the lightning suppressors . So, the plan is now set… We have the cable, the permission, and the plan. The next challenge is the work.

Let the Work Commence

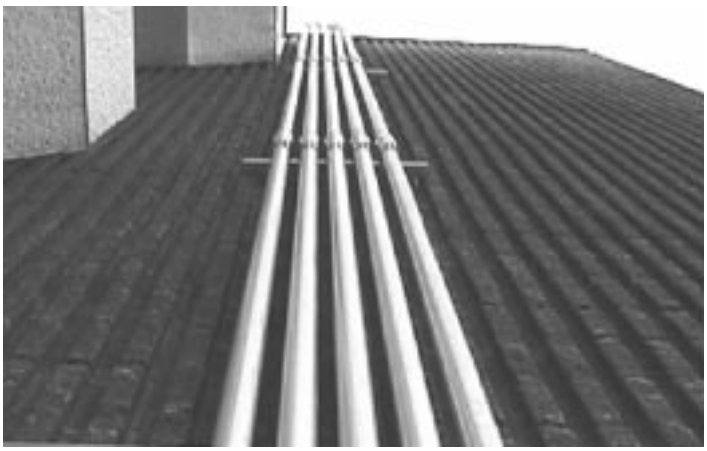


Photo: Alan Seybold, K7OPT

Conduit runs up the building contain the antenna cables

After a quick (albeit expensive) trip to an electrical supply store, enough conduit was obtained to place 5 separate 2-inch conduits up the side of the building. The conduits terminate in a large electrical box to

make the connections and transition into the building via two 4-inch conduits. Once the cable is inside, it runs in the ceiling to just over the radio room, then connections are made with Belden 9913 coax to the radios. That sounds quite easy. The reality is that it was quite a bit of work by many people. The ground rods were run one day by drilling through the building's foundation from inside the radio room and at the electrical box. The electrical box, the lower conduit supports, and the ½-inch hard-line was run on Saturday July 25. The electrical box, after its refit, was installed the next Saturday. The 7/8 inch hard-

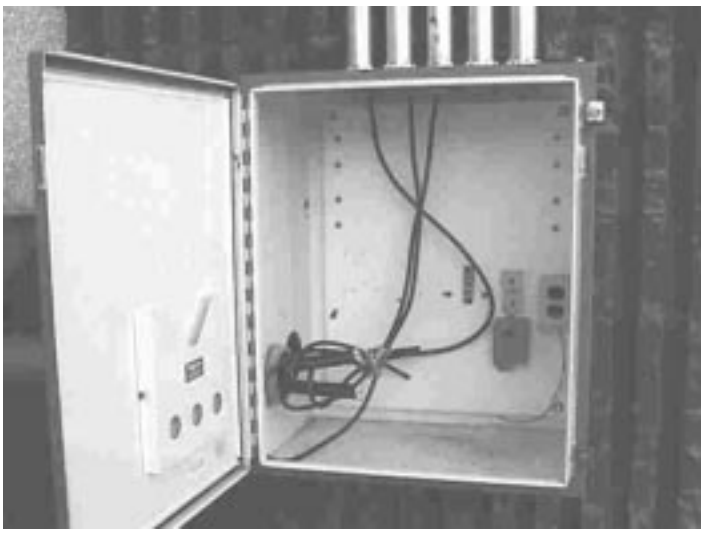


Photo: Alan Seyboldt, K7OPT

Electrical junction box where lightening protection devices will be installed

Line was run on another Saturday. The rest of the conduit and the antenna supports on the roof were run on yet another Saturday. Finally, several antennas were installed, the coax terminated and the rest of the 9913 was run in the conduit up the wall. Of course, the conduit mounting was made much easier by Russ, KC7ZDZ, and his "man-lift" as seen here. There are

Photo: Alan Seyboldt, K7OPT

The "Man-Lift" used in mounting the conduit.

still a few final touches to be done to the outside. We need to install Polyphaser surge suppressors and a few more antennas. We are also going to help the Red Cross install their low-band VHF antenna and radio so they can talk to their Emergency Response Vehicle (ERV). That will take care of the outside of the building. Then the inside projects will begin.

Its What's Inside that Counts

For HF radios, the radio room currently contains the club's Kenwood 450 S, the ICOM 730, and a donated Kenwood TS-820S For VHF, a donated ICOM IC-211 multi-mode 2 meter radio is available. We currently have about 4 computers, keyers, tuners, a station monitor, and a few other goodies. The radios are currently sitting on a few tables purchased from an office clearance sale. Now that the outside is nearly done, our attention can turn towards making the radio room a first class operating position. Don't forget that the primary purpose of the station is to allow the Red Cross a place to receive information from their activated shelters. It is hoped that we can have one HF position, one VHF voice, one UHF voice, one packet, and the Red Cross ERV radio active at the same time. Of course, since disasters do not happen all the time, we also have the opportunity to use the station as UARC's club station. Future goals are to have the site running an APRS digipeater along with an Internet connection as well as provide a place for club members to come down and operate in their favorite contest, pick up some DX, or simply rag-chew on 20 meters. There is plenty of room for growth in this project. We are limited by three things: Any additional antennas require a simple approval, money, and volunteers. If you have a suggestion, or would like to help, **let us know**.

Credits

I take a risk in having this section because I will surely forget someone. Just in case, please accept my apologies. First and foremost, our thanks go to the Greater Salt Lake Chapter of the American Red Cross. For their generous donation of time, resources, and space, we are forever thankful. Additional thanks go to Alan Seyboldt, K7OPT, for whom without this project would still be a wishful fantasy. John Buttles for his gracious donation of cable, Eugene, KC7CSE, for always showing up with just the right tool; James, KD7CIU; Steve, KC7IAS; Richard, KC7FIK; Russ, KC7ZDZ; Dave, KC7NGH; Jack, KC7KEL; Kevin, KC7MOQ; Gary, KC7AWU, and many more.

Open House

Once the inside of the station is "camera-ready", UARC and the Red Cross are planning a media open house to allow the local media to see what the Red Cross is capable of establishing right in downtown. This should take place in October. The station will be ready for operation by UARC members by the end of September. In case you are wondering how you get in the building…UARC has three keys to the building. Currently, Alan, K&OPT, Gordon, K7HFV, and the author (Tom, NY4I) have the keys. The rules are that one of us needs to be there to open the station. While I cannot speak for the rest of the group, I suspect that we will announce on the Sunday night UARC Information Net when we plan on being at the station. It may even get put on the web site. Even thought this project is completing its first phase, we have a long way to go to get it into the best club station it can be. With everyone's help, I am sure we can make it great.

73, Tom, NY4I ❑

On the Air - At Last!

A few years ago I began thinking how it would be nice to have easy access to an operating station for use by newly licensed Hams. At the time I did not own an HF rig and had just returned from my first Field Day. I was very excited but now I had to wait until the next year to operate on the air. I had just passed my 5 wpm but had nowhere to practice on the air, or to use these newly acquired privileges. I later purposed during my tenure as President of UARC that we look for an operational home for our club equipment and a place that we could call (our) Club Station. I, and many others, started asking around for possible locations. Tom, NY4I, was very helpful in getting us in the door at the Salt Lake Chapter of the American Red Cross.

After many hours of paper work and WORK, we finally had the HF antenna up on the building 7:00 PM, Saturday, the 12th of September 1998. Those present were Tom, Richard, and myself. Tom suggested that since I had dreamed up this project that I should make the first call out of the club station. At 8:45 Mountain Daylight Time the first call went out of the Club station on 7.028 MHz and was returned by:

AC5QO
WOODROW W CATER JR
RT 2 BOX 740
DARDANELLE AR 72834 USA

The Club Station has been talked about for many years. Many of the old notes that I have been sending Bruce, KI7OM, your *Microvolt* editor, and used in the regular feature, "A Blast From the Past", talk of this dream, even back as far as 1928. Well, it has been a long road for us to have a Club station but we now have one. I welcome all to come and use it. The best way to find out how, is to come to the regular club meetings at the Doxey Hatch Building and learn. Thank you, for all who have helped. Many have donated radios, computers, labor and just their time. I would also like to extend a special thanks to John Buttles, N7NTZ, for all that he has done, both in obtaining the generous donation of some VERY expensive hard line and connectors (200 ft of 7/8" and 200 ft of 1/2") from Commscope, and for hanging off the side of the building to install the runs.

I hope that this will be a source of education and fun for many years to come.

Best regards,

Alan Seyboldt, K7OPT ❑

Items for Sale

For Sale: Television receiving tubes. Many compactrons and odd-filament types. If you're into restoring old Tvs, I've got the tubes. SASE for list, or e-mail:_ russell@sierra.net. Ron, KG7OR, 1927 Laxalt Way, Elko NV 89801

For Sale: 50 ft. crank up tower, lean over - $100.00 Needs some work. Heavy duty rotator - $100.00 Needs adjusting. Cushcraft A4 Tri-Bander (10,15,20) beam antenna - $150.00. Call Wally Hebertson in Lehi at (801)768-3636. ❑

Scott's Hill September 12 Work-party Report

We met at the Big Cottonwood Canyon Park & Ride at 8:00 AM, the appointed hour. I was very pleased at the turnout of 13 , especially considering that we have the Wasatch 100 happening concurrently. We had two additional individuals who came to deliver either equipment or tools but were not physically well enough to make the trip. Initially I thought that we may have been over staffed, since we were planning on using Ready-Mix concrete instead of dry mix. As things developed the larger crew in fact helped make the day successful.

The weather was expected to be a factor and we had tried to do everything to anticipate it. The site was relatively dry when we started, but we had a cold south wind which at times during the day came in gusts of up to an estimated 20 miles per hour and on occasion brought light rain and latter snow.

Don, N7YUQ and Chris, KB7WMN, his brother-in-law went to work on the electrical and made some very significant progress. He estimates that he has only an hour or two of work left to finish up another run on the south wall and the lighting fixtures. With part of the crew under his direction the two, ten foot, electrical safety ground rods were driven as far as possible into the ground and then bent over and buried under the few inches of top soil and loose rock. Last

Photo: Dennis Millard, KC7KCW

Using the rod driver the crew attempts to get the second ground rod driven deeper than the first

week we had tried to drive the rod closest to the building further in with the electric jackhammer and had only about 1'' to show for 15 minutes of hammering. After the second rod reached a similar standoff today it was interesting to note that when the diggers trenched around it to do the burying job we found it going off at about a 45 degree angle about 1 foot below the surface. Everyone should take the time to thank Don for the fine work he is doing - it indeed is up to full commercial standards.

Another crew was dispatched to further excavate in front of the door to allow us to lay down a concrete door pad as part of the overall concrete work. Forms were set in place which allowed us to adjust the size of the pad depending on how closely the yardage had been calculated.

Chuck, WA7JOS, brought his finished lock box and using his buzz box (arc welder) attached it to the door over the door lock and latch arm. The box was fabricated out of 1/4" plate steel and is intended to make cutting or breaking the lock off to gain entry, very difficult. Again a very professional piece of work. Chuck said that he doesn't paint - so we have another little job, the lock box, for someone to take care of on a future visit.

Photo: Dennis Millard, KC7KCW

The lock box which now awaits a coat of paint.

The big job for the day was setting the two Rohn 55G 20' towers in concrete bases. The first task was to bolt the house brackets to the north side of the building. We ran into problems when it was discovered that none of the masonry drill bits we brought were over 6" long for the 7 ½" thick walls. To make matters worse Ed, KB7VIH, had provided us with 5/8" threaded shafts and the largest bit available on site was ½ inch. This meant we had do a lot of normally unnecessary measuring to make it so we could drill from both sides. It also seems that we managed to run into some rebar at just the points we wanted to make our holes. The four tower sections assembled into two 20' sections, were lifted into place, set into the holes, secured to the house brackets, adjusted for plumb, square, equal height, and setback from the building. This all took about two hours more than expected.

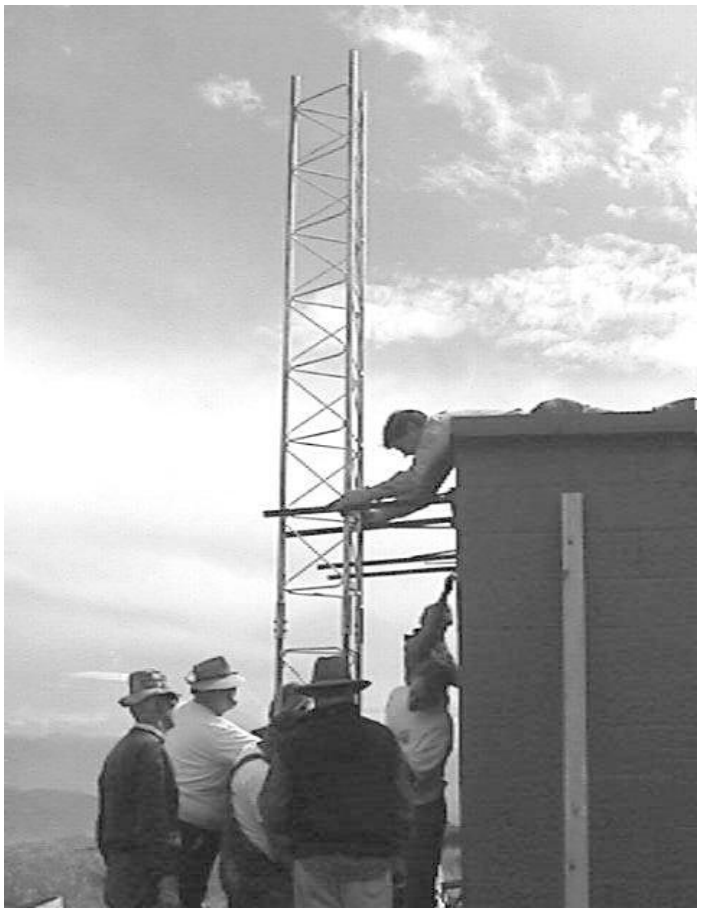


Photo: Dennis Millard, KC7KCW

Gary,KK7DV, lying on the roof adjusts the U-Bolts as the tower is maneuvered into place

Fortunately the ready-mix truck, which was to be at the gate at noon, did not make it till 2:00 PM.

I rode down to the gate with Darryl, AF7O, and Ron, KC7MYS, who both needed to leave. There I met the cement mixer and took an exciting ride up the hill in the cement truck. He took less than 15 minutes from

Photo: Dennis Millard, KC7KCW

The long awaited cement truck grinds up the final grade after giving the author a wild ride.

the gate to the site. Rodney, the driver, was really taken in by the view and gave me quite a ride - I think we had all expected it to take him about three times as

Photo: Dennis Millard, KC7KCW

The driver, Rodney, was struck with the magnificent view from on top. Looking to the South one has a beautiful vista of the Brighton Bowl.

long. The pour was over in about 15 minutes including the 3' x 6' pad in front of the door. After the initial rough troweling we had to let the concrete set for about 45 minutes before doing the finish float troweling and edging. It was at this time that the weather turned particularly nasty with wind blown snow. The temperature dropped to about 35 degrees, so while the cement set up a bit we gathered inside the building and found it to be quite cozy. With the finish troweling of the pad and the tower bases completed everyone present etched their call signs into the tower base tops along with those of the others who have helped this summer.

Photo: Dennis Millard, KC7KCW

One of the tower bases with the call signs of crew members etched in.

Thanks to all who have helped!

Bruce, KI7OM ❑

Batteries

This will be the first of a series of articles on batteries. I will be writing about both non-rechargeable and rechargeable batteries. The articles will include the testing of batteries and some of the methods to recharge rechargeable batteries. I plan to give schematics of chargers for NI-CAD and Lead Acid(Gel-Cell) batteries. These chargers will include simple chargers that will charge the batteries but will give no feedback as to the state of charge of the batteries, and I will also give schematics of more complex chargers that give feed back as to the state of charge. The schematic diagrams will not be from another publication, but are chargers of my own design, some of which have been in service for excess of 10 years.

There are numerous battery chemistries, but I plan to limit the articles to a small quantity of the more common ones, however if there is enough reader interest I may decide to include more on chemistries in a later article.

The types of batteries that will be included in the first series of articles will be: Carbon-Zinc, Alkaline, Nickle-Cadium (NI-CAD), Nickle-Metal Hydride, Lead-Acid, and Lithium.

Definition of some battery terms:

1. Chemistry - common terms of chemical composition

2. Nominal Voltage - Industry standard of average voltage per cell

3. Cutoff Voltage - The minimum voltage across the cell terminals for usable service

4. Shelflife - Period of time the battery will self discharge to 90% of its full charged capacity at a prescribed temperature. (usually 68 or 70 degrees Fahrenheit)

5. Rechargable - Battery can be recharged for certain number of cycles.

6. Nonrechargeable - Battery that the manufacturer does not recommend be recharged.

All batteries are constructed of one or more cells. When cells are connected in series the battery voltage will increase. If cells are connected in parallel, then the voltage remains the same, but the capacity will increase.

Below is chart #1 that lists the characteristics of D size cell chemistries mentioned in a above paragraph.

Chart #1 Battery characteristics: (Per Cell)

Battery Chemistry	Nominal Voltage	Recharg-able	Shelf Life	Cutoff Voltage	D Size Nominal Capacity
Carbon-Zinc	1.5	No*	1 Year	0.90	6.0 AH
Alkaline	1.5	No*	2Years	0.90	14.0 AH
Nickle-Cadimum (NI-Cad)	1.2	Yes	1 Week	1.00	5.0 AH
Nickle-Metal Hydride	1.2	Yes	10 Days	1.00	4.5 AH
Lead-Acid	2.0	Yes	6 Months #	1.70	2.5 AH
Lithium	3.0**	##	10 Years	2.50	14 AH @ 3.6V

Notes on above table

* There are some alkaline batteries that can be recharged and they are produced by Ray-O-Vac, and Carbon-Zinc batteries can be rejuvenated.

** Lithium batteries come in more than just 3.0 volts, and there is a version that is rechargeable.

Most manufactures recommend recharging Lead-Acid batteries every 6 months, however there are some that claim one year before charging is necessary when the battery is in storage.

The capacity of all batteries is expressed in Ampere Hours (AMP-HR's), or a fraction of AMP-HR's, like MA/HR's (Milliamps-HR's). The voltage of the battery depends on the number of cells that are connected in series.

The state of charge of most batteries can be determined by measuring the voltage across the battery terminals. A knowledge of the discharge curve the battery chemistry will help for a more accurate charge condition. The number of cells needs to be known. For example a 12 volt Gell-Cell (Sealed Lead-Acid) has 6 cells of 2 volts each connected in series. If the voltage across the battery terminals is exactly 12.0 volts, the battery is charged but not fully. A 9 volt alkaline, such as an Eveready 522 has 6 cells of 1.5 volts each. When the voltage across the terminals is 9.3 volts, it can be assumed the battery is fully charged.

To test the capacity of a battery is not difficult, but it requires some special test equipment. The capacity test of a battery is usually only done on rechargeable batteries, but it can be done on non-rechargeable

batteries if, one wants to compare capacities between manufacturers. Say you wanted to compare Duracell to Eveready of the same size Alkaline or Carbon-Zinc batteries, then a capacity test could be performed.

I gained a lot of my knowledge at Standard Supply Company. I held various positions while working there. One position as Technical Support Manager, I actually compared the capacity of three different manufactures size AA Alkaline batteries. I do not have the exact results, but one manufactures battery actually became discharged long before the others did and actually reversed polarity. The two manufacturers AA batteries were real close in capacity.

The capacity test for rechargeable batteries is a multistep process as follows:

1. Charge the battery to be tested to a full charge state. This requires some monitoring of the battery. For Lead-Acid the terminal voltage has to reach a prescribed amount and the charge current usually has to drop to a certain value. For NI-CAD's and Nickel-Metal Hydride monitoring the voltage across the terminals or the temperature until either voltage or temperature reaches a prescribed value.

2. Let the full charged battery rest, generally 24 hours.

3. Discharge the battery at a constant current until the cutoff voltage is reached at a battery manufacturer's prescribed discharge current. Power resistors are not suitable for this test, because as the battery discharges it's voltage decreases and because the resistors are of constant value the discharge current will decrease. I have successfully used power transistors, both bi-polar and MOSFETs mounted on a heatsink and controlled by OP-AMPs (operational amplifiers) to cause a constant current discharge current.

4. Monitor the time the for the discharge to the cut-off voltage.

5. Remove the discharge load from the battery when cut-off is reached, and immediately recharge the battery.

6. To determine the capacity, multiply the discharge time in hours times the discharge current in amperes. This is the true capacity of the battery. For example you discharge a Lead-Acid at 2 Amps for 16 hours. 2X16 is 32 AMP/HR's. Now if the battery is marked 38 AH, you know the battery has lost some of it capacity, which is normal for a battery to do that is cycled from charge to discharge.

I do not plan to write about the chemical composition, or the chemical changes that take place during discharge or the chemical changes that take place during charge for the re-chargeable batteries. My attitude about the chemical changes that take place in batteries is similar to my attitude about integrated circuits.

When I first started working with integrated circuits, I tried to understand what was going on inside the package. Needless to say, it can be extremely complicated. Then I realized that if I understood what the output would be with specific inputs then all was fine.

Thus if a battery is charged properly and then discharged the way it was designed to be discharged then all is well.

The next article will be about Lead-Acid batteries, and more specifically the Gel-Cell. Even though Gel-Cell and wet-cell lead acid batteries are in the same group of chemistry, there are some slight differences. In the article I plan to be more specific about characteristics and give schematics of chargers. The smart charger, although it will fit in the palm of your hand, still has the ability to charge your 12-volt car battery.

73, Ned, K7ELP ❑.

Ham Hot-Line

The Utah Amateur Radio Club (UARC) has a Ham Hotline, 583-3002. Information regarding Amateur Radio can be obtained, including club information, testing, meeting information, and membership information. Leave your name, telephone number and a short message on the answering machine if no one answers and your call will be returned.

Gary, KC7AWU ❑

Lowpass Filters

Lowpass filters are primarily a passive device used in the transmission and reception of radio signals in the HF frequency range (3-30 Mhz). Their intended purpose is to prevent the radiation of signals above 30 Mhz that often emanate from transmitters due to the mixing of various signals in the transmitter's internal circuitry. The filters should be thought of as a frequency-selective bypass device. That is, the unit will pass through without attenuation (loss) those transmitted and received signals below 30 Mhz and short circuit (between coaxial line center conductor and outer shield conductor)' those signal products whose frequency is above 30 Mhz.

The point at which the loss through the filter is measured as -3db (half of the power lost) is called the cutoff frequency. Above this point as frequency increases attenuation also increases, usually at a rate of rapid ascent. Lowpass filters in receiving operations work the same way. They prevent the reception of frequencies above 30 Mhz which, generated locally by broadcasters can frequently disturb HF reception.

Many filters produced over the past 30 years or so have been either poor by design or installed by the user in such a way that the filter's ability to work was compromised, or both. The result was the expense of a lowpass filter that did not contribute to enhanced station ability or reduction of interference.

Here's what to look for when selecting a good lowpass filter. First, find a filter whose cutoff frequency is close to 30 Mhz Many filters don't reach cutoff below 50 Mhz, and their resulting performance is often poor because of the amount of frequency spectrum between 30 and 50 Mhz hat is allowed to pass through. There's plenty of possibilities for interference and noise to occur in this range. If you're only interested in 30 Mhz and below it's best to decide up front to get rid of everything else. Further, a low cutoff point pushes the VHF frequency range above 50 Mhz farther into the stopband of frequencies where the attenuation is greatest. Second, be sure that the filter has sturdy housings and is not put together with “pop" rivets or hardware that will corrode and rust. Third, ask the manufacturer for a typical sweep curve of the filter so you can gauge the performance against other companies' published figures. If the figures are unavailable, shop elsewhere. Ask what insulation material is used and what the expected voltage breakdown of the filter is. If it's not insulated with a modern material such as teflon sheet or thick mica and insulated to 2,000 volts or higher, shop elsewhere. Ask what kind of warranty is offered. If it's not at least one year and unconditional, shop elsewhere. Ask what kind of impedance passivity the filter has. If its VSWR at 50 ohms is greater than 1.2 to 1 anywhere in the passband (DC-30 Mhz.), shop elsewhere.

Once a filter is selected and purchased it's up to you to install it properly. Most filters are installed by simply, connecting coaxial lines and hanging the filter in open space or mounting the unit to the rear frame of radio gear. But try to keep in mind that the filter is used to remove VHF energy above 30 Mhz. Once the removal is accomplished the VHF signal is applied to the case, and if the case from that point to ground is long (more than several feet) the signal will easily re-radiate or simply not be absorbed and the value of the filter will be lost. Always mount the filter at ground level and as close as possible to a ground rod connection point. Keeping the leads short ensures that high frequency energy will be directly shunted (absorbed) by the earth, and hence removed from the transmission line. Mount the filter outside if you have to and cover with a rainproof enclosure but always keep those leads short - then relax and enjoy'

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Power, Antennas, Feedlines and SWR

Power. Most amateur radio transceivers these days put out 100 watts on HF and somewhere between 30 and 50 on VHF and UHF. Almost all are designed for an antenna impedance of 50 ohms. What does this mean? Simply put, it means that the transmitter is designed to work into a 50 ohm load. This could be a resistor of 50 ohms resistance (as in a dummy load) or it could be an antenna which is designed to have an impedance of 50 ohms. As you can see, we are mixing terms here – resistance and impedance. Both are measured in ohms, and for our purposes they behave quite the same. Both put an equivalent load on the transmitter.

Ok, so what is the difference between a dummy load of 50 ohms resistance and a real antenna of 50 ohms impedance? Well, the antenna is supposed to radiate and the dummy load is not (although it always does a little). The real issue here is that the dummy load with

its 50 ohms resistance will have that resistance over a very broad range of frequencies, usually from HF all the way to 2 meters and UHF, since the dummy load is not frequency dependent.

The antenna however is very frequency dependent, which means that the 50ohms impedance is achieved only at a single frequency. The moment you go to another frequency, you are slightly off the point of resonance. Even a multiband antenna is resonant only at certain frequencies for which it is designed. At other frequencies its impedance will vary from the nominal impedance of 50 ohms. It could be higher or it could be lower, but it will not be 50 ohms. An important antenna specification then is its bandwidth, i.e. the frequency range over which the antenna will at least be close to 50 ohms.

So what happens if our antenna impedance is not 50 ohms? Well, lets think for a moment. Lets say that our mobile 2-meter FM radio puts out 50 watts into a 50 ohm dummy load. If we now connect a second 50 ohm dummy load in parallel, we have a new dummy load of 25 ohms. With half the resistance we have twice the current and, therefore, twice the power output. Our poor radio will now try to put out 100 watts instead of 50. This can destroy the finals in a radio quite easily.

On the other hand, lets say that we make a 100 ohm dummy load. With twice the resistance the radio's output will be cut in half to 25 watts. Is this dangerous? Not with a dummy load and not with a resonant antenna, except that you're only putting out half as much power as you think. Usually though, antennas are designed with a feed point impedance of 50 ohms, so if your antenna has a 100 ohm impedance, it indicates that you have a problem in the antenna or that it is not resonant. In that case, the antenna would reflect power back into your radio which is definitely not good

Feedlines. So far we have assumed that the antenna was connected directly to the back of the radio, as it would be in the case of our dummy load. So let's enter the Feedlines into the picture. Again, today, usually our feedlines are coax. Coax comes in a variety of styles and impedances. Since our transceivers are 50 ohm and our antennas are 50 ohms it stands to reason that our feed line must be 50 ohms as well. Just for completeness we should mention that TV coax is usually 75 ohms and computer coax is usually either 50 ohms (Ethernet) or 93 ohms (IBM 3270). Neither TV nor IBM coax will work well for us on transmit.
Getting back to the 50 ohm coax for our radios we find that coax is specified mostly by its impedance which we have covered, and then by its thickness and by its attenuation. Attenuation is important. The longer the cable and the higher the frequency, the more of our signal will get lost in the coax. What? You heard right, energy actually is absorbed into the coax cable. How much? Well, your attenuation figure tells you that. Lets say we have a 35 watt 70cm mobile in our basement. We have a little Radio Shack ground plane which we can put on the roof, and we have about a 75 ft run of cable. We have some RG-58 which is laying around and we plan to use it. Typically, at 450MHz, 100 feet of RG-58 coax has a loss of 12dB to 15 dB.

Ah, duh, so what's a dB? Simply put, we can think of dB as a ratio of power. A doubling of power means you added 3 dB. A 3 dB loss means you lost half your power. A loss of 6 dB means you lost half your power and then half of that again, so you are left with one fourth. Looking at our 75 feet we know that we will have a loss of 9dB (100 feet had 12dB loss, so 75 will have 9, ok?). We start with 35 watts, half of that once is 17, (your first 3 dB loss), half of that is 9 (your second 3 dB loss) and half of that again is 4.5 watts (your third 3 dB loss). By the time you get to the roof, you have lost 30 watts in your coax and you are radiating less than five, maybe as little as two. Basically, you are standing on your roof with a HT Hehehe. That will teach you not to use cheap coax.

We tend to disregard the loss of coax. We look at the core, we look at the shield and we figure that, since very little leaks through the shield, all of it has to make it to the other side. Not true as you saw a moment ago. For base station runs on VHF and UHF I would always use the thicker RG-8 which has a lot less loss than RG-58. In mobile use, our coax is short, so we tend to use the thin RG-58.

So what is SWR? Simply put, it is the measure of "how far off" we are from the 50 ohm impedance. The further off we are, the worse our SWR. Most radios will tolerate an SWR of 2:1, but the real issue again is whether your impedance is too low (dangerous for the radio) or too high (radio puts out less).

It is not necessary for an antenna to be resonant in order for it to radiate. Some of the best antennas are very long long-wire antennas (feasible only in the country or behind airships). These antennas are definitely not resonant, but have gain. We also know that we can use a tuner to improve our SWR, but what are we really doing? We are matching the output of our radio (50 ohms) to something else … whatever the

antenna is at the moment. But wait! Isn't our coax 50 Ohms? How can it be off???

The answer is simple. The changed feed point impedance of the antenna "throws off" (mismatches) our coax as it enters the tuner. This is not good. Now the coax is operated not at its normal impedance of 50 Ohms but at a possibly high SWR and it will not behave like a good, shielded coax but rather like an unruly part of the antenna. It will radiate, it will be sensitive to routing and it can give you RF burns. Careful!

This is why you cannot "just hook up a tuner" between your mobile radio and your antenna. The tuner should really be located at the feed point of the antenna, not by the radio. Of course, now you need one of those fancy automatic tuners, at least for HF and 6 meters. For 2 meters and 70 cm you should never use a tuner but rather fix whatever is wrong with your antenna.

Antenna Gain. You cannot get something for nothing. The gain which an antenna "gives you" must come from somewhere. It comes from focussing the available power in a certain direction. We usually understand this well enough in a yagi, but where does the gain in a vertical antenna come from? Well, since you are radiating in all directions it has to come "from the top", the area above your vehicle. You can see that there is a limit to this scheme, as there is only so much power to go around. But you can get a little gain on 2 meters and a little bit more on 70 cm by lengthening the antenna. On 6 meters you are pretty much confined to a 54 inch quarter wave, and on the HF bands … well, that's where salesmanship starts.

Antenna gain is specified in one of two ways: dBi or dB over a dipole. DBi refers to a true omni (ball-shaped) radiation pattern which does not exist in real life. dBi was invented to make antenna specs look good. If you read dBi subtract about 2.1 dB and you have what a dipole would do for you. Back to HF. So if lengthening the antenna gives you gain, guess what shortening the antenna will do? Correct, it will give you a loss! Negative gain. As in the example of our feedline above!

If you shorten it a lot, you get a lot of loss! There is no magic! If you take a 102 inch CB whip, mount it to a tuner and run 100 watts on 40 meters into it, you will probably see a loss of some 12 dB or so. Lets do the math: 100/50/25/12/6 watts. You are putting out 6 watts! You can test this very simply by comparing your mobile signal report with a dipole at your QTH. If you are "S9" on your dipole (with 100 watts) but only "S5" on your mobile, you know that, on identical frequencies, power levels and propagation conditions, your mobile is 4 "S-levels" below your dipole or 12dB since each S-level equals 3 dB.

73 - Mike Korlin, KB7CVH

Mike is Technical Support Manager for Browning Arms in Morgan. He can often be heard on 6 meters from his home in Henefer. ❑

October Meeting: 80-Meter DX and Greyline Propagation

Earle Sanders, NT7Y, tells us that he once worked DXCC rather easily on 15 and 20 meters. He thought it would interesting to try working DX on the lower bands, but concluded that 80 meters simply has no DX. After more investigation, though, he found that 80-meter DX is not only present, but plentiful, if you only know where (and when) to look.

Earle will be presenting the program at UARC's monthly meeting to be held Thursday, October 1. This meeting will be the second in our new location, the Doxey Hatch Medical Center, 1255 East 3900 South.

Most anyone can work DX on 15 and 20 meters where noise levels are low and skip distances are often long. But DX on the lower bands presents more of a challenge. Can one really work DXCC on 40, 80, or even 160?

Earle tells us that the answer is a resounding yes. Some stations have worked 300 or more countries on the lower bands. The trick is understanding the propagation phenomena including seasonal changes and "greyline propagation," that world of unexpected openings near sunrise and sunset.

Find out how it's done. Earle will tell us the secrets of finding those moments when DX really does show up on the lower bands.

Of course, the meeting will feature a chance to check out the latest book offerings from ARRL and match up faces with the voices you've been hearing on the bands. Don't miss it! ❑

Letters to the Editor

Bruce,

Thank you so very much for the article in your newsletter. The response has been terrific. Awareness for OT (On Target) and it's positive influence for young men got a big shot in the arm thanks to you and your organization. The young men are what OT is all about.

Thanks again ... Reuben

Bruce --

Nice job on *The Microvolt* this month. It sucked me in and I read it cover to cover before I even got started on dinner!

--Bill N1BR

Hi to all,

I meant to send this just to Bruce but thought that it might be a comment for all to think about. I was wondering if a portion of *The Microvolt* could be devoted to posting those who achieve (DXCC, WAS, ect...) and promote some type of a memento from the club for achieving said accomplishment. We could even put out a challenge to the VHF and UHF crowd to go mountain topping and see who could get the farthest contact via simplex. I know that many are close to Satellite awards and this would not take much to produce a certificate or some form of UARC recognition using my printer. Just a thought that might spark some interest and also reward those who have achieved said goals.

Alan, K7OPT ❑

Net Schedule

Day	Time	Freq.	Name/Purpose
Sun.	2000	146.62 MHz	TCP/IP Users' Group (packet radio)
Sun.	2100	146.62 MHz	Utah Amateur Radio Club Information Net
Mon.	2100	147.18 MHz	High Valley Net (Ragchew)
Mon.	2100	144.25 MHz	Weekly 2meter SSB net
Tues.	1900	146.98 MHz	West Desert Amateur Radio Club
	&	145.37 MHz	
Tues.	1930	146.90 MHz	Ogden Amateur Radio Club
Tues.	2000	146.94 MHz	Utah VHF Society (business and swap)
Tues.	2100	147.34 MHz	Utah Valley Amateur Radio Emergency Service
Tues.	2100	146.72 MHz	Bridgerland Amateur Radio Club Net
Wed.	2000	146.88 MHz	SL County Amateur Radio Emergency Service
Wed.	2000	145.43 MHz	Utah Box Elder Thiokol Net
	&	145.20 MHz	
	&	448.43 MHz	
Wed.	2100	146.74 MHz	Mercury Amateur Radio Association, SL area
Wed.	2100	45.49 MHz	Mercury Amateur Radio Association, Ogden area
Wed.	2100	145.37 MHz	Mercury Amateur Radio Association, Provo area
Wed.	2100	50.125MHz	Weekly sixmeter net
Thu.	1900	147.04 MHz	Davis County Amateur Radio Club
Thu.	1900	147.12 MHz	Youth Amateur Radio Club

HF NETS

Daily	1230	7272 kHz	Beehive Utah Net (formal traffic handling)
Daily	0200Z	3937 kHz	Farm Net (Same UTC summer and winter)
Daily	1930	3708 kHz	Utah Code Net (formal traffic handling)
Sat.	1100	7272 kHz	Quarter Century Wireless Association (QCWA) ❑

Examination Schedule for October

10/03/98 (Sat.)

City: Salt Lake City

VEC: ARRL

Contact Person: Gordon Smith, K7HFV
632 University Street
Salt Lake City, Utah 84102

Home Ph: 582-2438 **Bus. Ph:** 532-3400 Ext. 8116

Sponsor: Utah Amateur Radio Club

Location: Blue Cross/Blue Shield Cafeteria, southwest entrance
2890 Cottonwood Parkway (6580 South)
Salt Lake City, Utah 84121

Directions: Exit eastern I-215 at 6200 South
Go east to 3000 East (first light after freeway interchange) Turn right (west) at Cottonwood Parkway (first light) Turn left into parking lot after road makes a curve to the north and then returns to original alignment.

Schedule: First Saturday of Feb., Apr., June, Aug., Oct. and Dec. 20 w.p.m.: 8:00 a.m. 13 w.p.m.: 8:30 a.m. 5 w.p.m.: 9:15 a.m .No code test needed: Any time between 8 and 10 a.m.

Notes: Preregistration is required. Preregistration speeds the session and gets licenses on the way faster after the session. It takes only a few minutes by phone or on the air. Gordon usually monitors 146.62.

10/21/98 (Wed.)

City: Provo

VEC: W5YI

Contact Persons: Steve, NV7V, and Susan Whitehead
497 South 700 East
Payson, Utah 84651
Home Ph: 465-3983 **Bus. Ph:** 225-5200

Location: J. Reuben Clark Law Building
Brigham Young University

Schedule: Third Wednesday evening of each month, 7 p.m.

10/27/98 (Tues.)

City: Salt Lake City

VEC: W5YI

Contact Person: Eugene McWherter, N7OVT
536 E. Leland Avenue
Salt Lake City, Utah 84115

Home Ph: 484-6355
Location: LDS Ward building at 304 East 2700 South

Schedule: Last Tuesday of each month except December, 7 p.m.

Notes: This session is intended primarily for those seeking Novice, Technician, or Technician-plus licenses. Only elements 1A, 2 and 3A will be administered. Pre-registration is required.

For more detail and other locations in Utah but outside of the Salt Lake, Davis, and Utah county area, checkout the information on our webpage http://www.xmission.com/~uarc .

Things to Bring To a Test Session

-Two forms of ID

-$6.35 --Cash or Check

-The original and a copy of your current license (if you are currently hold an amateur license)

-The originals and photocopies of any Certificates of Successful Completion (CSCE's) you may hold. (These are only necessary if they give you credit for elements beyond those required for your current license and are less than one year old.)

-A filled-out FCC form 610 (This is optional --forms will be available at the test session.)

-Pencils and pens.

-A calculator (Optional --but you must show that it is not pre-programmed.)

-You may use a typewriter or lap top computer only if you make arrangements in advance. ❑