



**Photo Coverage of  
Field Day 2008  
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**Technician Class  
“Boot Camp Weekend”**

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**The Greensboro Amateur Radio Association**

# Feed Line

*Providing Amateur Radio news for the Triad*



**Volume 17, No. 7**

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## *Feed Line Special Feature*

# Can't Get Enough Time? A History of WWV, WWVB

### Story and Photos

**by Thomas Ray, III CPBE, W2TRR**  
VP/Corporate Director of Engineering  
Buckley Broadcasting/WOR Radio NYC

*The following article appeared in Radio World newspaper and is reproduced with permission. Visit [radioworld.com](http://radioworld.com).*

### *Final of a two part series*

**FORT COLLINS, Colo.** — I told you last time about my visit to WWV and WWVB (RW, April 23). But how did those services come about?

The National Institute of Standards and Technology, known at the time as the National Bureau of Standards, has been involved with radio and radio frequency research since 1901. During World War I, NBS established its radio section, which worked with the military to develop radio techniques for defense and navigation.

The letters WWV have no specific meaning; the calls were assigned to the NBS in October of 1919. A station was established in May of 1920 in Washington,

operating with 50 Watts on a wavelength of approximately 500 meters (around 600 kHz).

Keep in mind that these broadcasts occurred at least six months before KDKA, arguably the first commercial radio station, went on the air on Nov. 2, 1920.

In December of 1920, WWV started assisting the Department of Agriculture by broadcasting market news and farm reports. These 500 word reports, broadcast daily on 750 kHz, were transmitted using a 2 kW spark transmitter and “telegraphic code.”

### Standards

It was decided in December of 1922 that the purpose of WWV would be to transmit standard frequency signals as an aid to other broadcasters.

At the time WWV went on the air as a frequency standards station, the national frequency standard was a wavemeter, and WWV's operating frequency was set by a wavemeter that was calibrated against the national standard wavemeter. Shortly before WWV commenced this operation, the quartz crystal oscillator was invented.

By 1927, a 50 kHz quartz crystal oscillator was located at WWV and used as the frequency standard. With the number of radio stations increasing quickly, WWV was welcome as the nation's frequency standard.

In January of 1931, the first broadcast of 5 MHz commenced from College Park, Md., with WWV operating on Tuesdays for two hours in the morning and two hours at night with 150 Watts. Within the year, the power of WWV was increased

to 1 kW.

By April of 1933, WWV was operating on 5 MHz with 30 kW, and by 1935, was also operating on 10 and 15 MHz with 20 kW.

In June of 1937, the tone A above middle C, or A-440 Hz, was added to the WWV transmissions, along with second pulses, standard time interval announcements, and ionosphere bulletins.

A fire destroyed WWV on Nov. 6, 1940, but it was possible to salvage the frequency equipment, and WWV returned to the air five days later from an adjacent building and 1 kW. An act of Congress in 1941 allocated \$230,000 to build a new WWV in Greenbelt, Md. It went on the air in January 1943 and remained in this location until 1966, when the operation was moved to the present location in Fort Collins, Colo.

In June of 1944, WWV was ordered to synchronize its frequency standards to those of the U.S. Naval Observatory. In 1945, WWV was transmitting time announcements in code every 5 minutes. Voice announcements of time started on WWV in 1950.

In 1960, WWV started experimenting with the transmission of time code, which became part of the normal broadcasts in 1961. The time code was known as the NASA-36 bit code, and is believed to be the first digital time code broadcast in the United States. This allowed the development of “self-setting” clocks. The current version of the time code was adopted and first broadcast on July 1, 1971.

**NEXT MEETING  
July 28**

**The next meeting of the Greensboro Amateur Radio Assoc. will be July 28, at the Golden Corral Steak House, 4404 Landview Dr, Greensboro, NC 27407, off Wendover Ave., near Sam's Club.**

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One of the three hallways in the 'transmitter horseshoe' at WWV. Each of the frequencies has a main and backup transmitter. Main transmitters are modified CCA transmitters, backups are Technical Materiel Corp. Each frequency is auto switched to its backup in the event of failure of the main.

## Colorado

The Fort Collins location of WWV went on the air Dec. 1, 1966 at 0000 UTC. WWV began broadcasting Greenwich Mean Time in 1967, changing to Coordinated Universal Time in 1974. The station broadcast the first "leap second" in history in June of 1972.

On Aug. 13, 1991, WWV stopped using the mechanical drum recorders that had been used for the time voice announcements and switched to digital storage devices.

WWVB, meanwhile, first went on the air

as KK2XEI in July 1956 in Boulder, Colo. The station transmit on 60 kHz using 40 Watts. The LF signal proved to be far more stable and reliable than the WWV HF signals, and WWVL, operating at 20 kHz, went on the air in 1960.

WWVB went on the air from its present Fort Collins location on July 5, 1963, with 5 kW. This was increased to 7 kW, then 13 kW, and in 1997, power was increased to 25 kW. WWVL, meanwhile, went off the air in July of 1972.

Time code was added to WWVB in 1965. This allowed the development of self setting clocks and watches tuned to 60 kHz.

On February 7, 1994, a heavy mist froze on the WWVB antenna. The control system could not compensate for the resultant change in antenna parameters, and the station was off the air for 30 hours. This prompted a redesign and modernization of the system. The station was rebuilt in stages, using LF transmitters and equipment that had recently been decommissioned at Navy sites.

Power on WWVB was increased to 25 kW in 1997, and to 50 kW in 1999 when the renovation work was complete.

This information is compiled from [tf.nist.gov/timefreq/general/pdf/1969.pdf](http://tf.nist.gov/timefreq/general/pdf/1969.pdf).



## THE GREENSBORO AMATEUR RADIO ASSOCIATION invites you to an open house .....

**Saturday, July 26, 2008, 1 - 5 PM**

**at  
Blanche Benjamin Branch Library  
Meeting Room, 1530 Benjamin Parkway  
Greensboro, NC 27408**

Whether you're a formerly or presently licensed amateur, or a complete newcomer to the hobby, this will be a chance for you to catch up on technology and what's going on in the Amateur Radio community.

# GARA Meeting Minutes



## Regular Meeting Minutes June 23, 2008

The monthly meeting of the Greensboro Amateur Radio Association was held on June 23, at the Golden Corral restaurant located at 4404 Landview Drive beside Cracker Barrel off Wendover avenue. The meeting was called to order at 7:15 PM. President Chris Thompson asked everyone to identify himself or herself.

Chris then asked the board members if there was any business to discuss: Roy Smith N4BYU spoke about the recent soccer tournament that GARA provided communications for and the upcoming field day to be held on June 28&29 at the Summerfield community center. Roy also thanked the volunteers who helped with the triathlon at Belews Lake. Roy also mentioned that he saw in the paper that C.W. Bovender had become a silent key. He had been a GARA member in the 1990s. If you know someone who is not active anymore, give him or her a call and say "Hi."

Vice President John Strandberg AJ4BT spoke about the open house that the GARA is going to sponsor which will be held about two weeks after field day at the Lewis Recreation Center.

Engineering chairman Bob Morris W0EG said that he had purchased a call director box to use at the repeater site so both repeaters can share one phone line. He also spoke about the VHF repeater having developed a problem at the end of the soccer tournament and this will be checked out as soon as possible. We are currently operating on our backup repeater.

Treasurer Ernie Wall NC4EW said finances are good and checkbook balanced. Al Allred K4ZKQ gave the financial report stating that everything is in line with the forecast.

Gerald Donnelly KD4EQZ made a motion to accept the minutes from the last meeting. The motion was seconded and passed. The minutes were approved as published.

Allen and Madeline Bradley arrived just in time to give the official soccer report.

The tournament went well with no errors on our part as usual. They thanked everyone who helped and presented an award GYSA had given to GARA. They answered questions and gave some history on our involvement with GYSA.

John Standberg introduced Jesse Lindley, N4BFD, who gave a great program on the Flexradio SDR 1000 he has been using.

Bob Mays made a motion to adjourn and Roy seconded. The meeting closed at 8:15 PM.

### On-line board discussion

There was not an actual board meeting held for June due to scheduling problems so the board members have been discussing several topics via e-mail.

From Ernie Wall, NC4EW, treasurer: All bills paid and deposits made. The equipment insurance has been renewed and is in force until June 1, 2009. The policy has a \$50 deductible with a limit of coverage of \$31,903.00. There is a terrorism rider included at no charge. As soon as it can be finalized we need to send in an updated list of our equipment. Roy Smith N4BYU asked if we should up the deductible to \$200.00 and possibly save some on the premium. Chris Thompson K4HC president replied: Once the inventory is fully completed, priced and submitted to the insurance company that would be the appropriate time to check into the deductible adjustment and see what it would do to the premium.

John Strandberg AJ4BT, vice president: In regard to the open house, The Lewis center is not available on 7/12/08. It is available on 7/19. The cost is \$58.00/hour. The postcard mailout is \$65.00 plus postage @ \$0.27 each for 1000 cards. Chris said "I move we authorize printing 1000 cards at a cost of \$65.00 and postage cost of \$270.00. in order to break even we would need to attract 14 new members". Chris also wrote: "I move we authorize John to reserve the room at the Lewis center for the proposed open house. I think that 4 hours would be appropriate with a total

cost of \$232.00." Everyone seems to agree that 7/19 from 2:00 – 6:00 PM would be good for the open house. Roy seconded.

Chris also wrote: I proposed holding a Technician training class shortly after the open house. I anticipate a full day on Saturday (8AM to 5PM) and a half day on Sunday (12 noon to 5PM) for instruction and testing.

We have tentatively scheduled it for August 2nd & 3rd at the EM training center. Confirmation is expected shortly, there will be no cost for the class except for the required purchase of the license manual and testing fee. Chris made a motion to purchase 20 Tech license books from ARRL at a cost of \$18.71 each which can be resold at the cover price of \$24.95 resulting in a profit for the club of \$124.80. Roy seconded

Repeater repair: For those who don't know or are not fully aware of what happened: Immediately after the end of the Soccer tournament the signal of the repeater dropped significantly, then returned to full power, and continued this cycle.

Roy and myself went to the site and swapped out repeater 2 and put repeater 1 back in operation. This restored normal operation to the system. Bob W0EG and myself went back to the site and did some testing with the result being very low power output from repeater 2 further inspection revealed a significantly scorched section on the power amplifier circuit board. Bob took the PA board home to make repairs.

After doing some online research Bob found that this is a common problem with the Master II series PA's, Bob's research also turned up a long term fix for the problem. Bob also located a used PA for about one third of the normal price which sounded like a good deal until it was determined to be an incompatible part for our use so it was not purchased.

### More board discussion after June monthly meeting

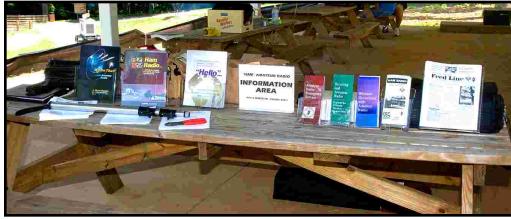
The Board of directors of GARA held a short meeting after the end of the regular monthly meeting on June 23rd to finish up

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# Field Day Highlights 2008

Photos by Tom Forrest, N4GVK



Information table



June 28 - 29, 2008







Photo by Steve Marks, KE4FCW

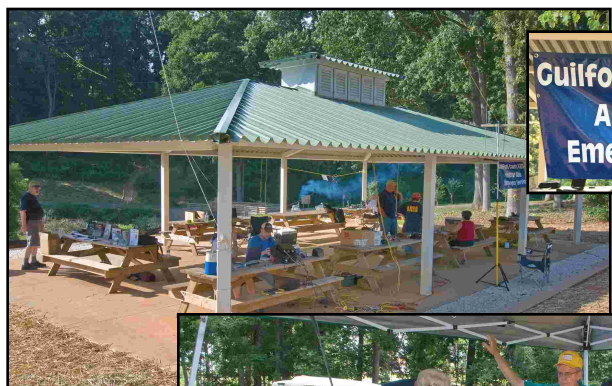
**Summerfield Mayor Mark Brown, right, gets a demonstration from Dave Collins, KE4IAF, center, and Bob Morris, W0EG.**



**The Moses Cone Critical Incident Support Unit (CISU)** is a communications vehicle that can be deployed independently or with the Moses Cone Surge Case. It can serve as a communications back-up to a hospital unit in case of maintenance projects or as a communications solution in case of internal information system disasters. Pictured is Mike Mansfield with the truck.



**State Medical Assistance Team on Display** - Each hospital trailer is 53-feet long and can be deployed within eight hours. Each hospital trailer can support 50-beds and can increase capacity to up to 400-beds if needed by connecting to other mobile field hospitals. Each hospital's staff consists of medical teams based out of one of North Carolina's eight Regional Advisory Committees which are made up of doctors, nurses, pharmacists and other allied healthcare professionals. Each team also includes subspecialty personnel in the areas of burns, cardiac, neonatal intensive care and obstetrics. Mary Beth Skarote and Jerry Tysinger of Wake Forest University Baptist Medical Center man the unit.



**Guilford County A.R.E.S. Amateur Radio Emergency Service**



**Summerfield Town Councilman Robert Williams, talks with John Doggett, AJ4DV, Guilford ARES Coordinator.**



## Sympathy

• It is with deep sadness we report the passing of **Bill Honeycutt, W4WRH**, July 17. Bill was known by many area hams and held an older call of WD4JVV. He is the father of **David Honeycutt, N4AXV**. Bill just recently lost of wife of many years, Maude Honeycutt, June 11.

• We also report the passing of the mother of **Judy Kellum, KC4SJE**. Judy was not able to drive and her mother brought her to VETesting every month from Madison, NC.

• **Glenn B. Tutterow, K4LCS**, 94, previously of 915 Lexington Avenue, died Thursday, July 10, 2008, at Well-Spring Retirement Community at Greensboro. Glenn was born August 19, 1913, in Davie County and moved to Greensboro at an early age, where he lived for the remainder of his entire life. Beginning at a young age, he worked at Mojud Hosiery for many years. He later worked in the printing industry for the Christian Advocate and then formed his own printing company, which he operated until his move to Well-Spring. He was an avid amateur radio operator for almost 50 years,

Prayers of comfort from the amateur community go out to the families who have lost loved ones.

## The Greensboro Amateur Radio Association

President Chris Thompson, K4HC  
Vice-President John Strandberg, AJ4BT  
Treasurer Ernie Wall, NC4EW  
Secretary Greg Spencer, KG4UQV  
Financial Al Allred, K4ZKQ  
Engineering Chairman Bob Morris W0EG  
Operations Roy Smith, N4BYU  
Member at Large Clark Doggett, KG4HOM  
Member at Large Dave Touvell, KN4ZO

Appointed Positions:  
News letter editor and Webmaster:  
Tom Forrest, N4GVK

"The Feed Line" is ©2008 by the Greensboro Amateur Radio Association and published monthly. Our address is P.O. Box 7054, Greensboro, NC 27417. The purpose of the newsletter is to provide the club and prospective members information about the club and amateur radio in general. Material and information should reach the editor by the first Friday of the month for the next edition of the newsletter. Opinions expressed in "The Feed Line" do not necessarily represent the views of the officers, directors, editor or members of the Greensboro Amateur Radio Association. Material may be reproduced, provided proper credit is given to GARA.



## Local Amateur News

• GARA member **Bert Goldman, KG4EPQ**, was recently awarded the state's highest civilian honor bestowed by the N.C. Governor, the Order of the Long Leaf Pine. Bert retired this year after more than four decades of teaching as an educational psychologist at the University of North Carolina-Greensboro. The honor is given to those who have served the state for 30 years or more. *Congratulations to Bert!*

• **Tom Hatley, KF4JZD**, is recovering after an auto accident recently. Tom received a broken upper jaw bone and underwent surgery to have fragments removed. We wish Tom a speedy recovery.

## Technican Class Boot Camp Weekend

• **The Greensboro Amateur Radio Association**, in cooperation with the Guilford County Office of Emergency Management, is sponsoring a Technician Class License Boot Camp Weekend.

**Where:** Large Training Room, Guilford County Emergency Services, 1002 Meadowood Dr, Greensboro, NC. 27409. This is behind the Rooms to Go store just off of Wendover Ave, near I-40

**When:** 8 am to 5 pm Saturday, August 9th and 12 pm to 5 pm Sunday, August 10th.

The weekend concludes with a testing session (fee of \$12,00 to test) upon successfully passing the test, you will be issued a Technician class Amateur Radio License from the FCC.

The class itself is free, and will be taught by experienced volunteer instructors

As there is a great deal of information to cover, it is strongly recommended that you obtain a copy of the ARRL Ham Radio

License Manual (\$24.95) ahead of time, and review all of the material prior to the class session. All of the information from the book will be covered, but at a very fast pace. Pre-study will greatly enhance your ability to successfully pass the Technician exam.

To obtain a copy of the license study guide, please contact:

**Chris Thompson, K4HC**  
**E-mail: [k4hc@triad.rr.com](mailto:k4hc@triad.rr.com)**  
**Phone: 336-402-2210**

The manual may be purchased using a check (Made out to GARA) or cash. Cash only is accepted for the test session.

### What to bring:

- Notepaper and pens/pencils
- Calculator (non-programmable strongly preferred)
- Two forms of ID, one with a picture (Driver License, Military ID, Birth Certificate, Passport, Work ID, School ID, Credit Card all accepted as forms of ID.) If you have questions about what can be used for ID, please contact Chris Thompson by E-mail or phone.
- \$12 cash for testing
- ARRL Ham Radio License Manual

## Olympic Games On NBC

The NBC television network will be using the 2008 Summer Olympic games as a research laboratory. This, to get a sense of how people are using different media platforms to experience the Beijing Games that begin August 8th.

NBC has scheduled 3,600 hours of Olympics programming on its main network, along with Telemundo, USA, Oxygen, MSNBC, CNBC and Bravo. That's the equivalent of eight days of programming packed into each day. In addition, the company is planning to make 2,200 hours of streaming video available on [NBCOlympics.com](http://NBCOlympics.com). Consumers may also get video on demand via their computer and Olympics content through their mobile phones.

NBC hopes its research provides a comprehensive picture of how people are supplementing TV viewership with tools such as video streaming, video on demand and mobile phones. (RW)

## A Note From GARA President Chris, K4HC ...

Recently, there was an incident on the GARA repeater where a station told a tasteless racial joke during afternoon drive time.

I don't know how many of you may have heard this, at least a few people have commented to me that this was overheard, and they were offended (as was I). I want everyone to be aware that this type of behavior will not be tolerated on the GARA repeaters. The offending station has been requested to refrain from such content in the future. Hopefully, this will lay this issue to rest without further intervention being required.

Please keep in mind that the GARA

repeaters are listened to by a wide audience, both licensed and unlicensed. It is important that we put forth a good face for GARA and Amateur Radio at all times. This does not mean that we can't have fun, or tell jokes, or complain about the other drivers on the road far from it. Please use the repeater system, and have a blast while doing so. Just speak as if you were addressing a large, diverse audience because you are. Save the tasteless or questionable for private conversations.

Some of you might observe that tasteless does not necessarily equate to illegal and might argue that this is a free speech issue. However, the FCC has

affirmed in numerous recent actions that repeater trustees and control operators have the right to impose conditions on the use of their repeaters. Whether a given transmission is legal or illegal is moot.

GARA enjoys having open repeaters, that are welcoming to all; and being a club that actively recruits new Amateur Radio operators (hopefully becoming GARA members in the process). Part of this involves maintaining a repeater system that hams from all walks of life will feel comfortable using. By and large, we all do a great job in providing that atmosphere. Let's keep that going.

*Chris Thompson, K4CH, GARA President*

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### Minutes from page 3

some business that we had been discussing through e-mail.

Chris said that the Boot camp training class for the technician license is confirmed. The class will be held at the EMS training center on Meadowview Drive behind Rooms to go on the weekend of August 9th & 10th

The board has agreed to purchase 20 copies of the Tech license manual's to be sold to class participants.

The issue of purchasing a backup power amplifier has been tabled for now. The open house was discussed and tentatively scheduled for July 19th Roy made a motion to have John book the Lewis recreation center for July 19th Bob seconded. Motion passed. (This event was later moved to the Benjamin Branch Library on July 26th due to availability issues)

John AJ4BT will draft a card to be printed and mailed out to inactive hams and prospective members. Which will include the information on the open house, boot camp weekend and license testing.

### July 14, 2008, Board Meeting

The meeting was hosted by Dave and Lisa Touvell and called to order by Chairman Chris Thompson. Those in

attendance were Chris Thompson, Chairman, board members Al Allred, Clark Doggett, Bob Morris, Roy Smith, Dave Touvell, and Ernie Wall, and attending member Jesse Lindley. Absent were board members Greg Spencer (ill) and John Strandberg (prior commitment).

Mr. Bob Morris informed the board due to a change in job status he would no longer be able to perform the duties of Engineering Chairman. The board took official action by passing a motion proposed by Chairman Thompson and seconded by Mr. Smith recognizing Mr. Morris for his service to the club in maintaining the VHF and UHF repeaters.

A motion was proposed by Mr. Smith and seconded by Mr. Allred to enter into a contract with a qualified individual or electronic service shop to perform alignment and preventative maintenance services on the club's repeaters in the Fall. The motion carried.

A motion was proposed by Chairman Thompson and seconded by Mr. Smith to recognize Mr. John Doggett, AJ4DV, with a plaque commemorating his years of service to the club as Net Control Station for the Sunday Night Net. The motion carried and Mr. Smith volunteered to procure the plaque with text provided by Chairman Thompson.

A motion was proposed by Chairman Thompson and seconded by Mr. Touvell

to form an investigative committee to study the feasibility of converting the club's UHF 442.875 MHz. repeater to a digital D Star operation. The motion carried and Chairman Thompson and Mr. Lindley volunteered for committee service. The committee formation will be announced at the next club meeting to enlist the aid of interested members to serve on the committee.

A general discussion was held on expanding the procedures club members are admitted to the club with no action being proposed or taken. The topic was tabled.

General discussion was undertaken concerning the upcoming GARA Open House July 26th at the Benjamin Branch Library. Specifics related to antennas, rigs, and displays were discussed.

Mr. Touvell volunteered to ascertain the interest in CW training and the formation of a CW net.

With no further business to be considered, Chairman Thompson adjourned the meeting and expressed the Board's thanks to the Touvell's for providing our meeting location.

Submitting in place of Board Secretary Spencer, Ernest Wall, NC4EW

# Area Activities

**FOURTH MONDAY** – at 6:30 PM, the Greensboro Amateur Radio Association have their regular monthly meeting at the Golden Corral, 4404 Landview Dr, Greensboro, NC 27407, off Wendover Ave, near Sam's Club. Please plan to gather at 6:30 PM for dinner. The meeting is scheduled to start at 7:15 PM

## CLUB NETS:

**SUNDAYS** – weekly at 9 PM, the **GARA News and Information Net**. This net features NewsLine and is on the 145.150, W4GSO repeater. Roy Smith, N4BYU is always looking for net controls. Contact him if you would like to help.

**THURSDAYS** – The **Guilford County ARES Net** meets on the 145.150 repeater (100 Hz. tone) at 9 PM.

**TUESDAYS** – at 8 PM, the **2 Meter SSB Net** meets on 144.225 Mhz. USB. Chris Thompson, K4HC is the net control station. (Not operational present time)

**WEDNESDAYS** – The **Guilford Amateur Society** holds their weekly net on the 145.250, W4GG repeater with an 88.5 Hz. tone. Jim Hightower, W4JLH is the net control.

**TUESDAYS** – at 8:30 PM **The Triad SkyWarn Net** meets on the 147.225, K4ITL repeater, no tone required.

## OTHER ACTIVITIES :

**FIRST MONDAY** – The **Guilford County A.R.E.S.** monthly meeting is held at 1002 Meadowood St. off W. Wendover Ave, in the EMS building, beginning at 7 PM.

**THIRD MONDAY** – at 6:30 PM **The Guilford Amateur Society** holds their monthly meeting at the Golden Corral, 4404 Landview Dr, Greensboro, NC 27407, off Wendover Ave. Refreshments at 6:30 PM and the business meeting begins at 7 PM.

**THURSDAY** – at 11:15 AM, Greensboro Hams get together for lunch. Thursday lunch group is meeting at the K&W Cafeteria, 300 Forum VI Mall at Friendly Shopping Center. Talk-in is on the 145. 150, W4GSO repeater with a 100 Hz. tone.

**EVERY FRIDAY** – at 8 PM (approximately) Greensboro Hams get together for coffee at Guilford College (summer location till Daylight Savings time changes)

• Hams at Hams every Friday afternoon, Cone Blvd. restaurant, at 5:30 - Talk-in on 145.150 repeater.

Greensboro Amateur Radio Association

P.O. Box 7054

Greensboro, NC 27417



Web:  
[www.w4gso.org](http://www.w4gso.org)

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