

FEEDBACK

MARCH 2015

Part 2 of 2 parts -- **Herb Fiddick, NZØF**

Remote HF Operation for WW1USA



In the January issue of *Feedback* we discussed the theory of remote operation of multiple HF rigs from a single location for the WW1USA special event on December 27-28, 2014. I promised a follow-up article to report on how well the theories related to reality. Having misplaced the article for a month, I

can now also report on the February 7-8 WW1USA event.

The good news is that remote operation works—the event resulted in 800+ contacts in December and 1200+ contacts in February. Neither event set a record for a WW1USA event, but the February event came

very close to the record-setting performance of JCRAC from September 2014. The contact counts for both events are typical of the variance we've seen in other similar events, so there's proof there that the technology was not an impediment.

The Theory

To review, our initial approach to the remote operation intended to use two different technologies for remote operation.

The first was to use the Icom RS-BA1 remote operation software with the two Icom IC-7600 rigs donated for the use of WW1USA in 2014 by Icom as well as an Icom IC-7200 owned by Joe WØPWJ. The RS-BA1 works with any Icom rig that has a CI-V connection.

The RS-BA1 is a software solution and the remote site needs only a computer. That can be a benefit, as the remote setup is fairly simple. However, the resulting operation doesn't look much like ham radio – no wires, no knobs. Depending on the Icom rig you're using, a direct USB connection to your shack computer may be all that is needed to pass both CI-V commands to and from the radio as well as transmit and receive audio. The RS-BA1 software manages the connection to the computer and allows input and output of audio to/from whatever you want to hook up to your remote PC.

see WW1USA on page 12

MARCH MEETINGS

March 13 – *The Lost Art of Modifying Radios-- Dennis Baker, KEØQM*

March 27 – TBA

The Johnson County Radio Amateurs Club normally meets on the 2nd and 4th Fridays of each month at 7:30 PM at the Overland Park Christian Church (north entrance), 7600 West 75th Street (75th and Conser), west of the Fire Station.

Much of the membership travels to the Pizza Shoppe at 8915 Santa Fe Drive for pizza buffet and an informal continuation/criticism/clarification of the topics raised at the meeting ... or anything else.

Leave the church, turn right (west) on 75th. Turn left (south) on Antioch. Turn right (west) on Santa Fe. Pizza Shoppe is just past the Sonic on your left.

IN THIS ISSUE

- 1 - Remote HF Operation of WW1USA (2) - Herb Fiddick, NZØF
- 2 - President's Corner
Editorial Notes
- 3 - Local Meetings and FM Nets
- 4 - February Meeting Minutes
- 6- Hambone Transformed - Jaimie Charlton, ADØAB
- 7 - A TCXO-Based Frequency Reference for Kenwood Transceivers -- Tom Wheeler, NØGSG

-> FEEDBACK <-

*A publication of the
Johnson County Radio Amateur Club, Inc.*

Bill Gery, KA2FNK, President

Aaron Boots, AAØRN, Vice President

Ted Knapp, NØTEK, Secretary

Cal Lewandowski, KCØCL, Treasurer

* * *

Chip ACØYF and Deb KDØRYE Buckner, Editors

All email address are available at w0erh.org

Integrating New Hams

At our Febraury 27 meeting, **Herb Fiddick, NZØF**, led a session on ways to bring new hams into the community. Most of the following suggestions were raised at the meeting. A few more are the FEEDBACK's four cents. (That's two cents from each of two editors.)

Be approachable. Wear a name tag to club meetings so that new members can call you by name. Wear a club shirt or hat to public events so that members of the public know to whom to direct questions.

Approach. Greet new members and visitors at club meetings. Invite a new member to join you for pizza after the meeting. Instead of "monitoring" the local repeater, ask whether anyone licensed within the past year is listening. Answer the call of someone you don't know.

Ask questions on behalf of new members. It may be difficult for the new member to admit that he doesn't know what everyone else seems to know. At our last meeting, a ham (who had twice gone to the Liberty Memorial to operate WW1USA) asked a speaker what WW1USA was. Two new people thanked him for asking the question.

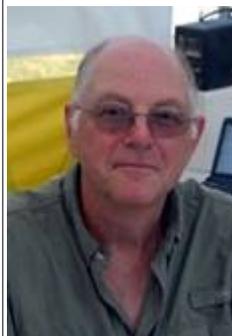
Offer to give a two-minute "tech talk" segment at club meetings. "This is an antenna tester/electronic keyer/ ground plane antenna/whatever. Here's what it does. Here's how to use it."

Remind speakers that the first minute or two of the program needs to be aimed at someone who has no understanding of the topic.

Offer to attend a testing session where you hand out a "what's next" packet to people who pass the test. The packet has a flyer that congratulates the new licensee, identifies the club and invites the new licensee to the next JCRAC meeting. The packet might contain a list of local nets and an explanation of how to participate. It might contain a certificate for free (club paid) pizza at a club after-meeting.

-- **Chip and Deb**

PRESIDENT'S CORNER



March did come in like a lion, sort of. Snow on the ground, no wind and temperature on a roller coaster ride. Dipping to the single digits one day an then back up into the

40s and 50s. With these temperatures swings at least only have to clear the steps of snow. Mother nature has taken care of the driveway.

The Club's new 145.29 repeater is performing great. **Bill Brinker, WAØCBW** believes the new repeater has an plenty of good ventilation. So summer heat should not be an issue with this installation. The new 440 repeater which is comes an line will be another good addition.

Club event planning for 2015 is well underway. As always thank you to club members that put in extra time to make the shootout, field day, auction and Ensor camp fires a success.

- **Bill Gery - WA2FNK**

More FEEDBACK Changes

In keeping with the "let's integrate new hams" theme, readers will note that the FEEDBACK is running more photographs of contributors. The changes results from the FEEDBACK's solicitation, rather than the vanity of the authors. The idea is that someone who finds an article interesting will be able to associate a face with the article, at which point he has both a name and a face that he can approach.

LOCAL MEETINGS AND FM NETS

	SUN	MON	TUE	WED	THU	FRI	SAT
AM	0:00 Paul Revere 146.94- (88.5)				11:00 Quarter Century Wireless Assn - RC's Restaurant, 135th & Wornall		07:00 - Santa Fe Trail ARC @ Perkins, Santa Fe E. of I-35, Olathe 09:00 - Ray/Clay ARC - Bargain Town (Hwy 10&13), Richmond, MO
18:00	18:45 Miami County D4 ARES/Paola 147.360- (151.4)	18:30 4th: KCDX Club @ Better Homes & Gardens Realty, 8101 College Blvd, #100 OPKS	JoCo ARES Simplex 146.450				
19:00	Wheat State Net/Paola 147.360- (151.4)	145.47- (151.4) JoCo ECS 1st: Clay Co ARC @ Liberty Hospital (Dialysis Ctr - Lower Level)	JoCo ARES 145.29+ (151.4) 2nd: Indep. FM ARC, St. Matt's UMC, 2415 R D Mize Rd., Indep, MO 3rd: Heart of Amer RC - Red Cross HQ, 211 W Armor, KCMO 3rd: Testing @ Community Christ, 63rd & Manning, Raytown	2nd: Douglas Co ARC @ Douglas Co Fairgrounds Bldg#1 2nd: Wheat State Wireless Assn @ Paola Fire Station	Jayhawk ARS 147.150+ (151.4) 1st: Pilot Knob ARC @ Leavenworth Co Courthouse - Emer. Op. Ctr.	3rd: Santa Fe Trail ARC Meeting and Fun Night @ Faith Technologies, 11086 Strang Line Rd, Lenexa	
19:30	Swap and Shop 145.17- (151.4) Pilot Knob ARC 147.00- (151.4)		JoCo SATERN 145.13- ()	Clay Co ARC 146.79- (107.2) Pilot Knob ARC 147.00- (151.4)	4th: Raytown ARC @ basement of Comm of Christ, 63rd & Manning, Raytown	2nd/4th: JCRAC "Regular Meeting" @ OP Christian Church, 7600 W 75th St. OPKS	
20:00	Douglas Co ARES 146.76- (88.5) Raytown ARC 145.17- (151.4) Clay Co ARC 147.33+ ()	145.13- () KC Assoc of the Blind ARC 147.375+ (156.7) Ray/Clay ARC	Southside ARC 147.12+ () Santa Fe Trail ARC 147.24+ ()	Johnson Co RAC 443.725+ (151.4)	Johnson Co RAC 145.29+ (151.4)	VA Casual/Ham Roundtable 443.500+ (151.4)	
20:30				Jackson Co ARES Digital Training 146.97- ()	Independence RACES 145.31- ()		
21:00	Right Wing Wacko Net 146.97- ()			Swap and Shop 147.09+ ()		2nd/4th: JCRAC "Annex Meeting" @ Pizza Shoppe, 8915 Santa Fe Dr, OPKS	

Local nets, meetings and testing sessions are posted as the FEEDBACK editor becomes aware of them.

A net is "local" if it can be heard on an attic VHF/UHF J-pole near I-435 and US69. Boldfaced type indicates that FEEDBACK heard the net. Plain type indicates that someone reported it to the FEEDBACK or referred to it on Larry's List, but the FEEDBACK has not confirmed its presence.

A meeting is local if the person who prepares the calendar thinks that it is local.

Johnson County Radio Amateurs Club - February 13, 2015 Meeting Minutes

Meeting Date: Friday February 13, 2015. The meeting Started at 7:30PM.

Attendance: Self introduction with name and call sign. 42 signed the check in sheet. This was followed by the Pledge of Allegiance.

The Minutes from the January 23, 2015 meeting were read and accepted with 1 opposed vote.

The Treasurer's report, as follows, was read and accepted unanimously.

Cash on Hand	\$ 77.11
Checking Account	\$ 482.90
Savings Account	<u>\$ 7,534.00</u>
Total	\$ 8,094.01
Repeater Op.Reserve	\$ 734.87
Memorial Fund	\$ 175.00
Active Members	143

Old Business:

- Repeater Update – Currently our 440 Repeater is located on the top of the Black & Veatch building at 103rd and Lamar. **Bob Lovell KCØEFC** our contact at this building is retiring at the end of February. We are in the process of looking for another contact at this location.
- WWIUSA Special Event Station February 7-8, 2015 – The event was successful with at least 25 operators (including 2 Father-Daughter teams) making 1229 contacts. Included in those contacts was N3SUB a WW2-era museum submarine in the Philadelphia Seaport.
- Field Day 2015 – June 27-28, 2015. Jay Greenough WJ0X would like to hear what you liked and did not like about last year's Field Day.
- Club Shirt Update - **Bill Gery, KA2FNK** is still collecting information.

New Business:

- It was brought to the attention of the Club that an individual who said he was “loosely” affiliated with the Club took advantage of a widow of Ham and told her that her husband's equipment was only worth about \$200 when it was really valued at \$3,500. This individual purchased all the equipment for \$200. By bringing this event to light, it is the hope that this individual will do the right thing in this situation. A short discussion followed around about how the Club can more actively be involved in situations where equipment value needs to be determined.

Reports:

- 6 m – None.
- 10 m SSB Roundtable – 5 participated on February 12.
- 440 Wheat Shocker net – 19 check-ins on February 11 and 18 check-ins on February 4.
- 2m Wheat Shocker net – 20 check-ins on February 12 and 31 check-ins on February 5.
- Licenses Anniversary – None
- Birthday's – None
- Silent Key's – None
- HF Activity – Navassa Island K1N, Iran, Iceland, Guantánamo Bay.

Announcements:

- Hamclass.org graduated 36 new Hams and 1 upgrade to General.
- MECC meeting February 14 at 9 AM.
- Watch Larry's List for upcoming events.

Business meeting adjourned at 8:12 PM

Program:

- The Program for this meeting will be a presentation and demonstration by Brandon Graham W0GPR on Software Defined Radio.

Submitted by **Ted Knapp, NØTEK**, Secretary.

Johnson County Radio Amateurs Club - February 27, 2015 Meeting Minutes

Meeting Date: Friday February 27, 2015. The meeting Started at 7:30PM.

Attendance: Self introduction with name and call sign. 42 signed the check in sheet. This was followed by the Pledge of Allegiance.

The Minutes from the February 13, 2015 meeting were read and accepted with 1 opposed vote.

The Treasurer's report, as follows, was read and accepted unanimously.

Cash on Hand	\$ 142.11
Checking Account	\$ 438.17
Savings Account	<u>\$ 7,534.00</u>
Total	\$ 8,114.28
Repeater Operating Reserve	\$ 747.87
Memorial Fund	\$ 225.00
Active Members	146

Old Business:

- Repeater Update – The new Yaesu Fusion Repeater has received its new frequency. The new Repeater should be here in a couple of months and installed at the Shawnee site.
- WWIUSA Special Event Station May 9-10, 2015. Look for signs up details on Larry's List or on the National World War One Museum site. As a reminder, the Club will be sponsoring the December 12-13, 2015 event.
- Field Day 2015 – June 27-28, 2015. The organization team is looking at having Club members wear matching shirt so they can easily be identified by visitors.
- Shootout – Lon Martin K0WJ is planning two Shootouts this year. On indoor event around the beginning of April and the second outdoor HF event in the summer. More details to follow.
- Club Shirt Update - Bill Gery, KA2FNK is still working on collection information.
- We would like to report that the individual would took advantage of a widow of Ham and told her that her husband's equipment was only worth about \$200 when it was really valued at \$3,500 had made the situation right! This individual said he was "loosely" affiliated with the Club. He went back to the widow and gave her a proper amount of money for the equipment. He also donated \$100 to Club as an apology.

New Business:

- None.

Reports:

- 6 m – None.
- 10 m SSB Roundtable – 6 participated on February 26.
- 440 Wheat Shocker net – 19 check-ins on February 25 and 14 check-ins on February 18.
- 2m Wheat Shocker net – 14 check-ins on February 26 and 27 check-ins on February 19.
- Licenses Anniversary – None
- Birthday's – None
- Silent Key's – None
- HF Activity – Robinson Crusoe Island 3G0ZC, Cocos Island.

Announcements:

- Harold "Van" Van Daveer K0HCV took First place in last year's ARRL DX Phone Contest.
- Watch Larry's List for upcoming events.

Business meeting adjourned at 7:55 PM

Program:

- The Program for this meeting will be a presentation by Herb Fiddick NZ0F on "The Role of the Club in the Life of a New Ham".

Submitted by Ted Knapp, N0TEK, Secretary.

Hambone Transformed -- Jaimie Charlton, ADØAB

It was a peaceful, sunny, sixty-degree early Spring morning in America's heart-land. A few robins were perched on the newly budding trees and their songs drifted in the open kitchen window of the house where Hambone and his family lived. But, what drifted out was anything but peaceful.



"Transformers are made special for what they are supposed to do." Said Hambone. "Look right here on this power transformer. It says primary, that's the input, 120 volts, and secondary, that's the output, 24 volts, 3 amps max."

"Yeah, yeah," replied Dude, Hambone's younger, and sometimes smarter, brother. "But what it's really doing is transforming impedance."

"You're wrong! If that were true, it would say so like this audio transformer that has impedances stamped right on it. See, it says 100 ohms on the primary side and 4 ohms on the secondary. Everybody, but you, knows that power transformers are rated in amps and volts and VA and audio transformers are rated in ohms and watts. That's just the way they are, so sit down and shut up."

"You're wrong! Just because you somehow managed to get your General Class license you think you're so smart." Retorted Dude as he picked up one of the transformers.

Hambone, sensing an escalation, backed away. "Put down that

transformer or I'm gonna call Uncle Elmer."

"And then what? Show him that you've forgotten everything he's taught you about transformers? I don't think so!"

At that exact moment Uncle Elmer appeared with a cup of coffee in one hand and a donut in the other. "Hey guys, what's going on here, the Battle of the Transformers?"

"Bad joke, Uncle Elmer," replied Hambone. "I was trying to explain to Dude that each type of transformer is specially designed for a particular job. Some provide power like this one and some have special impedances that are used to match things up. But dumb Dude over there says that all transformers are basically the same. Please, tell him he's wrong."

"Well, boys, I hate to say this, but you are both right. At their core (pun intended), transformers' designs are optimized for specific purposes. But, in principle, they all work the same and follow the same electrical laws.

Remember," said Elmer, adopting his smooth, yet authoritarian professorial voice, "a basic transformer is simply two coils of wire --one called the primary winding and the other called the secondary winding--arranged so that the magnetic field generated by current flowing in one winding passes through the other winding. In other words, the windings are magnetically coupled. According to *Faraday's Law*, that means a voltage applied to one winding will induce a voltage in the other winding."

will induce a voltage in the other winding."

"If it's that simple, why are there so many kinds of transformers?" asked Hambone.

"That's easy. There are a lot of different voltages and currents people need at different frequencies so transformers are made with different numbers of turns on the windings as well as different sizes of wires and types of cores."

"See, Dude, I told you so. Transformers are made special for different jobs." Sneered Hambone.

"That's sort of true," replied Elmer, trying to lower the emotional temperature in the room. "For example, if we want a transformer to take a high voltage applied to its primary winding and reduce it, like that 120 volt to 24 volt unit in Dude's hand, we put fewer turns on the secondary winding than on the primary. Consequently, the voltage that appears on the secondary winding will be lower than the voltage applied to the primary. That is called a step-down transformer.

To illustrate, if we make a transformer with, say, 500 turns of wire on the primary and 100 turns on the secondary and apply 120 volts AC to the primary, we will see 24 volts on the secondary. That's because the primary has five times more turns than the secondary. In technobabble, we say the transformer has a 5:1 turns-ratio. This makes it a five to one step-down transformer. But don't get hung up on the name.

We could apply 24 volts AC to the "secondary" winding and get 120 volts on the "primary". So, you

see Hambone on page 7

from Hambone on page 6

see, the terms primary and secondary are really arbitrary.

One caution, I'm not saying Dude's little transformer has exactly those numbers of turns on its windings. I'm just making up numbers to show that it is the *ratio* of the number of primary turns to secondary turns that determines whether a transformer steps up or steps down a voltage. Calculating the actual number of turns is more complicated."

"That's cool." Replied Hambone. We can hook up Dude's transformer backwards--put 24 volts AC on the secondary and get 120 volts on the primary--and get free power!"

"No, there's no free power because although the secondary voltage is five times higher than the primary, the secondary current is only one-fifth the primary current. So, the power stays the same.

"But Uncle Elmer, where does impedance come in?" asked Dude.

"I thought you'd never ask." Said Elmer. "Let's think about your little step-down transformer in a new way. Let's say you have a 24 volt, 2 amp marine lamp you want to light but, the only voltage you have available is 120 volts AC. You know if you connect your lamp directly to the 120 VAC it will draw way more than 2 amps and burn out.

So, you use your step-down transformer to step the 120 VAC down to 24 VAC for your lamp. Problem solved. But let's look at what you actually did.

NOTE TO READER: DANGER DANGER! Math ahead!

The lamp draws 2 amps at 24 volts because of its resistance. You can calculate that resistance using Ohm's Law as:

$$R = \frac{E}{I}$$
$$R = \frac{24}{2} = 12 \Omega$$

Where:

R = The lamp's resistance in ohms

E = 24 volts - The lamp's rated voltage

I = 2 amps - The lamp's rated current

We could also say that the lamp's impedance, which in this case is the same as its resistance, is 12 ohms.

Further--using the power formula that states that watts = amps time volts--the power supplied to the lamp is:

$$P = I \times E$$
$$P = 2A \times 24V$$
$$P = \underline{48 \text{ watts}}$$

Summarizing, this is a 48 watt lamp designed to operate on 24 volts. Its resistance is 12 ohms.

Now, if we connect this lamp directly to the 120 VAC supply it will draw much more than 2 amps. We can calculate exactly how much more by using Ohm's Law again:

$$I = \frac{E}{R} = \frac{120V}{12\Omega} = 10A$$

Our 48 watt-rated lamp will draw 10 amps if we connect it directly to a 120 volt supply! That's a total of 1,200 watts, which will nearly instantly burn it out!"

After pausing for dramatic effect, Elmer continued, "if we raise, or

transform, the lamp's resistance to a higher value, it will then only draw its rated current and power and will burn long and bright. That's what your transformer is doing.

Remember, we said that no power is created or destroyed inside a transformer. This means that in an ideal transformer the power that comes out exactly equals the power we put into it."

"I don't get it, the voltage went up so that means we get more power, doesn't it?" Asked Hambone.

"No," said Elmer, "If the transformer steps up the voltage, the current must go down in the same proportion.

To see how that works, let's start by writing an equation that says the secondary power equals the primary power like this:

$$P_s = P_p$$

Note that P_s and P_p mean secondary and primary power in watts.

Because $P = E \times I$, we can re-write that equation:

$$E_s I_s = E_p I_p$$

Here, E_s and I_s are the secondary voltage and current and E_p and I_p are the primary winding's voltage and current.

Finally, using a little algebra, we juggle the terms around and get:

$$\frac{I_s}{I_p} = \frac{E_p}{E_s}$$

This equation clearly shows that as a transformer increases or decreases the voltage, the current is increased or decreased in inverse proportion. Because this is a step-down transformer, the

See HAMBONE on page 11

A TCXO-Based Frequency Reference for Kenwood Transceivers -- Tom Wheeler, NØGSG

Have you ever been invited to meet someone on a specific frequency to make a contact? If you're like most of us, the answer is "yes," and in response you likely dialed up the requested frequency on your transceiver's handy digital display and proceeded with the contact. But just how accurate is your transceiver's frequency display, and why is that important?



Modes such as ordinary amplitude and frequency modulation (AM and FM) are normally quite tolerant of frequency differences between stations. In fact, frequency error in these modes seldom causes an issue unless it's extremely large (more than 1 kHz).

However, it's a different story for single sideband (SSB), Morse (CW), and digital mode contacts (such as PSK31). These modes require both good frequency accuracy (the number of the display is close to the actual frequency of the transmitter) and frequency stability (the transmitter frequency varies a minimal amount from the desired value as time elapses).

In general, frequency errors of more than 200 Hz make SSB very unpleasant to copy by causing thereceived pitch to be wrong. In the 1950s, detractors of SSB complained of the "Donald Duck" quality of speech. This was

primarily due to the relatively poor frequency stability of radios from that era. Frequency drift can make CW very difficult; with the narrow filters in some receivers, 200 Hz of drift will make the signal disappear!

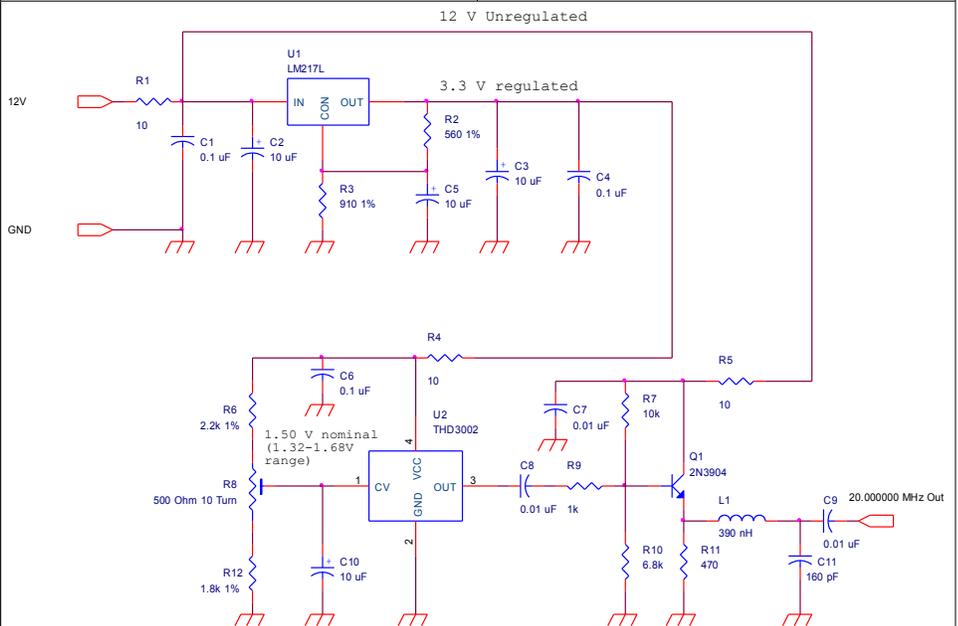
Fortunately, modern technology makes it much easier to construct highly accurate and stable frequency sources. In fact, most modern transceivers (built since 1986) include digital frequency control. Kenwood's transceivers generally use a single crystal "master oscillator" that is used to derive all frequencies within the transceiver. This "master oscillator" acts as a metronome, providing accurate timing for everything in the transceiver.

The master oscillator of many Kenwood models consists simply of a single quartz crystal oscillator stage. It's accurate to about plus or minus 10 parts per million (ppm). That sounds pretty good, until you consider that a 10 ppm

error at 1 MHz means ± 10 Hz of frequency error; at 10 MHz, it's ± 100 Hz of error, and at 30 MHz, it's ± 300 Hz of error. That's a 600 Hz span of error on 10 meters. (And did I mention, this accuracy and stability are Kenwood's specifications for new units--not five, ten or twenty year old models?) For a while in the 1990s, Kenwood offered an improved-stability master oscillator called the SO-2. This oscillator provides ± 2.5 ppm accuracy. Unfortunately, it's no longer available.

The NØGSG frequency reference is designed as a drop-in replacement for the Kenwood SO-2. It's based on a state-of-the-art temperature compensated crystal oscillator (TCXO) and provides better than 0.3 ppm accuracy out-of-the-box, and can be easily calibrated against a standard such as WWV for better than 0.1 ppm accuracy. That's less than 3 Hz of error at 30 MHz, folks--which means that with this unit in your

See TCXO on page 9



from TCXO on page 8

radio, you'll never again be in doubt about what frequency you're really operating on. With drift a thing of the past, your buddies will no longer be chasing your signal up and down the bands!

Circuit Description

The frequency reference unit is based upon the Pletronics THD-3002 TCXO IC, as shown in Figure 1. Most of the circuitry wraps around the Pletronics IC to support its operation.

Power for the IC is regulated by U1 to approximately 3.3 volts. This regulated voltage provides both power to the TCXO module (pin 4) as well as a control voltage (pin 1), which is derived through a voltage divider consisting of R6, R12, and potentiometer R8. The control voltage fine-tunes the TCXO frequency over a range of ±1 ppm.

Construction

The TCXO module can be constructed on a small piece of perfboard. The required dimensions are shown in Figure 2; if this unit is to be installed into a Kenwood radio, your dimensions must exactly match those shown. Figure 4 shows the prototype as constructed.

As always, keep wiring short as possible and locate all bypass capacitors immediately adjacent to the transistor or IC they're electrically associated with.

The THD-3002 TCXO IC is a surface mount part. To mount it on the perfboard, carefully solder four

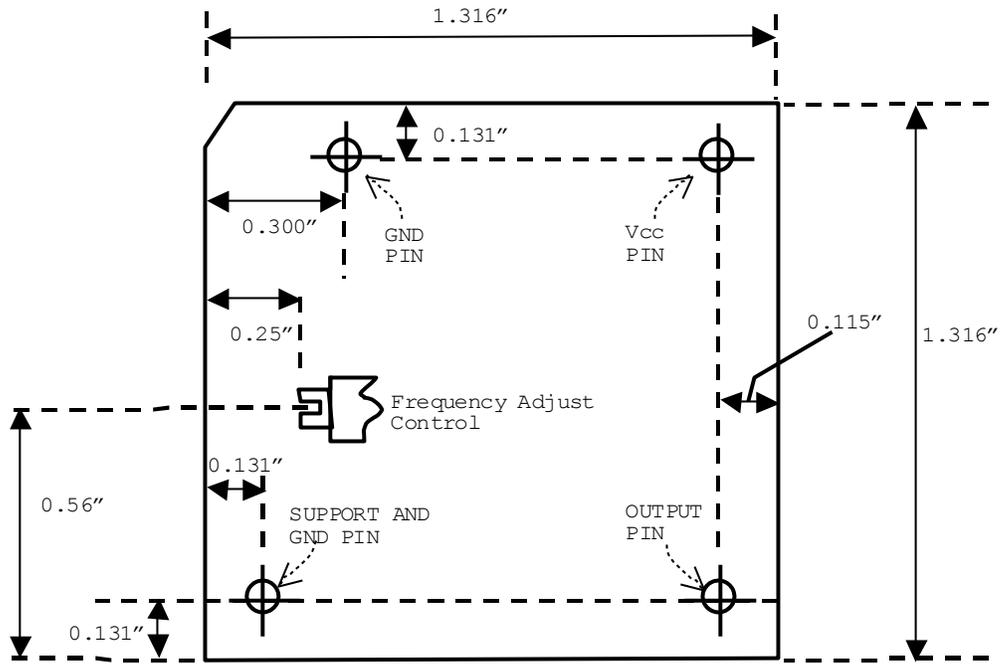


Figure 2: Required Mechanical Dimensions for SO-2 Drop-in Compatibility. Note: Maximum height of any portion of the board must be less than 0.490", or the unit will not fit correctly in all Kenwood transceivers. View is from top of PC board.

short pieces of 32 ga wire wrap to its pins, and run these to the circuit. Be careful--this is an expensive part (\$28 @ from Mouser Electronics)--don't overheat it when soldering to

it. A microscope is recommended for this step; the IC is exceedingly tiny, measuring only 5 mm in length! See Figure 3, below.

see TCXO on page 10



Fig. 3: Close-up of the TCXO IC.

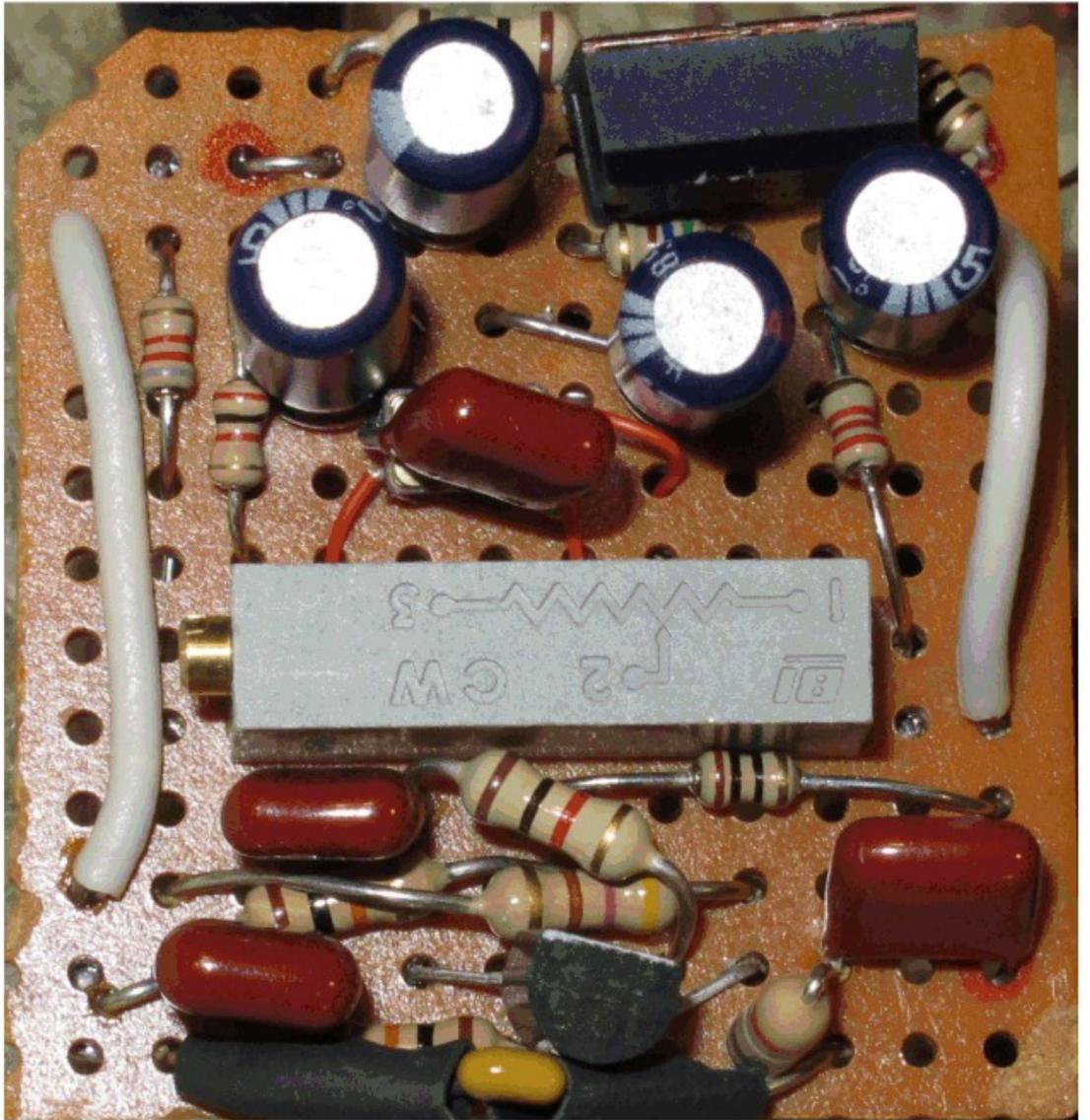
from TCXO on page 9

Testing

The frequency reference unit should be bench-tested before installation in your radio. Connect a 12 volt supply to the VCC and GROUND terminals, and a 50 ohm non-inductive load resistor to the OUTPUT terminal. The unit should provide at least a 0.250 mV RMS sine wave at the output terminal at very close to 20 MHz. If you have an accurate frequency counter, you may connect it to the OUTPUT terminal and adjust R8 for exactly 20.000000 MHz. If you don't have a counter, simply adjust R8 until exactly 1.500 volts are present on the control pin of the TCXO IC - - use an accurate digital multimeter. This latter method should get you within ± 0.5 ppm of 20 MHz.

Operation

Once you've installed the unit, your radio should operate normally. It's best to do an immediate calibration check by tuning to WWV on 10 or 15 MHz. If you've built the module according to the mechanical specifications of Figure 2, you'll be able to access the adjustment control from outside your radio for fine calibration.



A quick test of accuracy is to switch between USB and LSB modes while listening to the tones coming from WWV. There should be no audible pitch difference. If you achieve this, congratulations, your frequency is now spot-on!

Conclusion

In an afternoon of construction time, you can easily bring many Kenwood radios up to twenty-first century standards for frequency accuracy and stability. If there is sufficient interest, I'll lay out a PC board for this project to make it easier for everyone to replicate the work.

-- JCRAC FEEDBACK --

from HAMBONE on page 7

secondary or output voltage is lower than the primary, or input voltage. Which, in turn, means that the secondary current is proportionately higher than the primary current. But beware, this is theoretical and the currents in either winding are also limited by other factors such as the size of wire used in the windings. To be safe, you must not exceed the nameplate specifications.”

“Clear to you, maybe,” said Hambone, under his breath.

“Geez, Hambone, didn’t you learn anything in Algebra?” sneered Dude. “Oh, that’s right, that’s the class you slept through because you said you were going to be an engineer and would never need any of that weird stuff from a class that sounds like a piece of girl’s underwear.”

Ignoring the boys, Elmer continued, “for this step-down transformer, the primary voltage (120 volts) is 5 times greater than the secondary voltage (24 volts), which means the primary current is 5 times less, or 1/5, of the primary current. The primary current is:

$$I_p = \frac{E_s}{E_p} I_s = \left(\frac{24V}{120V} \right) \times 2A = 0.4A$$

Note: the 2 amps is the rated lamp current at 24 volts

Finally, let’s find the impedance of the transformer’s primary winding with the lamp connected to the secondary.

We know that the voltage applied to the primary is 120 volts and we know that the primary current is 0.4 amps. So, using the previous Ohm’s Law formulas:

$$R = \frac{E}{I} = 120V/0.4A = 300\Omega$$

Where:

R = the resistance of the transformer’s primary in ohms

E = the primary voltage in volts

I = the primary current in amps

Voila, our transformer has raised, or transformed, the impedance of the lamp from 12 ohms to 300 ohms. So, guys, you both were right. A transformer can be designed for a specific purpose, but it is also an impedance transforming device.”

“Wow, that’s cool!” Exclaimed Dude.

“I think I see it, now.” Hambone added, unconvincingly.

“Even cooler,” added Elmer, “is that the transformer “transformed” the impedance, not by its turns ratio, but by the *square* of its turns ratio. See, the transformer has a 5:1 turns ratio because it steps voltage up or down five times. But it took the original 24 ohm resistance of the lamp and stepped it up to 300 ohms. That’s an impedance step-up of 25 times or five squared.”

Hambone, stunned, could not even reply, so Elmer continued. “This is a characteristic of any transformer. For example, a balun with a 3:1 turns ratio changes impedance by a factor of 9. That’s a particularly useful ratio because it converts back and forth between 50 ohm coax and 450 ohm window line.

NOTE TO READER: IT IS NOW SAFE, MATH IS OVER!, We return you to normal reading.

“So, if transformers all work the same, why are they made so different?” Asked Hambone, returning to reality and still trying to win his argument with Dude.

“The biggest difference is the core. Most transformer windings are wound on some type of magnetic core to greatly increase their magnetic coupling. The amount of current a winding will carry determines its wire size. The voltages along with

the core material and a parameter called ‘volts-per-turn’ determine the number of turns on each winding and the cross-section area of the core. The number of turns and the wire sizes determine the size of the core. After all, the windings must fit on the core.

Power transformers, which generally operate at a low frequency, say, 60 Hertz, have cores of a type of steel that greatly increases their magnetic fields. Unfortunately, solid steel also acts like a shorted turn in the transformer and gets very hot. To reduce that, the steel is cut into thin sheets, or laminations, that are stacked but insulated from each other.

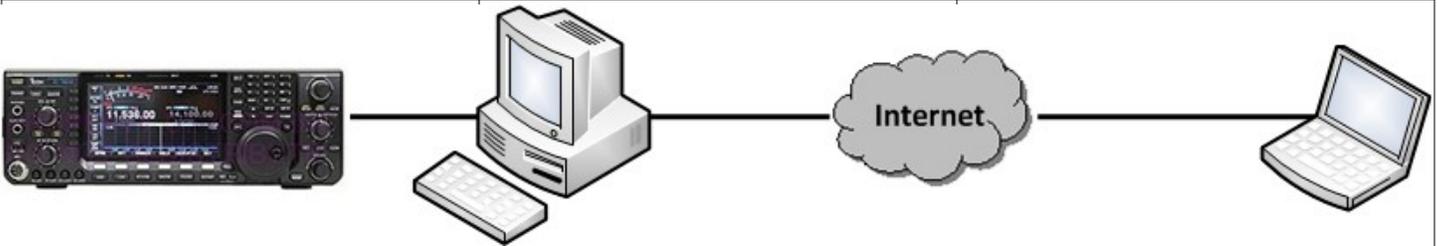
But that steel doesn’t work well at high frequencies so, audio transformers’ cores are made of a different type of steel and much thinner laminations. Even some RF baluns are wound on cores made of ferrite material that works with minimum loss at RF frequencies. In fact, to minimize losses, there are RF transformers that have only air for a core.”

“Gee, Uncle Elmer,” sighed Dude, “That’s a lot to think about. I guess there’s more to transformers than stepping voltage up or down.”

“Yes,” replied Elmer, “and there’s one more thing. Not all transformers have two or more windings. Autotransformers have only one winding, yet they can step voltages either up or down. I’ll leave it up to you guys to figure out how they do it.”

With that, Elmer picked up his donut and now-cold coffee and walked onto the deck leaving the boys to rethink what they thought they knew about transformers.

-- JCRAC FEEDBACK --



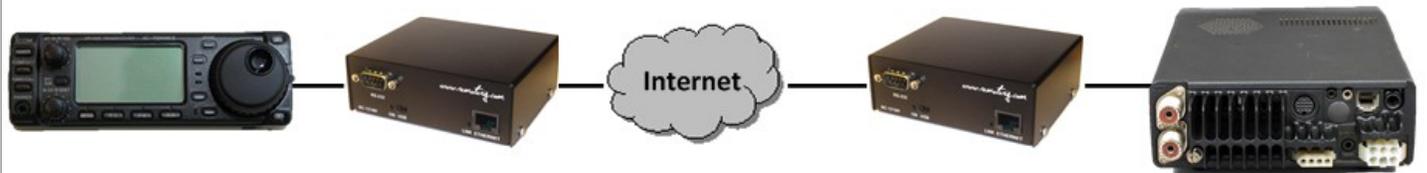
from WW1USA on page 1

The other option we intended to use for the operation was a product called RemoteRig by Microbit. It (second diagram) is more of a hardware solution and works well with radios that have removable faceplates, like some popular Icom and Yaesu rigs.

The Reality

The final analysis of the two operations indicates that both technologies we selected can work reliably for long-term continuous operation. While every setup experienced some occasional audio drop-outs, those rarely affected the operation. All

only a few minutes. Those rigs were set up in 2 different locations with different internet providers. The only common denominator we were able to determine (after the event) was the version of the RS-BA1 software we were using. The IC-7200 belonging to Joe WØPWJ



The RemoteRig solution incorporates two “black boxes” that translate TTL commands between the radio and its removable faceplate into packets that can be transmitted over the internet. Depending on the radio model,

operators found that they quickly got used to the characteristics of remote operation. We had 4 stations set up for the event for the December event – 3 using the RS-BA1 software and 1 RemoteRig setup. While the

used a slightly different and newer version of the software and operated reliably for the whole event. We were not able to confirm that the software version was causing the problem with the IC-7600s, but it’s the only thing



separate audio connections for transmit and receive audio may also be made to the “black boxes” and packetized for transmission over the internet. Because of the wide variety of radios this application is suited for, setup can be a bit more complicated than the Icom RS-BA1 solution. However, once it’s set up, it’s very portable and results in an operation that looks like a ham radio at the remote end.

overall results of the December operation were good, it was not without its challenges.

While we had 4 stations set up, 2 experienced reliability issues that we couldn’t solve during the event. Curiously, the 2 un-reliable stations were the IC-7600 rigs. Both of those setups experienced chronic loss of transmit audio after operating successfully for

we have been able to identify.

See WW1USA on page 13

from WW1USA on page 12

Given the issues we had with the two IC-7600s, we dropped one of those from our station on Sunday and used a slightly different version of the RemoteRig solution. In addition to the hardware-based solution that we used successfully, RemoteRig has a hybrid solution in the third illustration.

This setup was used with my Yaesu FT-857. We did not use this setup extensively on Sunday, but it was staffed for a couple of hours and netted about 100 contacts by an operator working on 15 meters.

The two balky IC-7600 rigs were not available to us in February, so our station consisted of Joe WOPWJ's IC-7200 using the Icom RS-BA1 software, Lee KOLW's IC-706 using the RemoteRig hardware solution, and my FT-857 using the Remote Rig hybrid solution above. All three rigs worked flawlessly for the entire event.

Summary Observations

Overall, I think there's no question that we were successful using remote operations for these special events. We did, however, learn a lot during the preparation for the event and during the event.

- All of the remote operation technologies we used require some configuration of the internet router at the rig's location so that the remote end can find and connect with the rig. This typically involves setting things up so that whatever connects the rig to

the internet has a predictable and static IP address and configuring 3 different IP ports to be forwarded to that IP address inside your network. Depending on your internet provider and your setup, you may not even have access to your router to configure these settings. There are instructions available for this step from both Icom and RemoteRig, but every router is a little different. If you're not comfortable with this step, I would advise finding a good IT friend that is.

Internet latency causes delays that you'd think would be an issue, but they're not. When setting up these remote configurations, we often had both the remote and the rig in the same physical location and you can detect noticeable delays in keying the rigs and in both the transmitted and received audio. However, operating from a remote location, you don't realize these delays are present and none of the operators

• Troubleshooting these setups is difficult. Like a lot of digital things, it either works or it doesn't and finding the failure point is hard. In the analog world, it's relatively easy to trace a signal path and find the point where failure is occurring. Very few of us have the tools or knowledge to do that in the digital world, however.

• From a support standpoint, both Icom and RemoteRig have a lot of documentation available for setting these

systems up. The Icom setup is generally more straightforward and a little easier than the RemoteRig configuration, however, we couldn't find anywhere to get authoritative help on the Icom setup when things weren't working as expected. RemoteRig maintains a robust on-line help forum that's responsive and helpful that we used to solve some configuration issues with that technology.

We'll be doing this whole remote operation again in December 2015 from inside the Museum and JCRAC will be hosting/coordinating that event. We hope to see a lot of new operators participating. Based on our experience in the last two events, I think you'll find remote operation easy and enjoyable – especially when somebody else has already done all the setup and fine-tuning for you.

While there's obviously a lot of satisfaction from setting up a complete operation in the field for a special event like we do for field day, there's also a lot to be said for using remote operations. Both physical and remote operations have their challenges and strengths and it was good for WW1USA to prove that both can successfully be used to conduct a high-visibility special event.

-- JCRAC FEEDBACK --

FRIDAY	SATURDAY
<p>MARCH 6</p>	<p>7 2015 Severe Weather Symposium KU Memorial Union, Lawrence, KS <http://douglascountyks.org/severe-weather-symposium/join-us> 08:00 HAM 101 at the Smithville Fire Station, 341 Park Drive, located on HWY 169, south of HWY 92), with talk-in on 146.790 [107.2].</p>
<p>13</p>	<p>14</p>
<p>20 Independence/EJC CERT is having its next CERT Basic Training Class on March 20, 21, 27, 28. This class is open to all interested persons from Jackson County including those needing to recertify.</p>	<p>21 Independence/EJC Cert Basic Training (2) Register at www.indepmoep.org, click on the Events Calendar and go to March 20 or call 816-325-7167.</p>
<p>27 Independence/EJC Cert Basic Training (3)</p>	<p>28 Independence/EJC Cert Basic Training (4)</p>
<p>APRIL 3</p>	<p>4 Missouri QSO Party --></p>