



# Squelch Tales



Newsletter from the Merrymeeting Amateur Radio Association for May 2010

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Aerial view of Oak Hill, Brunswick taken in 1932 before there were radio communications towers, Ham radio repeaters of a fellow named Bill Messier, K1MNW living on it.

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## Sagadahoc County gets new Emergency Coordinator

At the end of last year Sagadahoc County ARES Emergency Coordinator Steve Kerchel, AA4AK asked Maine SEC Bryce Rumery, K1GAX to be relieved of his EC duties in six months because of his overly busy volunteer commitments. Steve recommended that outgoing MARA President Harry McNelley, N1TTT would be an excellent replacement. Steve's recommendation was echoed by other County AECs.

In Early April, Bryce took the recommendation and made his

recommendation to Maine ARRL Section Manager Bill Woodhead, N1TTT who then appointed Harry McNelley as Sagadahoc County EC starting in April.

We should all congratulate Harry for his very important League appointment.

We should all give Steve a big THANK YOU for his outstanding leadership as Sagadahoc County EC and wish him well in his other volunteer activities.



# The 6146 Family of Tubes

Glen E. Zook, K9STH, Copyright 2002 by author

Probably the most used tube of all times in the final amplifier of "boat anchor" transmitters is the 6146. From the early 1950s until at least the 1980s, the 6146 found its way into virtually every manufacturer's line of transmitters. In fact, during the early 1960s RCA had a series of advertisements on the back cover of QST that listed a different manufacturer's equipment that used the 6146 each month. A copy of the January 1960 QST advertisement featuring the Hallicrafters HT-37 is included with this article.



There are actually three distinctive variants of the basic 6146: The 6146, 6146A, and 6146B. It is unfortunate that the 6146B was called the 6146B for it is really a different tube from the first two. Primarily the difference between the "plain" 6146 and the 6146A is the makeup of the heater ("filament"). The 6146A has what RCA calls the "dark heater". This "dark heater" is supposed to be more resilient to vibration, work well at a larger "range" of voltage, etc. Otherwise, the 6146 and the 6146A are the same tube.

In mid-1964 RCA introduced the 6146B with the "claim" of 33.33 percent higher power input than the 6146 / 6146A. Also, it was "claimed" that the 6146B could be directly substituted for the earlier tubes. The 6146 / 6146A had a maximum rated power input of 90 watts for CW and SSB operation and the 6146B had a rating of 120 watts for the same emissions. You can see this in the attached copy of their ad from the September 1964 issue of QST.

Many amateurs are aware that the military "ruggedized" version was designated the 6146W (I will get to these tubes a bit later). However, RCA also introduced in the early 1960s the 8298 tube for use in commercial mobile equipment. The 8298 is just a "heftier" 6146A. Motorola, General Electric, and quite a number of other commercial FM equipment manufacturers used these tubes in all sorts of FM communications

equipment for both low band (30-50 MHz) and high band (150.8 - 172 MHz). When the 6146B was introduced, RCA "announced" the 8298A commercial equivalent of the 6146B. In fact, most of the RCA 6146B tubes were "cross branded" with the 8298A number in addition to the 6146B.

Those companies who were manufacturing 6146 series tubes for the military changed from the "plain" 6146 to the 6146A to the 6146B as the military decreed. However, all of the tubes manufactured under military contracts were known as 6146W and, to my knowledge, nothing was done towards marking the tubes as being equivalents of the 6146, 6146A, or 6146B. The only way of telling is from the "date code" which is printed on each tube. Different manufacturers changed tube types at different times. Also, I know of no "master list" telling on what date a particular manufacturer changed from the 6146 to the 6146A to the 6146B. The only "sure" way to know if a particular 6146W is of either the 6146 or 6146A type is to look for a "code date" of before 1964 since RCA introduced the 6146B in the middle of that year. However, some manufacturers did not start manufacturing 6146B equivalent 6146W tubes for at least a year after RCA introduced the 6146B.

RCA "claimed" that the 6146B was directly interchangeable with the earlier members of the 6146 family. Unfortunately, this did not hold true in most cases. Collins, Heath, and probably other companies, at first issued various documents saying that the use of the 6146B in their equipment was "fine". But, this soon proved otherwise!

For example, when the 6146B was used in the Collins 32S-1, 32S-2, 32S-3, 32S-3A, KWM-2, and KWM-2A it was discovered that the components in the neutralization circuitry "burned up" in a very short amount of time. Thus, Collins had to retract the statement that it was "OK" to use the 6146B. Then, due to the fact that the United States military establishment wanted to "standardize" on the 6146W equivalent of the 6146B, the neutralization components had to be redesigned to allow the 6146B to be used. Fortunately, these changes did not affect the use of the earlier 6146 and 6146A in those transmitters manufactured to use the 6146B. All three types of tubes may be used without any problem in these transmitters.

Replacing the 6146 / 6146A tubes with 6146B types often results in spurious emissions, parasitic oscillations, etc. This is due to the fact that there are different bias requirements, different inter-electrode capacitances, etc. of the 6146B versus the other two. It is often difficult to neutralize 6146B tubes when used in place of the 6146 / 6146A. If neutralization can be achieved, often it lasts for just a few minutes before the tube(s) goes into oscillation.

If one insists on trying the 6146B tubes in place of the 6146 / 6146A types, the very first thing to do is to neutralize the final amplifier. If it will not neutralize, then the 6146B tubes should immediately be replaced with the older type tubes. If it does neutralize, then the neutralization should be "watched" for several hours (even days) of operation. If the neutralization changes, then the 6146B tubes again should be replaced with the 6146 / 6146A series. If the neutralization remains constant after several days, then use of the 6146B is fine in that particular transmitter.

I have, in my shack, a number of transmitters that use the 6146 / 6146A type of tubes. These include Collins 32S-1, 32S-3 (earlier model before the neutralization was changed); Heath Apache, DX-100, DX-35, SB-401, SB-110, Seneca; Johnson Pacemaker; and other transmitters as well. Every one of these is much "happier" with the 6146 / 6146A family of tubes. In addition, I have owned transmitters like the Knight T-150 and T-150A that use the 6146 tubes. Frankly, these transmitters were much happier with the 6146 / 6146A tubes.

There is another 6146 family tube that is "superior" for operation at least through 10 meters. That is the 6293. This tube was designed for "pulse" service and is rated at 1-Kilowatt pulse power input. The primary difference between these and the "normal" 6146 is that the plate is much "heavier" in its construction. Back in the late 1950s and early 1960s we would almost "kill" to get our hands on a pair of these for our DX-100s, etc. The 6293 outlasts the 6146 in "normal" service by at least 5 times and often more than 10 times the life of the tube. These tubes "show up" at hamfests, swap meets, etc., from time-to-time. If you see some of these, definitely "glomp" onto them!

The 12-volt equivalent of the 6146 is the 6883, the equivalent of the 6146A is the 6883A, and the 6146B is the 6883B. Now, there are the tubes that were manufactured for FM commercial service. These series go as follows: 6883, 6883A / 8032, 6883B / 8032A / 8552. Again most of these are "cross branded" with all of the tube numbers that are equivalent.

From 1970 until late 1979 when Motorola went out of the reconditioned equipment business, I owned the Motorola reconditioned equipment center for the south-central United States. We reconditioned Motorola FM equipment for 14 states, everything that Motorola sold reconditioned that was exported, and everything that was sold to the United States Government (this was the height of Viet Nam and the Government did buy reconditioned equipment!).

At that time, the Motrac series of mobile equipment was very popular. Depending on the model, these normally used one, or two, of the 6883A / 8032 tubes. It was only in the very "latest" models (HHT "E" series, LHT series, and MHT series) that Motorola had redesigned the equipment to use the 6883B / 8032A / 8552 tubes. Around late 1976 or early 1977, Motorola decided to eliminate some of the tube types that they were "stocking" at the Schamburg, Illinois, parts depot. Thus, they started shipping 8552 tubes in boxes that were marked as 8032. The Motrac is unique in the fact that you cannot see the tubes when they are in operation (they are enclosed in a metal "heat sink"). In fact, it is difficult to even "tune" a Motrac when the heat sink is not in place.

We went through from 50 to over 100 of the 8032 type tubes per week and within days were "down" to using the 8552 tubes in the 8032 boxes. Within a very few days of starting to use the 8552 tubes we started receiving complaints that virtually every Motrac unit that was received by customers arrived with one, or both, tubes broken. Prior to this we had never had a single complaint. Upon investigation we found that the 8552 tubes had so many parasitic oscillations that they were getting so hot that the glass envelope was being annealed! This was happening within a minute, or two, of tune-up and final quality control. When the radio was subjected to normal vibrations of shipping, the glass envelope of the tubes was being shattered.

This was reported to Motorola. At first they refused to believe us saying that we must have gotten a "bad" shipment of tubes. But, within a couple of weeks they received over 1000 complaints from their service stations about exactly the same problem. It cost Motorola one "heck of a lot" of money to pay the warranty claims because they had tried to "cut costs" by eliminating the earlier type of tube. They had to re-box all of the 8552 tubes that had been put into 8032 boxes and get in a "rush" shipment of 8032 tubes.

The whole problem stemmed from the fact that the "B" series of tubes is not the same as the "plain" and "A" series. The parasitic oscillations were caused by the different bias requirements and by the "fixed" neutralization of the driver and/or amplifier tube in the Motrac. There was no practical way to change the circuitry to handle the "B" series tubes. Also, making such a change would void the "type acceptance" of the units.

In a "practical" sense, it is "OK" to mix 6146 and 6146A tubes since the primary difference is in the design of the heaters. But, NEVER mix 6146 / 6146A tubes with a 6146B! This is really "asking for trouble".

Also, in a number of transmitters and transceivers (especially the Heath SB-Line) the heaters ("filaments") of the pair of 6146 tubes are in series. In these units it is very easy to change the heaters from series to parallel and substitute the 6883 / 6883A / 8032 tubes. The 12-volt equivalent tubes are often available for "pennies" because of the vast number that were used in the commercial FM market. I have done this with my Heath SB-110A and it works "like a champ". If you every want to change back, it is a very simple operation to do so.

I know that there are amateurs who say that they have used the 6146B tubes in place of the 6146 / 6146A without any problems. I can definitely believe that. But, I have seen way too many examples of the 6146B causing problems in relation to the cases in which the substitution has no effect. As I said before, neutralize and keep checking the neutralization for several days if you do replace your 6146 / 6146A tubes with 6146B types. Otherwise, you can find yourself with TVI, "burned out tubes", and other damage to your transmitter.

You must be VERY careful when dealing with the various tubes of the 6146 family, otherwise you just might be in for some very interesting problems. Substitute if you must, but, be aware that you are "treading on thin ice".

**Editors Note:** We want to thank Glen for allowing us to reprint this article in our newsletter to benefit all you boat anchor collectors.



## Fifty years of knob twisting by W1ZE



Maine QCWA Chapter President K1GUP presents W1ZE with Fifty Year Certificate  
*(Photo provided by Marjorie Turner, KX11)*

Lewiston: At the Spring QCWA meeting held at the Maine State ARRL Convention the MARA's own Bruce Randall, W1ZE received his certificate from the QCWA National organization for Fifty Years as a licensed Ham. Bruce was first licensed in 1960 as WV6MUP in Maywood California. His interest in Amateur Radio lead him to a career in radio-electronics, most of it as a civilian employee of the US Navy's Naval Sea Systems Command. Over the years Bruce has been President of the Anaheim Amateur Radio Association, Trustee of the MARA and has and still holds appointments in various ARRL positions.



# MARA members do well in 2009 NEQP



On April 16<sup>th</sup> the results and awards went out for last years New England QSO Party. There were twenty entries from the Great State of Maine with all entries doing well.

Three members of the MARA did exceptionally well. At the top of the list was Steve Kerchel, **AA4AK** who took top honors in Maine Single Op QRP and second place in New England and first place Cumberland County. Bruce Randall, **W1ZE** took top honors for Sagadahoc County (all categories) and fourth in Maine for Single-Op, Low Power. Michele Briggs, **W7LIF** took second place Sagadahoc County and seventh place in Maine in the Low Power, Single-Op category.

The following Maine hams received the following top scores:

### High Power, Single Op.

**K1FK**----- 1<sup>st</sup> place ME & Aroostook Co.  
**KB1OWT**--1<sup>st</sup> place Somerset. Co.  
**AI1O**-----1<sup>st</sup> place Penobscot Co.

### Low Power, Single Op.

**K1EO**-----1<sup>st</sup> place Maine & Oxford Co.  
**K1PQS**-----1<sup>st</sup> place Penobscot Co.  
**W1KX**-----1<sup>st</sup> place Kennebec Co  
**W1VEH**----1<sup>st</sup> place Hancock Co  
**K1PAR**-----1<sup>st</sup> place Washington Co  
**NY1E**-----1<sup>st</sup> place Piscataquis. Co.

### QRP, Single Op.

**N1URA**-----1<sup>st</sup> place Androscoggin Co, 2<sup>nd</sup> Place ME  
**N1AIA**-----1<sup>st</sup> place York Co.

A “well done” goes out to all the Maine hams that participated in the NEQP with special “*Way-to-Go*” to Steve, Bruce and Michele.



## Were you licensed prior to 1985?

If you were, you are eligible to be a member of the Quarter Century Wireless Association.



If you would like more information about QCWA, go to:

[www.qcwa.org](http://www.qcwa.org)

or contact Maine Chapter President

**Jerry Burns, K1GUP** at:

[k1gup@roadrunner.co](mailto:k1gup@roadrunner.co)

### Who's Who in the MARA

President = John Munton Jr., N1OIG

Vice Pres.= Dan Lindsley, N5AGG

Sec./Tres .= Marjorie Turner, KX1I

Exec Board:

- Jim McIrvin, N1IPA
- Ed Wynn Jr., N1WY
- Mark Potter, W1AUX
- Brad Gebhardt, N1OMS
- Don Wakeman, KA1WAL

KS1R Trustee = Bruce Randall, W1ZE

Activities = Harry McNelley, N1TTT

Technical Committee:

- Bruce Randall, W1ZE
- Bill Messier, K1MNW
- Donnie Dauphin, WD1F
- Jin McIrvin, N1IPA
- John Goran, K1JJS

Newsletter Editor = Bruce Randall, W1ZE

MARA Web Site = [www.ks1r.net](http://www.ks1r.net)