ARC OVER

The Official Newsletter of the Fox River Radio League
Since 1924

September 2013

Proud to be an ARRL
Special Services Club

What's Inside

(Editor: This article was sent to the ArcOver Newsletter e-mail address from Primex Wireless, Inc. I was going to dismiss it, however, I thought it might be interesting to those members who don't know much about Greenwich Mean Time.)

OVERVIEW

Since the days of the Industrial Revolution, American businesses have recognized the importance of accurate time.

Several new technologies emerged in the 20th century to help improve time-measurement techniques. Each is based on atomic time generation: both radio waves and global-positioning-system (GPS) satellites distribute precise atomic time to clocks and other timekeeping devices. This paper explores the similarities and differences between radio-controlled and GPS-based clocks.

GENERAL INTRODUCTION

Before about 1949, astronomical sightings determined absolute time. But because these sightings were not very accurate, scientists began to look for a universally repeatable method for standardizing time. The time standard for the United States is known as "Mean Solar Time." Our clocks use Mean Solar Time, which is a uniform measure averaged out over a year(365.243... days). The local Mean Solar Time on the Greenwich meridian is called "Greenwich Mean Time" (GMT).

People sometimes use the term "Greenwich Mean Time" to refer to Corrected Universal Time (UT1). UT1 is not actually a measure of time but rather a reference to the orientation angle of the earth. When we talk about time using space as its reference, it is important to realize that time is not predictable because of the slight wobble in the earth's axis, which is called "rotational precession." This imperfect rotation has led scientists and mathematicians to find a way to correlate these angles to time. Different places view time through different meridians. For example, Eastern Standard Time (EST) is the Mean Solar Time of the meridian at 75 degrees W.

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About the FRRL

The Fox River Radio League, Inc., is a general interest amateur radio club serving the central Fox River Valley area. Records indicate the club has been in existence since at least 1924, and has functioned continuously ever since. We are an ARRL Special Service Club, an Illinois not-for-profit corporation, and a 501(c)(3) tax exempt organization as specified in IRS Statutes. We sponsor training classes for new hams, license examination sessions, an annual hamfest, and participate in various public service events. If you have a specialized amateur radio interest, chances are you can share it with one or more of our club members.

The Fox River Radio League meets on the 2nd Tuesday of every month at St. Rita of Cascia Church in Aurora. The meeting begins at 7:30 PM and includes a business portion, social time and a program of interest.

All persons interested in amateur radio are invited to attend. Families are welcome.

Please welcome our new member to the club!

CALL	Name	License Class
WB0LAK	Patrick Lennon	General
N9JTW	Jeremy Williams	Technician
No Call	Justin Arb	Not Yet!
K9NRO	Jeremy Ramirez	General
KC9USB	Brian Stroub	General

ArcOver FRRL Newsletter

The ArcOver is published monthly by the Fox River Radio League, Inc. Articles and letters are always welcome. The normal deadline for material is the 25th day of each month for the next month's news letter. Articles can be sent by email to: arcover@frrl.org or via U.S.

Mail to: FRRL Newsletter PO Box 673 Batavia, IL 60510.

Contact the Editor for details and submission guidelines.

The opinions expressed in the ArcOver are strictly those of the authors and do not necessarily represent those of the FRRL, Inc. or its sponsors.

Fox River Radio League
Founded 1924

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P. O. Box 673
Batavia, Illinois 60510-0673

Email:
info@frrl.org

Web Site:
http://www.frrl.org

Annual dues are payable no later than the January Club Meeting each year. New members joining during the year will have their first year's dues prorated to the nearest yearly quarter.

Regular dues are $20.00 a year, Senior Citizen dues are $12.00. Family dues are $30.00. Members can help support the FRRL Repeaters by making an annual $10.00 donation.

Bill Erikson HF Challenge

By Dawn Williams, KC9LQS

HF Challenge Update for Mid-August

Challenge updates reflected increased on-air activity during the dog days of summer, compared with the previous month's report. Welcome to Debby WX9VOR who sent her first update, and to Joe NA9A who is back in the game as of last month.

Interesting catches for Larry K9ARZ last month included Laos, Sudan, Namibia, Libya, East Malaysia, Samoa, West Malaysia, Afghanistan, and Fernando de Naronha. Joe NA9A reported QSOs with Vatican City, Qatar and India. (Participants are welcome to mention their most coveted contacts when sending in the monthly update.)

Newcomers are invited to join the Challenge at any point throughout the year. For info on how to get started, or to ask questions or share comments, talk to Joe at the next club gathering, or send an email to challenge [at] frrl [dot] org.

Limited Class	States	Provinces	DX Countries	Total
Paul KC9UZV	48	7	26	81
Jim W9NJP	25	3	17	45
Paul KC9SEB	51	5	53	109
Warren K9IH	24	3	36	63

Operator Class	States	Provinces	DX Countries	Total
John W8ACI	17	3	31	51
Tobi K9TCD	25	4	50	79
Tom WB9CHY	7	1	55	63
Jack K9JE	46	8	127	181
Herb W9DTR	88	20	138	246
Dean KC9EOQ	31	3	55	89
Bill NF9D	21	0	11	32
Debby WX9VOR	21	1	0	22
QRO Class	States	Provinces	DX Countries	Total
Joe NA9A	51	7	301	359
Gary K9MMS	50	10	176	236
Dick AH6EZ	76	25	311	412
Larry K9ARZ	100	24	407	531

Ragchew Class	States/Provinces	DX	Total
Dick AH6EZ/W9	17	9	26
Jim W9NJP	17	1	18
John W8ACI	9	1	10
Paul KC9UZV	35	2	37
Herb W9DTR	36	3	39
Joe NA9A	7	8	15
Warren K9IH	19	5	24
Debby WX9VOR	7	0	7

The actual standard of time that scientists track and control is often called "Coordinated Universal Time" (UTC). UTC is a compromise between the highly stable atomic time and the irregular Earth rotation. A connection with UT1 is necessary to keep Earth rotational values accurate. That's why scientists depend on leap seconds—by adding or subtracting them from time to time, they maintain a link with UT1. It is important to note that UTC is not a physical realization but only a prediction based on time in a laboratory, and that differences between labs can vary by as much as 10 nanoseconds. There are many labs throughout the world that predict time for correlation purposes.

ATOMIC CLOCKS

Today, atomic clocks represent the standard for highly accurate timekeeping devices, and the term "atomic time" is commonly used to connote the most precise time available. But "time," in the case of atomic clocks, is actually developed from an atomic frequency standard. A "frequency standard" generally refers to anything that generates a periodic signal, and a "clock" is a device that displays a time interval relative to a period of oscillation. The time on an atomic clock at the U.S. Naval Observatory in Washington, D.C., determines the time we set on our clocks. The National Institute of Standards and Technology (NIST) also maintains atomic clocks that are calibrated to the U.S. Naval Observatory's clock.

Just as the Celsius temperature scale is calibrated to the freezing and boiling points of water at sea level, time is synchronized to the natural orbiting rhythms of electrons in such elements as cesium 133, hydrogen, or rubidium. When a specific frequency of microwaves bombards these electrons, their orbits resonate and release energy. The microwave frequency at which this occurs is divisible down to an exact second and becomes the time base for an atomic clock. Cesium, which resonates at a frequency of 9,192,631,770 Hz, is the most common type of atomic clock. Atomic clocks are extremely accurate. Some atomic clocks now claim to have an accuracy of plus or minus one second in 20 million years! An atomic clock must be calibrated to the standard at the U.S. Naval Observatory (or a NIST standard).

RADIO-CONTROLLED CLOCKS

Some clocks on the market that are labeled "atomic" really are not. Rather, they are synchronized by a radio signal to an atomic clock located at a NIST facility in Fort Collins, Colorado, and thus are more accurately described as "radio-controlled" clocks.

At the NIST facility in Colorado, the government operates a 23-kW transmitter at a low frequency of 60 kHz. This transmitter, licensed as station WWVB, continually broadcasts the time and date as a series of slow data pulses. At 60 kHz, the WWVB signal consists of mostly magnetic waves that, like an insect flittering on the surface of a pond, generate ripples in the earth's magnetic field. Through an array of long antennas at the NIST site, this time signal is broadcast throughout most of the North American continent. Transmitters similar to this are located in different areas of the world, such as London, England, where the British Broadcasting Company transmits at a different frequency of 198 kHz.

Although these low frequency waves do an adequate job of conforming to the terrain of the earth, the waves have a difficult time penetrating some metal structures, and they are sharply polarized. Being "polarized" means that invisible flux lines striate the magnetic field, similar to the grain in a piece of wood. These flux lines, which run perpendicular to the direction that the waves are traveling, can twist due to aberrations in the environment. One detriment of a polarized signal is that it requires the receiving antenna (located inside clocks or watches) to be oriented properly for best signal detection. This isn't a big problem for watches since the wearer moves about during the day, allowing the watch to be properly oriented often enough to receive the signal and update the time. Physical orientation becomes more of an issue with fixed wall clocks. Once they're mounted, these clocks don't move, so it is imperative that they be mounted in a position that allows the internal antenna to receive the WWVB signal.

The need to properly orient the clock imposes limitations on where the user can mount it, and these clocks must also be kept away from sources of low-frequency electrical or magnetic interference such as motors or computer screens.

GPS-BASED CLOCKS

The Global Positioning System consists of a network of 24 orbiting satellites, each with its own cesium or rubidium atomic clock on board. The purpose of this network of satellites is to facilitate an electronic means of determining the longitude and latitude coordinates of any place on Earth. This is possible through a technique called 3-D trilateration, which measures the distance to several satellites.

A certain distance from a satellite, in all directions, defines a sphere. If you can measure the distance to three satellites, you have defined three intersecting spheres. The intersection of two spheres is a circle and the intersection of three spheres is two points. A fourth intersecting sphere is required to define a single point. Ignoring altitude, the globe of the earth can be this fourth sphere. If four satellite signals are received, it's possible to calculate elevation as well.

We measure distance to a satellite by the time it takes a microwave signal to travel from a satellite to a specific point on Earth. Here is a brief analogy of how one can calculate distance by knowing the delay time. Let's say you work at a factory where they always blow the noon whistle just as the second hand on your watch passes 12. One day you are home from work and you hear the factory whistle in the distance just as the second hand on your watch is 10 seconds past noon. You can calculate the distance to the factory based on the knowledge that sound travels at 770 miles per hour (mph) and the sound arrived at your home 10 seconds late by your watch. A speed of 770 mph equals 0.214 miles per second, so calculations indicate the factory is 2.14 miles away. A GPS receiver works in a way similar to the above scenario, except that it calculates the distance to orbiting satellites by measuring the delay in the arrival of microwave signals it receives from the satellites. Microwave signals travel at nearly the speed of light. Atomic clocks on all the orbiting GPS satellites initiate a precisely simultaneous series of data transmissions. On Earth, the signals from three or four of these satellites arrive at a GPS receiver at slightly different times, depending on the distance the signal traveled from each satellite.

In the factory example above, if you didn't know exactly what time the whistle actually blew, you couldn't measure the delay to make the distance calculation. Likewise, a GPS receiver needs to know the exact time the signals left the satellites in order to measure the time delay of each satellite's signal. The GPS receiver must derive the exact time in order to calibrate its internal quartz clock to true atomic time. The information required to do this comes from the delayed signals being received from at least three satellites.

The synchronizing signals from GPS satellites experience time delays due to the long distances they travel as they come to Earth. However, the GPS receivers carry what is called a firmware "almanac," which enables them to determine the location of each satellite at any time, and thus calculate the actual distance to each satellite. This enables the GPS receiver to compensate for the known signal delay. It uses this correction data to reconstruct the actual time that is in the atomic clocks aboard the satellites. In other words, the GPS time signal is adjusted to correct for propagation delay. The GPS receiver adjusts its own clock until the signal arrival times make sense compared to position data reported by each satellite. Once the GPS receiver acquires signals from at least three satellites, its internal clock is set to near-perfect agreement with the atomic clocks aboard the satellites. The satellite clocks are calibrated to the time standard at the NIST and the U.S. Naval Observatory. It may take some time for three or more satellites to orbit into view of the GPS receiver. This is why it sometimes takes several minutes to extract the time from a GPS receiver. After the GPS receiver's clock is set, it can then determine the time delays and calculate the distance to each satellite.

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RADIO-CONTROLLED VS GPS TIME

As discussed earlier, the physical orientation of radio-controlled wall clocks and proximity to metal structures or sources of interference can affect reliability. Also, the distance of the receivers from the WWVB source can be thousands of miles away. This distance causes slight delays in the time registered on radio controlled clocks. The WWVB signal also weakens with distance from Fort Collins making signal reception more unreliable. Reception is also affected by weather and ground moisture conditions.

The Primex GPS Wireless Clock System overcomes most of the disadvantages of radio-controlled clocks. The system corrects signal propagation delays to yield exact time anywhere on Earth. The GPS receiver is not sensitive to orientation, other than that it needs a view of the sky. With the Primex Wireless system, the GPS signal is locally rebroadcast in a building at a 72.1- to 72.4 MHz frequency that is less prone to noise signals than the WWVB broadcast frequency of 60 kHz and more easily penetrates walls and metal structures. The GPS signal is also less affected by weather conditions, and the receiver can pick it up anywhere in the world.

Since the WWVB signal is amplitude-modulated (AM), it is susceptible to electrical noise, both man-made and weather related. This interference can mask synchronizations of WWVB clocks. Primex Wireless clocks are synchronized by an FM signal, which is less prone to interference. Furthermore, GPS clocks can receive synchronization six times a day, whereas most WWVB clocks only look for a signal four times a day. GPS clocks will be inherently more accurate just because they synchronize more often and won't drift as far.

Finally, during midday hours WWVB sky waves cannot be detected beyond 500 miles of Fort Collins, Colorado. Outside this radius WWVB clocks may only see three synchronizations per day compared to a GPS clock's six synchronizations.

CONCLUSION

While both methods provide accurate ways to derive time, radio-controlled clocks have more limitations due to their inherent design. These clocks may be acceptable for typical residential and consumer applications, but they are not a good fit in commercial buildings. The materials used in the construction of schools, hospitals, and office buildings often interfere with the radio transmission required to synchronize radio-controlled clocks. GPS-based systems, on the other hand, function well in commercial building applications. The locally broadcast time signal penetrates every type of construction material. The signal is not affected by weather conditions. Users can locate clocks virtually anywhere in a building. As long as they are in range of the local transmitter, they'll always be synchronized and perfectly accurate.

STUDY QUESTIONS OF THE MONTH

FROM THE TECHNICIAN POOL

Q: T1C07

What may result when correspondence from the FCC is returned as undeliverable because the grantee failed to provide the correct mailing address?

FROM THE GENERAL POOL

Q: G2B03

If propagation changes during your contact and you notice increasing interference from other activity on the same frequency, what should you do?

FROM THE EXTRA POOL

Q: E5C05

In polar coordinates, what is the impedance of a network consisting of a 400-ohm-reactance inductor in parallel with a 300-ohm resistor?

Editor's Note:

Due to a request from several members, the answers to the questions are now located on another page in the ArcOver. You will find it elsewhere in the issue.

President's Traffic

Harry Jones, K9DXA

I was recently given an opportunity to spend a few days in Michigan's Upper Peninsula, so I decided to operate one day at the top of Brockway Mountain in Copper Harbor (about 800 ft. above Lake Superior). Later I checked the Summits On The Air (SOTA) program and found that quite a few Michigan summits, including Brockway Mountain, had just been recognized by SOTA this past Aug. 1, 2013. So I checked out their activation rules and made plans. I was concerned there may not be a tall tree to launch an antenna wire, so I obtained a Buddistick. Good thing, I clamped it to a large sign and it loaded up nicely.

SOTA is to summits as IOTA is to islands. These programs are run by different organizations, and they both promote the activation and accumulation of both activations and working those entities.

I needed four QRP QSOs to qualify the activation, and I ended up with almost 50 QSOs in four hours, including Joe, NA9A and Bill, NF9D. Thanks to both of you for the Q's.

It was a lot of fun, a new experience, I even saw an ore boat passing by during the operation. Several tourists even stopped by the find out what I was doing. At one point I was explaining aspects of Amateur Radio to a small group of youngsters.

All you DXers should be signed up for the annual W9DXCC conference in Elk Grove later this month. There is an optional full day instructional class on DXing the day before the conference. If you are new to DXing and want to learn more, it is well worth taking the course.

This would be a good time to start making plans for the Illinois QSO Party in October. Check the rules. There are a number of ways to participate. It is something like an eight hour operating event on a Sunday. Work it at home, work it as a mini-Field Day, or work it as a mobile. The mobiles can position themselves on rare county lines to provide great multipliers.

Let's figure out how we can warm up the rig in the church basement this Fall. What do you say? As always, whatever your plans, make sure you get on the air!!!

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UPCOMING EVENTS

Board of Director's Meeting

Sept. 3, 2013 @7:30pm

St. Rita's Office Annex

Membership Meeting

Sept.10, 2013 @7:30pm

St. Rita's Church

Hamfests

CFMC Hamfest

Saturday Sept. 7th

Boone County Fairgrounds

8AM to 3PM

www.chicagofmclub.org/

Last Call for Registration!!

If you want to learn about DX, this is the place to be!

You do not need to be a member of W9DXCC to attend.

Make your reservation now!

The W9DXCC website, www.w9dxcc.com has been updated with all info currently known for W9DXCC 2013 - Sept 20-21.

Please take a look at:
- Program loaded with SMC: (K9CT for NH8S and 3D2C, WB9Z for a pre view of FT5ZM, and Eric K9GY/T6MO)
- SMC Reception on Friday evening
- Banquet speaker Nobel Prize winner Joe Taylor K1JT, of WSJT fame
- Class schedule for DX University Part 2
- Grand prize FT DX 3000 courtesy of Yaesu
- Registration for the convention and banquet
- Reserving a room at the Holiday Inn

The W9DXCC convention committee has announced it will offer a six session class on Friday, September 20th, 2013, to help inform all hams interested in DX'ing" about general topics of interest to the DX community. The class will be held the day before the W9DXCC convention and has been designed for both new and experienced DX'ers. Each session will cover a different aspect of DX'ing and features speakers NN1N, K9LA, K9AJ, K9EL, K9NU and W9MU. Please contact W9MU for additional details and information.

Technician Pool- B. Revocation of the station license or suspension of the operator license.

General Pool- C. As a common courtesy, move your contact to another frequency.

Extra Pool- A. 240 ohms at an angle of 36.9 degrees.

UPCOMING CONTESTS

September & October 2013

Date	Contest	Web Page
09/07/13	All Asian DX Contest, Phone	http://www.jarl.or.jp/English/4_Library/A-4-3_Contests/2013AA_rule.htm
09/07/13	QCWA Fall QSO Party	http://www.qcwa.org/2013qso-party.htm
09/08/13	North American Sprint, CW	http://www.ncjweb.com/sprintrules.php
09/14/13	ARRL September VHF Contest	http://www.arrl.org/september-vhf
09/14/13	Arkansas QSO Party	http://www.arkanhams.org/aqp2013rules.pdf
09/15/13	North American Sprint, SSB	http://www.ncjweb.com/sprintrules.php
09/16/13	Run for the Bacon QRP Contest	http://fpqrp.org/pigrun/
09/19/13	NAQCC Straight Key/Bug Sprint	http://naqcc.info/sprint201312mw.html
09/21/13	ARRL 10 GHz and Up Contest	http://www.arrl.org/10-ghz-up
09/21/13	South Carolina QSO Party	http://scqso.com/rules/
09/21/13	Washington State Salmon Run	http://www.wwdxc.org/images/stories/SalmonRun/2013rules.pdf
09/28/13	CQ Worldwide DX Contest, RTTY	http://www.cq-amateur-radio.com/cq_contests/
09/28/13	ARRL EME Contest	http://www.arrl.org/eme-contest
09/28/13	Texas QSO Party	http://www.txqp.net/

Date	Contest	Web Page
10/05/13	Oceania DX Contest, Phone	http://www.oceaniadxcontest.com/rules.pdf
10/05/13	California QSO Party	http://www.cqp.org/Rules.html

Kane County ARES News

Bill Muhr, NF9D Kane County ARES Emergency Coordinator

Kane County ARES (Amateur Radio Emergency Service), is a group of amateur radio operator volunteers who provide emergency communication for the communities of Kane County, IL and surrounding counties when called upon. All licensed amateurs are welcome to join.

We hold monthly meetings at 7 pm on the fourth Thursday of the month at the St. Charles EOC conference room at 112 North Riverside, St. Charles, IL. Our schedule at these meetings includes training on various aspects of emergency communications, weather spotting and reporting, and general amateur radio topics.

Anyone interested in joining Kane County ARES should contact Bill Muhr, NF9D, the ARES Emergency Coordinator for Kane County. He can be reached by email at nf9d@arrl.net.

ARES units are also active in other northern Illinois counties. You can find more information about ARES and public service opportunities on the ARRL website, arrl.org.

Kendall County ARES® is a part of the structure of the American Radio Relay League's emergency communications organization called the Amateur Radio Emergency Service®.

Kendall Co. ARES® members are trained in emergency communication and weather-spotting. We are an integral part of the SKYWARN weather spotting program of the National Weather Service. The Kendall Co. ARES® runs a local net and relays reportable information to the National Weather Service.

Kendall County ARES® Staff:

Emergency Coordinator: Dirk Wolgast, W9QA (w9qa@arrl.net)

Assistant Emergency Coordinator: Chris Kennell, KC9BKS (kc9bks@arrl.net)

NETS: Nets are held weekly at 8:00 PM on Wednesday nights on the Yorkville, IL ARES Repeater (complements of N9FNS). There are no NETS on meeting nights.
The frequency is 147.375 MHz FM, +60Khz with a 103.5 Hz PL.

MEETINGS: Kendall County ARES® meets monthly on the fourth Wednesday of each month at 7:30 PM. Meetings are held at the Panera Bread Cafe in Yorkville. The location is about one block South of Hwy 34 on Hwy 47 on the East side of Hwy 47.

Fox River Radio League
"Established 1924"
An ARRL Special Service Club
W9CEQ PO Box 673 Batavia, IL 60510

Minutes of the Regular Meeting of the General Membership of the
Fox River Radio League (FRRL) an Illinois not-for-profit Corporation
Held at St. Rita of Cascia, Aurora, IL

August 13, 2013

The meeting was called to order at 7:35 PM by Vice-President Dawn Williams KC9LQS

Question of the Month Have you gotten on the air in July? Results: 38 yes and 10 no

Reports:

Minutes: Approved as printed; Moved by Larry,K9ARZ, Second by Gerry, KB9QFP, Motion carried

Treasurer: Reported by Dean, KC9EOQ

Program: Dick, AH6EZ will talk about Off-center Fed Dipole Antennas.

ARES: Bill NF9D, Next meeting Thursday August 22 at St Charles Fire Dept.

Old Business:

NONE

New Business:

AH6EZ will be activating the Grosse Point Lighthouse at 2601 Sheridan Rd, Evanston
Cougars, many tickets available Ken W9WCX
General License Education Classes start Sept 28th at Rasmussen College
River Fest on the Fox
61st annual DXCC convention in Elk Grove Starts Sept 20, great speaker list
Status is not officially firm between the church and club

Announcements:

Monthly Raffle, see Chris KC9IEQ during the break
DX QSL Service- See Jack, K9JE
FRRL Club pins are available for $3 dollars each, see Larry, K9OKI
Worksheets for the second half of the HF Challenge are available from Joe, NA9A

Adjournment: 8:10PM Moved by Marty N9NTM, Seconded by Paul AC9BS

IMPORTANT AMATUER RADIO WEB PAGE LINKS

www.frrl.org

www.arrl.org

www.colpage.org

www.qrz.com

www.eham.net

www.twit.tv/hn

www.dxspots.com

FRRL Repeaters:

W9CEQ—147.210 MHz +600KHz Offset, 103.5 PL
W9CEQ—444.300 MHz +5 MHz Offset, 114.8 PL (IRLP Node # 4850) (Echolink # 230933)

FRRL Digital Voice/Data Repeaters: (Contact Kermit, W9XA for information)

W9CEQ__B D-Star—442.10625 MHz (+ 5.0 MHz offset)
W9CEQ__C D-Star—147.225 MHz (+ 0.6 MHz offset)

Other Local Area Repeaters:

Owned by Kane County OEM:

KC9OEM—145.470 MHz -600 KHz, 103.5 PL
(2 meter is primary Kane Co. SKYWARN/ARES Frequency)

KC9OEM—444.525 MHz +5 MHz, 114.8 PL

W9DWP—Kane Co. Amateur Public Svc. Repeaters:
(Both repeaters are dual mode APCO-25 NAC-293)

145.270 -600 KHz 107.2 PL
443.025 +5 MHz 114.8 PL

Input: 52.210 Output: 53.910 Carrier Access FM (W9XA 6-meter repeater)

W9ZGP—NIARC:
147.060 +600 KHz, 103.5 PL

Weekly Nets:

FRRL 2 Meter Net: Tuesday Evening at 7:30 pm

ARES & Skywarn Net: Wednesday Evening at 6:30 pm on the KC9OEM 2 meter repeater

Illinois DStar Net - Wednesday Eve. at 8:00 pm on the DStar 2 meter repeater

Ten Meter Net: Monday at 8:00pm 28.150 MHz CW
Monday at 8:30pm 28.720 MHz SSB