

Chirps & Clicks

July 2007

An ARRL Special Service Club

Since 1932

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Important Dates

- July 5th KARC Board meeting
- July 11th RACES meeting
- July 14th SMART Club Picnic
- July 19th KARC meeting
- August 2nd KARC Board meeting
- August 8th RACES meeting
- August 11th SMART Club Meeting
- August 16th KARC meeting
- **August 18th KARC 75th Anniversary Special Event Station**

Field Day Notes

NK8X

The 2007 Kalamazoo area Field Day was a success. This year the weather actually cooperated. We weren't flooded, scorched, frozen, or lounging in a sauna. The mosquitoes weren't even a major problem. W8VY, ran station class 8A, meaning 8 transmitters running at any one time. The VHF station doesn't count in the transmitter total. Our VHF station was alternating between 6 meters and 2 meters. The air was too dry to allow enhanced tropospheric propagation. The 80/40 meter HF bands were in decent shape. 20, 15 and 10 meters was a bit iffy. My suggestion of trying 11 meters if 15 was dead wasn't well received!

Below is a table of the bands operated and the station sponsor.

80 CW Jim W8MKR
 40 CW Jerb K8WPI
 75 SSB Jim K8EXF
 40 SSB Dave AB8DS
 20 SSB John W8SZV
 15 SSB WD8IDJ
 10 SSB W9ATU
 2/6 SSB KA8AOB
 PSK 31 KC8ZTJ

More than 30 hams operated W8VY stations over the weekend. K8EXF attempted to send the Section Manager a radiogram for bonus points. The HF net he used, refused to accept traffic. I guess they were too busy with more important things on Field Day weekend.

N8ZUV aeronautical mobile contacted us on the 147.00 repeater, before flying his aircraft over our site.

AB8DS reported working Bob W3IDT. Bob participated in our Field Day 2 years ago.

Eric N8ZSK, (a Kalamazoo area ham vacationing up north) was also contacted. The ARRL Field Day bulletin was copied by NK8X and WD8AXB.

KB8SFR took numerous digital photos for the website.

Jack KA8AOB installed the 50' military antenna mast.

Brian KC8FZY demonstrated APRS.

Jim WB8TNN demonstrated ATV.

Ron N8CML managed to send our radiogram via packet radio.

A solar panel was set up at the site, but I don't know of any QSO's that were made using solar power. Jim K8SIW operated W8MKR's station for a few hours Saturday night, and made an awesome number of contacts. Jena Keesler ran the feeding operation. Everyone enjoyed the food.

One of the keys to a successful Field Day is an effective antenna. I was quite pleased with the quality and installed height of the antennas. Antennas included

dipoles, zepps, loops and beams. I didn't see any HF verticals this year.

Tons (literally) of equipment were brought to the site and installed. In fact, the teardown took about 10 hours.

Here is a list of the physical equipment.

2 Zumro Decon/Triage inflatable tents from Bronson Hospital
 1 Mass casualty



Jim, W8MKR at his 80 meter station

1 triage trailer
 1 KCSO OEM Mobile Command Post
 1 AVCOM Communications trailer HAM
 1 Mini Command post HAM
 1 5X8 equipment trailer HAM
 2 Large equipment trailers
 1 Refrigeration trailer
 1 Motor Home
 1 50' military mast antenna support
 1 30' Ladder antenna support
 1 John Deere Gator from Bronson Hospital
 Several generators ranging from 20KW down to 2KW
 Several tents and screen rooms

A good time was had by all. Plans have already begun for FD-2008
 Pictures of this years event can be found at <http://pictures.kb8sfr.net/>

K8TDJ — sk

CyberHam

Our community lost a valued member and an exemplary ham with the recent passing of Jim Walker, K8TDJ, aka JW. Jim was an avid DX'er, earning five band DXCC using only wire antennas and never more than 100 Watts, he was very close to current 370 entity collection, and held a code proficiency endorsement at 30 WPM. Jim's gentle approach in dealing with people was often heard while offering assistance to new hams on the "Double O", or while inspiring older hams on the same venue; his wealth of knowledge gained from reading everything printed and having a photographic memory was somewhat of a trademark.



Jim, K8TDJ

During the early '90s, Jim was a leading force in the KARC Disaster Communication Project, which gave the community the WWF-34 NOAA transmitter and our AVCOM communication vehicle. As a fund raiser for charitable agencies and political parties, he knew how to ask for money, and equally as important, whom to ask. His political and legal savvy gained from working as an aide with the State Attorney General's office, holding a County Commissioner seat, and as President of the Kalamazoo County Board of Realtors was put to good use, especially for us in the KARC. Jim is sorely missed for his insight, inspiration, accomplishments and for many of us, as a friend.

[Here is a site with free software for PSK31, CAT control for transceivers, and mapping.](http://hrd.ham-radio.ch/)

<http://hrd.ham-radio.ch/>

[Another Morse code translator.](http://morsecode.scphillips.com/jtranslator.html)

<http://morsecode.scphillips.com/jtranslator.html>

[This site calls itself a packet radio training course.](http://www.rain.org/~jkrigbam/packet.htm)

www.rain.org/~jkrigbam/packet.htm

[Here's a web controlled shortwave radio.](http://www.chilton.com/scripts/radio/R8-receiver)

www.chilton.com/scripts/radio/R8-receiver

[And with hopes of ten meters returning to it's glory we have 10-10 International.](http://www.ten-ten.org)

www.ten-ten.org

July

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1 UHF Net	2	3 SMART Club Net	4 LOSTeam	5 KARC Board Meeting	6	7
8 UHF Net	9	10 SMART Club Net	11 RACES Mtg. 5th District Hospital Net	12	13	14 SMART Club Meeting
15 UHF Net	16	17 SMART Club Net	18 LOSTeam	19 KARC Meeting	20	21
22 UHF Net	23	24 SMART Club Net	25 LOSTeam	26	27	28
29 UHF Net	30	31 SMART Club Net				

Club Information On-Line — KB8SFR

One of the problems with publishing information on the internet is that it is sometimes difficult to know if your work is worth the effort. Are people *really* reading any of the newsletters, minutes, listings of repeater commands, or does anyone via the internet really care who the board members are? In a word, yes!

Thanks to Jay Pike, AA8SS we now have a great new tool for tracking the traffic to our web-site. It gives us the exact figures for visitors by domain, IP address, time, day, what pages are being requested, and so much more information about our guests that I'm still plowing through it. Just a few of the nuggets that I thought were interesting were:

There were about 2000 visitors to our club site last year, and this year we've already had over 8000!

The March issue of Chirps & Clicks had 533 distinct visits.

The April issue had 657 hits.

The minutes of our meetings have already had 586 people interested enough in what we do to go and seek them out on the internet.

One other thing to realize about our internet presence is that almost every one of our new members over the last few years has made their initial contact to us through the net. Whether the SMART Club, the KARC, RACES, or LOSTeam, people are finding us on the internet and we need to provide as much information to them as we can. It is sometimes difficult to keep current and complete material available for internet users, but by using these new statistics we can see how important it is to us.

Although this information is usually password protected, we are making it available to club members for a short time for illustration purposes. If you go to www.w8vy.net/stats.html you can get all of the raw data to go through for yourself.

Public Service Events



KalTour Bicycle Ride July 22nd

Duathlon at Prarieview Park

Labor Day



August

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1 LOSTeam 5th District Hospital Net	2 KARC Board Meeting	3	4
5 UHF Net	6	7 SMART Club Net	8 RACES Mtg.	9	10	11 SMART Club Meeting
12 UHF Net	13	14 SMART Club Net	15 LOSTeam	16 KARC Meeting	17	18 KARC 75th Anniversary Special Event Station
19 UHF Net	20	21 SMART Club Net	22 LOSTeam	23	24	25
26 UHF Net	27	28 SMART Club Net	29 LOSTeam	30	31	

We're #1, We're #1, we're # 1..... KB8SFR



Ron, N8CML manning the Kalamazoo EOC station during the 2005 SET

The annual Simulated Emergency Test was held once again last October with the results being published in the July QST. This exercise gives amateur radio operators the opportunity to establish communications networks between served agencies such as hospitals, fire departments, police agencies, Emergency Operations Centers, and Red Cross Chapters for example. And since about 2002 we have coordinated with other counties in southwest Michigan to test our abilities to pass messages and data to a wider area for potential mutual aid requests.

Some of the scoring is based on the number of operators participating, with a bonus for those licensed after 1/1/2002, the number of served agencies that communications was provided for, using emergency power for individual stations, using emergency powered repeaters, the use of digital modes, and a number of other categories that points are awarded.

Like in 2004 and 2005 Michigan was the top scoring state in the US, and like in 2004 and 2005 Kalamazoo County was the top county in the state, almost doubling second place which has a population of almost four times ours. But what was different in 2006 was that Kalamazoo County had the number one score in the entire country. Not only did our county alone beat out many of the states, it even beat out the entire Midwest Division which includes Iowa, Kansas, Missouri, and Nebraska!

Other counties in the area also have a lot to be proud of. Calhoun County was fourth in Michigan, with Allegan County placing fifth, Barry County Sixth, and Cass County placing eleventh. By pre-planning our exercises with these programs we were able to maximize our scoring by increasing the number of operators that participated, the number of agencies that were staffed, and the number of messages that were passed.

If you've never taken part in one of these worthwhile events, I would like to take this opportunity to invite you to join us on October 6th, 2007 for the next S.E.T. There are a number of levels in which you can participate, from going to and operating from a served agency, staying at home and making contact with the various other counties to be counted in their score, or even getting on a traffic net to pass messages on a statewide or national level. If you don't feel that you have enough experience to contribute to our effort, we have an entire summer of RACES meetings where training is available and the rest of the LOSTeam season to get some practical experience setting up your portable station.

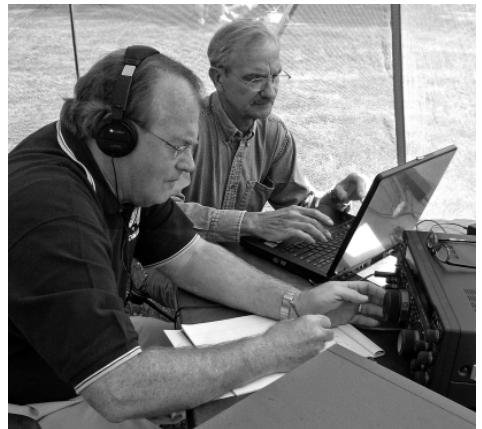
Since we had 47 participants in the 2006 exercise, let's make it one of our goals to have 50 people involved in our effort this year. So let's get each other excited about it, take no prisoners, and have fun!

Another Take On Field Day K8WPI

Field Day '07 was a great event for the KARC. Of course the weather could not have been better even though the bands were far from even being "good". Nine stations with a good array of antennas and equipment led to a festive atmosphere. It was absolutely delightful to meet the few visitors which came out to see us, but some hams who made an effort to visit after many years of being away was very satisfying. More time was spent talking with visitors this year than I can remember in any other year.

Personally, it was a bit rough not having "boy wonder" working with me, but with a paper and pencil and for most hours, 25 Watts of Morse to a Zeppette, seemed to be all I could hope for. The 40M CW total is about half of normal, but easily explained with justification. I very much enjoyed the slower pace and the time to just wander around the site visiting with other stations. Thanks to those who helped me with my station and antenna installation and removal, and the well wishers and hecklers who stopped by my tent.

Also, thanks the entire crew for the preparation work, food service, coordination and tear down for the club, it was a big project. So much fun, let's do it again next year....JeRB



Jim WB8TNN and JeRB K8WPI working some CW on Sunday afternoon.

Getting Started in Geocaching

Although not directly related to amateur radio, I do hear a lot of discussion on the air about Geocaching from all of the hams that participate in it. If you're not familiar with it, you may wonder what the heck they are talking about. Simply put, Geocaching is high-tech treasure hunting!

The Geocaching hobby started early in 2000 after the federal government allowed GPS units to receive the full capability of the 24 satellites. This instantly improved the GPS units accuracy by 10 times. Soon creative enthusiasts were coming up with new ways to use the devices and Geocaching was born.



Charlie KB8SFR & John KB8UWA after a successful find

You can get started by visiting www.geocaching.com/ and entering either the state, or zip code of your starting point. If you enter the zip code you can get a listing starting with the nearest ones to you. This will give you an idea of what treasures are out there, but for more detailed information you will need to establish a free account that tracks your adventures. Once you have selected the cache of your interest, you can either download a file to your GPS directly, or simply enter the latitude and longitude as a waypoint. With that waypoint as your destination the hunt begins and you follow the GPS instructions to the hoard. They are usually hidden in public places like park or hiking trails. The simple ones have a single point objective, but my favorites are called multi-caches that leave clues at each point, and usually have three or four stops before the final destination. The cache usually consists of an old ammo box containing anything from playing cards, Lego kits, CD's, or other inexpensive items that someone might consider a treasure. The tradition is to leave as much as you take. Included in the box is a log for you to fill out with details of your trip and other highlights of the find. Once home, you go back on-line and fill out the electronic version of your log and the find is tracked under your account and published on the caches web page.

If you have A GPS unit and would like to get a little more use out of it, I think you would really get a kick out of the adventure and feeling of an old fashioned scavenger hunt that Geocaching brings. It's a great way to get out on the trails with your whole family, and take the dog too!

Charlie — KB8SFR

Transmission Line Program for Windows

A review of software in the KARC Library.

"TLW" is one of the free-to-KARC members computer programs on the CD-ROM with the 20th Edition *ARRL Antenna Book*. It answers all kinds of common transmission line related questions such as RF line loss and "What is the impedance at one end if you know (or guess) the impedance or SWR at the other end?"

This computer program had an excellent review in the February 2007 *QST*, page 63. Please see that for details that I'll not repeat here.

A drop-down list of common transmission lines includes 32 common coax and parallel lines, including RG6, several RG8, RG8X, RG11, RG58, RG59, RG62, RG142, RG174, RG213, 1/2, 7/8 and 1 1/4 hardlines and 3 kinds of "ladder line". You can even define your own exotic line if desired.

The program is a "fill in the blanks" chart for things like cable type, length (feet, meters or wavelength), frequency and the impedance or SWR at either end.

After you've supplied the information, the program will calculate what it can—items like impedance and SWR at the unknown end, total line loss in dB, etc. The program will also calculate values for four different tuner network types (High-Pass L, Low-Pass L, Low-Pass Pi and High-Pass Tee)---then draw the selected one!

Questions such as "How much loss does 100 feet of RG8X have on 2 Meters?" are easily answered by this program---3.0 dB, or 50% power. Then---same situation but the antenna SWR is 3:1? Answer---an additional 0.974 dB loss due to the SWR, or a total loss of almost 4 dB. Further, the SWR at the line input (transmitter end) is only 1.67 : 1.

How about same conditions but using that thin RG-174 coax (about 1/16 inch diameter) that is in study guides (but almost never used!)? Answer---at the transmitter end the SWR is only 1.06 for a SWR of 3 at the antenna, but the total loss is now almost 14 dB!

This program is very useful for telling what is really happening at the antenna end if you can measure the transmitter-end impedance (or SWR) with an antenna analyzer---and you know the length and type of transmission line.

Try it---you'll like it! And again, it is free to KARC members via the KARC library!

Oh--- need a brush-up on dBs? Don't miss "Making Sense of Decibels" in the April 2007 *QST*, page 61. This includes how to use the Windows Scientific Calculator that is already on most Windows PCs!

Note: The ARRL web site, members only section has an "Errata and Addenda" for this Antenna Book that includes a ZIP file (TLW3B.ZIP) which corrects some minor bugs and updates TLW to ver. 2.03. Let me know if you can't find that ZIP file!

Jim—K8EXF

And that was the end of that!

JeRB K8WPI

The KARC at 75 Part 5

Oldbugger@earthlink.net

Although there are occasional reports of high frequency activity from Prospect Hill, the affinity this group had for the shorter wavelengths has been made very obvious. Of course, VHF was an experimenter's heaven. The 30's saw tremendous changes in every aspect of radio, and the swelling number of stations who were actually making great contacts on the HF bands were proof. It had been less than ten years since country prefixes were developed for each nation, as having hams in different countries using the same call just wouldn't do anymore. New equipment offerings with new technologies, either ready-made or for home brewing, could easily entice nearly anyone to the HF spectrum. On the other hand, if you wanted a challenge, a real challenge, and were more interested in learning the science than just using it, VHF was the place to be. Just to be accurate, I will continue to use the term VHF, as that is what we call it today; however, at the time, it was considered UHF and encompassed all frequencies above 29 MHz, which of course at the time, was 29 Mcs. OK?

Effective January 1, 1939, new regulations became effective for the VHF crowd, as had been done earlier for HF operation. Items agreed upon internationally at the Cairo Conference in Egypt, settled some discrepancies between nations. For the HF crowd, traditional American Morse was dropped in favor of the International Morse code. The period and comma we know today were new to U.S amateurs. For the VHF gang, you would have to know your rig was operating within designated segments of amateur bands. Keying and modulation were specified for quality and radiation of spurious emissions had to be controlled; in all, it was a new ball game. There was still no proof that VHF signals could travel very far, or even be useful, but still the regulations had to be met. At the same time, a group of VHF interested amateurs were doing everything they could think of to determine the usefulness of VHF. Reviewing ARRL Handbooks for this decade indicates little for the VHF enthusiast. There is a VHF section in late 30's ARRL Handbooks, but it is given only ten pages. I believe the Kalamazoo gang could have offered a few pages unknown to the League. Also new on the radio horizon were directional antennas. It must have been a frenzy, as the evolution of HF directional-gain antennas was immediately redirected to VHF. It seems the one thing known about VHF was, if you want long distance point-to-point communication, don't waste your signal with an omni antenna.

Locally, W8CVQ was on the bandwagon for development of reliable communication using VHF. The magazine RADIO, which was published by Radio Engineers, also publishing the "other" handbook, the Radio Handbook, offered a VHF section in every issue, which was typically ten pages, or as much as the ARRL Handbook would contain for a full year. W8CVQ appears in each 1939 issue. There was interest in establishing a long range VHF message/traffic route. The concept would be a number of fairly long hops to connect the

Chicago area to the New York area. The Elgin, Illinois to Detroit circuit was quite reliable, with each leg at about 135 miles, Kalamazoo being in the center. This W9CLH-Elgin, W8CVQ, to either W8DMA-Ann Arbor or W8QDV-Detroit path seemed to be nailed. There were admitted problems getting through the mountains of Pennsylvania. It seems there was not sufficient density of hams along the southern New York state route, so a longer path through metropolitan areas of Pennsylvania was needed.

As was common for the day, whether on HF or VHF, transmitters were crystal controlled, but your receiver was tunable. If you called CQ, you would tune around looking for a station who may have heard you, but his transmit frequency may be a few KHz away. If you heard someone calling CQ, you would respond on the closest frequency you had available, and you would probably be found. It seems almost by plan, the VHF gang working to perfect a long distance circuit was operating on individual frequencies. If you heard a signal too weak to recover modulation, you could determine who it was likely to be, by the frequency. Later confirmation by mail or an eventual contact could confirm or deny your suspicions. If you aren't aware, until abandoned by the FCC in the 1990's, all amateur transmissions were required to be logged and kept for at least one year. Signal reports of various stations, band conditions, openings, sunspot activity and conversations were sent to RADIO magazine for monthly publication. Equipment upgrades and experiments, as well as antenna evolution were reported, sometimes in lengthy detail. One thing which caught my attention was the frequency of comments regarding signal level being too low to recover modulation, but if they were using CW, it would be solid copy. Were these hams trying to prove a narrow minded point for whatever reason? Were these people dedicated to the point they had no flexibility? Does our current philosophy that VHF is in general, a voice only habitat stem from our roots?

Early in 1940, the KARC participated in the "Second Annual Hobby Show"¹ which was held at the Masonic Temple on North Rose street for a Thursday through Saturday event. Sponsored by the Kalamazoo Chamber of Commerce, 25 different types of exhibits were displayed, and the previous year's attendance of nearly 3000 was expected to be exceeded. Ed VanPeenan and Paul Krielick were in charge of the KARC operation, which included a behemoth transmitter and a National NC-80 receiver schlepped to the second floor. This was a great show-and-tell for the KARC, and messages were sent for the general public, demonstrating the value of our hobby.

Although Field Day had been around for a few years, the first record of KARC participation was June 7, 1941. The event, which seems to have been held at Seth Lover's property on what is now 9Th, street, was manned by 15 KARC members. Five stations were set up using generator power

for CW on 160, 80, 40 and 20 meters with a second 80 meter station on phone. On-site recap suggested about 400 contacts, but that included dupes and the club would be pleased if the actual count was 250. This seemed to be a good follow-up exercise following a Simulated Emergency Test in cooperation with the Red Cross in May. Although we received front page coverage including a photo in the Sunday, June 8, 1941 Kalamazoo Gazette, the future of the world, and our hobby is reflected not only in the headline, but in stories strewn around the front page. Exactly six months later, December 7, 1941, all amateur radio operation would cease until the end of WW-II.

While all amateur radio operations were on a four year hiatus, there was still activity in the hobby, which may be worth taking a look at, especially in retrospect. With no operating activity, the publishers of the industry were facing a loss of income. The war effort redirected manufacturing and even raw materials to the point where there was little to talk about, and with such a large percentage of the population headed off to war, the audience was further reduced. Although the discussion here is of a radio hobby, traditional communications means in the late 30's and early 40's were not like we know today. There was no internet, a long distance phone call meant someone had died, and telegrams were for the wealthy; the general public did not expect instantaneous communication. To some extent, the great distance between California and the eastern states seems to be reflected in publications of the day. Of course, it could be said that the west coast was more liberal and open to new ideas than the conservative easterners, but I believe there was a genuine lack of communication which would take time to equalize, although I would never refute the liberal versus conservative statement either.

By the time Pearl Harbor was attacked, both Editors and Engineers, and the ARRL had already printed their 1942 Handbook. It is with more than just curiosity I mention the League offers 15 pages on VHF receivers and 25 pages on VHF transmitters and transceivers (new term), all but one being AM, while the Radio Handbook provides 52 pages on the same topics, with FM units running all the way to 400 MHz. As for VHF antennas, the ARRL presents two pages, which in total contains a J-pole, a corner reflector and a vertical dipole. The Radio Handbook presents five pages, which includes the corner reflector and a vertical, but then continues with two gain type antennas, a direction finding antenna, and a mobile antenna.

With the exception of the '8JK which was recently developed, most gain type HF antennas were scaled down short-wave broadcast type antennas. You have heard the term Sterba curtain, and there was the Bruce array, the H and others. A very new (at least to the United States) antenna at the time was called the close spaced rotary. Although this antenna appears in the first edition-1939 ARRL Antenna Handbook, it is barely mentioned in the 1942 ARRL Handbook, with merely a technical description and single line drawing. This marvelous antenna anchors page 4 of the E&E Handbook in a full page photo and is well described in the antenna section with still another photo of a different array. The Chamberlain-Bassett Hand Book³ for 1939, which admittedly is a manufacturer's publication and a very

nice one, carries a two page spread showcasing the first confirmed contact between the USA and Lasha. W9HLF of Pe-kin, Ill received the QSL from AC4YN, a Political Mission To Lhasa..."located in the mysterious land of Tibet in central Asia and high in the Himalaya Mountains." W9HLF was using of course, a close spaced rotary from Basset, who was also selling "concentric line," coaxial cable. The 1939 issues of Radio each contain either ads or articles on this new antenna design, with seemingly a complete understanding of what this design will mean to the future of communication. The 1940 Montgomery Ward Radio catalogue, in a bit of typical-for-the-day advertising hype, spreads a USA map across pages one and two. With spike highlights indicating various major cities across the nation, a tower holding one of these very obvious antennas is planted at Chicago, home of Montgomery Ward, beaming brilliance in a narrow wedge pattern across the entire country to California. Ward's offered the Mims Signal Squirter on page 10 at between \$110 and \$159 depending on model. Everyone had this antenna, except the League. It took many years, especially considering the psychological impact of Pearl Harbor, before the U.S. dropped the "working title" of the close spaced rotary and used its proper name, the Yagi. It was 29 years after being developed and patented in Japan by Hidetsugu Yagi,⁴ that the League first published the name Yagi in the Handbook index, in 1955. Today of course, the Yagi is the pre-eminent directional gain antenna for 10MHz through 800 MHz,

During the first year of the war, there was tremendous need for additional radio operators and anyone who had a clue about radio communication for service and installation work. Basic knowledge of not only operating practices including Morse was needed, but technical understanding of how radios worked was in high demand. To this end, the League published a Special Defense Edition, Radio Amateur's Handbook: A Manual for Radio Training Courses. This was a significant contribution to the war effort and offered sound information with excess technical errata removed. The format was very similar to a traditional ARRL Handbook, however, extremely condensed. This special edition, with a very stoic solid red cover, totaled only 288 pages including index.

As a groundswell of patriotism swept the country, so did shortages, allocations and rationing. The war affected without exception, everyone's life, and the publications and advertisers jumped on the bandwagon. There was no amateur market, but with production and facilities being redirected to the war effort, it really didn't matter. Out of sight is out of mind, and advertising space had already been purchased, so the manufacturers spent their magazine/book advertising space touting their support of the war and their workforce, and our communication supremacy over our foes.

To be continued next month.

1 Kalamazoo Gazette, specific date not available

2 Kalamazoo Gazette, June 8, 1941

3 The Bassett Hand Book of Rotary Beam Design for 1939, Chamberlin Bassett Research Corp. Niles, Mi.

4 IEC History IEC Techline

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www.W8VY.net

**75th Anniversary
Special Event Station**

August 18th

Western Michigan University East Campus

“It’s a very big deal”