OUR 25TH YEAR!

EPARA BEACON

VOL. 5, NUMBER 10 THE OFFICIAL NEWSLETTER OF THE EASTERN PENNSYLVANIA AMATEUR RADIO ASSOCIATION OCTOBER 2021

NEXT CLUB MEETING: OCTOBER 14TH

Monroe County Public Safety Center, 100 Gypsum Rd Stroudsburg, PA 18360

Welcome to the EPARA Beacon! This newsletter is published monthly and is the official newsletter of the Eastern Pennsylvania Amateur Radio Association. EPARA has served the amateur radio community in the Pocono Mountains for over 25 years. We have been an ARRL affiliated club since 1995. We offer opportunities for learning and the advancement of skills in the radio art for hams and non-hams alike. EPARA supports Monroe County ARES/RACES in their mission of providing emergency communications for served agencies in Monroe County. Feel free to join us at one of our meetings or operating events during the year. The club meets on the second Thursday of every month, at the Monroe County 911 Emergency Control Center. The business meeting starts at 7:30 P.M. Anyone interested is invited to participate in our meetings and activities.

ZOOM Meeting Info: Meetings begin at 7:30PM!

https://us02web.zoom.us/j/85463346031?pwd=bU1KcVZoaVZiVEUvdjRsUXlNNHZkZz09

Meeting ID: 854 6334 6031 Password: 244632

From The President

October brings fall and the nighttime temps are already getting crisp. Time to plan that antenna maintenance you may have been putting off, get it done before winter sets in.

So, in September we held our first HamFest in over 15 years, and it was a huge success. It was well attended, selling over 130 tickets. We filled up the tailgater's section and most of the tables under the pavilion. Everyone had an enjoyable day! We will be doing this again as it will be an annual event. I want to thank everyone who helped make the hamfest a success, the donations of food, equipment, and time made it possible. I want to extend a special thank you to Walt W3FNZ for coordinating the event, your efforts in organizing this event made it so successful!

At our October meeting we will be going over the hamfest income, we also will be approving the annual budget for 2022. We delayed this from last month until we knew what our income would be. October 9th and 10th is the PA QSO party, Bob W3BMM will be hosting a club station so If you want to be part of this get a hold of him. Our next big event will be the Christmas dinner in December. I am hopeful we can do it this year, last year we canceled it due to Covid.

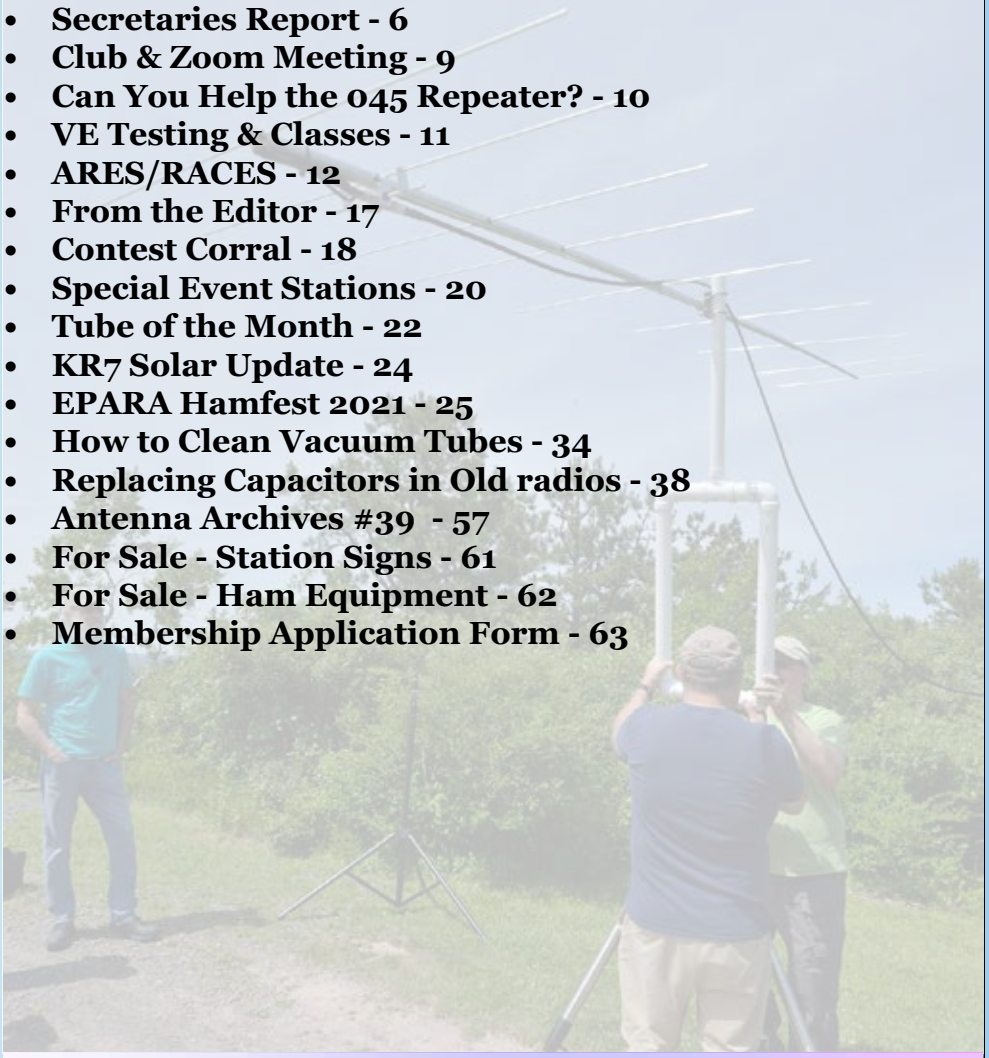
That's if for now, I hope to see many of you on September 9th at our next meeting. 73 Chris AJ3C

CONTACT INFORMATION

President Chris Saunders AJ3C: aj3c@gmx.com	Vice President Bill Carpenter AB3ME: bill47@ptd.net
Secretary Kevin Forest W3KCF: w3kcf@outlook.com	Treasurer Scott Phelan KC3IAO: kc3iao@hobbyguild.com
Member at Large Eric Weis N3SWR: n3swr@ptd.net	ARES EC Charles Borger KB3JUF KB3JUF@gmail.com

Postal Address:	Web Site:	Send dues to:	Newsletter submissions to:
EPARA	https://www.qsl.net/n3is/	EPARA	Eric Weis, N3SWR Editor
PO Box 521	Email:	PO Box 521	EPARAnewsletter@ptd.net
Sciota, PA 18354	N3IS@qsl.net	Sciota, PA 18354	

What's INSIDE this ISSUE



EPARA Net list

Monroe county ARES-RACES – Sunday's 8:30 PM, 146.865 MHz, PL -100 Hz

The Monday Night Pimple Hill repeater 8:30 PM (Repeater freq = 447.275 with a - 5MHz offset) DMR TECH Net on TG314273* Time Slot 2

SPARK Information/Swap Net – Tuesday's 8:30 PM, 147.045 MHz, PL 131.8 Hz

The Wednesday Night EPARA Hot Spot DMR Rag Chew net at 8:30 PM, TG 3149822* Time Slot 2 (N3IS Talk Group)

EPARA Tech Net – Friday's 8:30 PM, 147.045 MHz, PL +131.8 Hz

*TG = Talk Group

Announcements
AND UPCOMING EVENTS

EPARA Patches: Club patches are in! For those that ordered them please step forward to collect them. We also have extra just in case …

EPARA Club Dues
Club dues were due January 1st. For those that missed the chance to stay current, there are two (2) methods available to pay to help make this easy for all. Contact Scott KC3IAO via his email: KC3IAO@hobbyguild.com and you can send him a check or pay via PayPal.

New EPARA hat design under consideration!

Rule #1 of Amateur Radio, it is a hobby, unless you figured out a way to fashion a living out of it.
Rule #2 of Amateur Radio, life is not a hobby and typically carries heavy responsibilities of everything that is not a hobby.
Rule #3 of Amateur Radio, never give up a LIFE event for a Ham event. You may make some great memories at the Ham event, but the guilt you may carry missing a LIFE event can be a terribly heavy millstone.
Rule #4 of Amateur Radio, as technology moves forward, so does Ham Radio - do what makes you happiest, experiment with other elements of Ham Radio as LIFE allows.
Rule #5 of Amateur Radio, it is only Ham Radio, when confused always refer to Rule #1 through #4.

TEST YOUR KNOWLEDGE!

What is digital time division multiplexing?

A. Two or more data streams are assigned to discrete sub-carriers on an FM transmitter
B. Two or more signals are arranged to share discrete time slots of a data transmission
C. Two or more data streams share the same channel by transmitting time of transmission as the sub-carrier
D. Two or more signals are quadrature modulated to increase bandwidth efficiency

Last month's answer was, D. In binary encoding, the number of levels that can be encoded by a certain number of bits is 2 to the power of the number of bits. So an 8 bit ADC can encode an analog input to one in 256 different levels ($2^8 = 256$). The values can represent the ranges from 0 to 255.

DMR
DIGITAL MOBILE RADIO

The EPARA HOT SPOT Wednesday night DMR rag chew is here!

Wednesday evenings at 8:30 PM local, 0:30 UTC!

Tune your DMR radios to Talk Group 3149822 TS2 to join the

N3IS EPARA Hot Spot rag chew DMR net.

Listen to the Tech Net Friday nights on the 147.045 repeater to learn more about joining this net and for upcoming ZOOM meetings announcements to learn more about programing your radios and hot spots!

International Edition
July 1983 $2.49½
Issue #274
Amateur Radio's Technical Journal

EPARA General Membership Meeting Minutes
September 9th *2021*
General Membership Meeting 7:30Pm

Open meeting:

Meeting called to order at 7:30 pm on Sep 9th 2021 by Chris AJ3C
Introductions with call signs
Declaration of Quorum.
Total members attending: 24: 16 members at the 911 Center and 8 members on Zoom. Visitors present: 1.
Total attendees were 25.

Pledge of Allegiance / Moment of silence:

Membership Meeting - Minutes Aug 12th, 2021:

Secretary - Kevin W3KCF:

Meeting minutes for Aug 12th, 2021 were posted on the EPARA website. Chris – AJ3C asked members if they had seen and read the minutes from our previous meeting. He then asked if there were any questions or objections to the minutes as they were presented. With no objections, Chris asked for a motion to accept the minutes as presented:

Motion to accept minutes as presented: By RuthAnn – W9FBO 2nd by Charlie – KB3JUF Motion Passed

Treasurers report:

Scott, KC3IAO stated the opening balance from Aug 31st 2021 was $2604.78 We had expenses of $73.70 for equipment purchases – Antenna Weekend. We had income from 2 deposits. First deposit was on 08/17/21 and included $70.00 in dues and $41.00 for the 50/50. The second deposit was on 08/18/21 and included $20.00 in dues, $27.00 for the 50/50 and $20.00 for two patches sold. In addition, Interest earned was $ 0.12, leaving a closing balance of $2709.20

Our PayPal account had an opening balance of $463.69 We had no activity, leaving a closing balance of $463.69

Motion to accept reports by Al – KB3OVB 2nd by Alex – KD2FTA Motion Passed

Correspondence:

None

Reports of officers and committee's:

Bill AB3ME – Program Committee:

Bill stated that we have a presentation scheduled for after the meeting tonight with Alex – KD2FTA. He will be doing a presentation on "Slow Scan TV.

Bill said next month, he would be doing a presentation on his Di-Pole Project.

Bill then then asked if anyone else was interested in giving a presentation and to please contact him to set things up.

International Edition

July 1983 $2.49½
Issue #274

EPARA GENERAL MEMBERSHIP MEETING AGENDA

Amateur Radio's Technical Journal

Charlie KB3JUF – ARES/RACES:

Charlie stated that he had nothing much for the group. Once again, he mentioned - "*Stay Prepared*", as he was going to implement a surprise activation to test our readiness for any situation.

Charlie then emphasized that all members get involved and start checking into other ARES Nets to gain experience and see what is going on around the area.

Charlie said he is also looking for additional members to volunteer for ARES.

Charlie then mentioned that the Monroe County Office of Emergency Management was offering two classes

ICS-300: Incident Command for Expanding Incident and Supervisors.

ICS-400: Incident Command for IC & General Staff for Complex Incidents.

For further information and to register, contact Brad Harrison 570-992-4113 or email him at bharrison@monroecountypa.gov

** One further note, make sure you're training and task books are up to date and ready to go.

Chris AJ3C -- Instruction and Training:

Chris said there is going to be a DMR Workshop held on Saturday September 11th. Dan – KD3CEU, Alex – KD2FTA and Chris AJ3C have volunteered to help those wishing to learn DMR.

PIO: Public Information Officer position is still vacant

Chris AJ3C - Website

Nothing to report

AL, KB3OVB: Membership:

We currently have 61 members with 1 more to be voted on tonight.

Eric N3SWR – Newsletter and Communications:

Eric said there was nothing new and asked if anyone had articles, they'd like to share, please send them to him at eparanewsletter@ptd.net.

Sat-Com Group: *Planning for an EME project*

Alex and Bob mentioned that the ARRL was promoting 3 EME events in December. Further details to follow.

Old business:

2020 Audit Update:

Bill – AB3ME is working to set a time to get together with RuthAnn and Ed to conduct the audit. No time has yet been set to meet.

Embroidered Patches:

Chris said there are still patches available for purchase. For those still interested in purchasing patches, the cost of a patch is $10. PayPal is setup, so if you are interested, contact Scott KC3IAO

The West End Fair:

The West End Fair went extremely well. Next year is the 100th fair and we hope to run a Special Event Station to commemorate this.

International Edition

July 1983 $2.49½
Issue #274

EPARA GENERAL MEMBERSHIP MEETING AGENDA

Amateur Radio's Technical Journal

Tech Net on DMR:

EPARA Tech Net on the KG3I DMR repeater (T 442.275/R 447.275) The net is hosted on Monday nights at 8:30 PM on Talk *Group* 314273 ***and is on Time Slot 2, Color Code 0.***

N3IS DMR Talk Group:

EPARA has established a DMR talk group under the club N3IS call sign. The talk group is 3149822 and is accessible via hot-spot only. This group meets Wed nights at 8:30pm for a great time and rag chew.

World Wide Net - DMR

Talk Group 91 - Saturday 11:00am: Alex mentioned there is a *World-Wide Net* on talk group 91 every Saturday. The net begins at 11:00am and gets around to North American for check-ins around 1400

2021 Hamfest;

The EPARA Hamfest will be held on September 26th 2021. It will open at 0800. Walt asked if all members participating could arrive by 0500. He then spoke about job assignments, necessary equipment and available cash needed to operate the drink concessions and ticket sales. If anyone needs additional information, they can contact Walt – W3FNZ at 570/350-1185. We will also be offering a VE session at the Hamfest, to those that are interested.

Any Other Old Business:

At this time there was no old business

New business:

Votes / New members:

We had one new member voted in tonight. Dave – KA2TSM. It was unanimous. EPARA welcomes its newest member.

Club Hats and Shirts:

Kevin – W3KCF presented the new hats available to club members. They come in 3 colors (Blue/Gray/Khaki) and have our club logo on the front and your call sign on the back. The hats will be available for $20.00 to all those interested.

Kevin also showed pictures of the shirts we will be wearing at the Hamfest. The front will have the club logo and the back will have EPARA/Hamfest/Staff on it. The T-Shirts are blue with a gold logo on front and gold lettering on the back. The cost is $12.00 per shirt.

The 50/50 raffle contained $62.00 and was won by Pete – KB3YKJ

Adjournment…

Meeting was adjourned at 8:45 pm Motion to close by Pete – KB3YKJ 2nd by Bob – W3BMM. Motion Passed

Secretary
Kevin Forrest
W3KCF


ZOOM
MEETING

To: All EPARA Members and Users of the WA3MDP Repeater System

Re: The 147.045 Repeater Malicious Interference

Over the past few years the 147.045 repeater here in Monroe County has been plagued with an increasing amount of deliberate and malicious interference. While some of this interference has been directed at some specific operators the end results has been a wide area large foot print repeater that get little to no use except for a few regularly scheduled nets.

This is not a problem that is special to just the 147.045 system. Nationwide FM repeaters (and HF bands for the matter) are also being interfered with deliberately and the FCC lacks the manpower and ability to search out the people causing the issues.

The ARRL in conjunction with the FCC reorganized the Volunteer Monitor program a while back to assist in tracking down QRM on all of the amateur bands. While some progress has been made there obviously is a lot more to be done.

A small dedicated group has been tracking the QRM locally by various means for over a year. While some of the sources have been narrowed down it is now time to get the rest of the local ham community involved.

What we are asking people to do is when you listen to the 147.045 repeater also listen to the "input" frequency which is 147.645 (no tone is required). If you should hear any of the malicious and deliberate QRM occurring, do the following:

1) DO NOT ENGAGE IN A CONVERSATION WITH THESE INDIVIDUALS.

2) If you hear farting, cat calls, high pitch cartoon voices, music, etc write down the DATE, TIME, YOUR LOCATION and APPROX STRENGTH OF THE QRM STATION. If you have a beam antenna and can provide a heading that would be great too!

3) Send your listening report to the email address LIDSonzero45@gmail.com.

ALL information will be kept confidential and with this added information we hope to narrow down the locations that have already been identified.

In closing let me assure you that the people looking for the sources of the interference are doing so with the blessing of the repeater owners. It is our desire to see the 147.045 repeater system return to the quality repeater that it used to be many years ago.

Thank you in advance for your cooperation.

VE Testing & Classes

Anyone looking to take an exam is encouraged to contact Chris AJ3C to preregister at least one (1) week in advance of the test date. If you have any questions or to register, Chris can be reached via email AJ3C@GMX.COM. VE sessions are being held the 4th Friday of each month at 6pm at the Monroe County 911 training center. Seating is limited for the time being so we can follow the health guidelines set forth by the county and state.

VE sessions are back - contact Chris AJ3C for further information!

AMATEUR RADIO CLASSES

ARES/RACES meetings are now being held on the fourth Friday of each month at 7PM. The meetings are once again being held at the 911 call center. These meetings will serve as training sessions covering several aspects of amateur radio emergency communications. We will start with traffic handling and the use of Radiograms and the ICS 213 general message form. Future sessions will cover the use of several ICS forms and the setup and use of digital communication modes including Winlink, Packet Radio, APRS, and the FLDIGI software program. Meeting are open to all, you do not need to be an ARES/RACES team member to attend.

Don't forget to sign up with with ARES Connect if you haven't done so already and if you plan to attend the meeting or check-in to the weekly net remember to register you attendance on the ares connect page. To sign please use this link: https://arrl.volunteerhub.com/lp/epa

Want to Put Your Ham Radio Skills to Good Use? Get Involved in

EmComm!

One of the missions of the Amateur Radio Service is for amateur radio operators to provide public service and emergency communications (EmComm) when needed. We act as a voluntary noncommercial communication service and pitch in to help our communities and first responders.

So, what organizations are out there for community-minded amateur radio operators and what can we do to help?

Join In

One good entry point into public service and emergency communications is to join SkyWarn, a volunteer program run by the National Weather Service (NWS) with more than 290,000 trained severe weather spotters. These volunteers help keep their local communities safe by providing timely and accurate reports of severe weather to the NWS.

Not all of these weather spotters are amateur radio operators, but many are. Amateur radio communications can report severe weather in real time. When severe weather is imminent, SkyWarn spotters are deployed to the areas where severe weather is expected. A net is activated on a local repeater and SkyWarn spotters who are Hams check into that net. The net control advises the spotters when they might expect to see severe weather, and the spotters report conditions such as horizontal winds, large hail, rotating clouds, and even tornadoes.

To become a SkyWarn spotter, you must attend a class that teaches you the basics of severe weather, how to identify potentially severe weather features, and how to report them. The classes are free and typically last about two hours. Check your local NWS website for class schedules.

ARES/RACES/CERT

Another way Hams can become involved in public service and emergency communication is to join an ARES or RACES group. Technically, these are two separate services—the Amateur Radio Emergency Service (ARES) is run by the ARRL, while the Radio Amateur Civil Emergency Service (RACES) is a function of the Federal Emergency Management Agency (FEMA). Amateur radio operators who typically take part in one also take part in the other.

To participate in RACES, you'll need to take some self-study FEMA courses in emergency preparedness and emergency-response protocols. Classes may or may not be required to participate in ARES. These requirements are set by each individual ARES group. To get involved with either ARES or RACES, ask your local club members when they meet. You can also contact the Section Manager or Emergency Coordinator for your ARRL section. To contact them, click here and find the section that you live in.

Amateur radio operators belonging to ARES (and its predecessor, the Amateur Radio Emergency Corps) have responded to local and regional disasters since the 1930s, including the 9/11 attacks, and Hurricane Katrina and Hurricane Michael, among others.

The Community Emergency Response Team (CERT) program trains volunteers—both Hams and non-hams—how to be prepared for disasters that may impact their area. They provide basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. CERT offers a nationwide approach to volunteer training and organization that first responders can rely on during disaster situations, allowing them to focus on more complex tasks.

What Gear Do You Need?

For most local needs, a 5-watt VHF/UHF handheld transceiver is sufficient for utilizing local repeaters to relay messages and report on conditions as they exist. Replacing the radio's stock antenna with a higher gain antenna or connecting it to a magnetic mount on a vehicle will increase range significantly.

Even better is a VHF/UHF mobile radio installed in your vehicle with 25 or more watts output and a good mobile antenna. In the event the repeater loses power, you can talk over a considerably larger area in simplex mode with the extra power and a good mobile antenna.

If you work with an ARES or RACES group, you may be asked to act as a county control station. In this capacity, you'd need both HF and VHF transceivers in a fixed location, such as your house, with a good antenna system and emergency power capabilities like a generator or batteries. This allows you to make contacts within your state and throughout the U.S.

Helping Hams

Ham radio can play a key role in emergency situations. Here are a few examples:

- Ham radio connected firefighters and police departments, Red Cross workers, and other emergency personnel during the 2003 blackout that affected the northeast United States.
- In 2017, fifty amateur radio operators were dispatched to Puerto Rico to provide communications services in the wake of Hurricane Maria.
- Amateur radio operators provided communications in the aftermath of the Boston Marathon bombing when cellphone systems became overloaded.

- During Hurricane Katrina, more than one thousand ARES volunteers assisted in the aftermath and provided communications for the American Red Cross.
- During the devastating Oklahoma tornado outbreak that began in May 1999, amateur radio operators—giving timely ground-truth reports of severe weather—played a critical role in the warning and decision-making processes at the NWS Weather Forecast Office in Norman, Oklahoma.
-
-

Credit: https://www.onallbands.com/want-to-put-your-ham-radio-skills-to-good-use-get-involved-in-emcomm/

Monroe County Office of Emergency Management

100 Gypsum Road
Stroudsburg, PA 18360
EMAIL - mcoem@monroecountypa.gov
570-992-4113 Fax 570-402-7358

FACEBOOK - www.facebook.com/MCPAOEM

ICS-300: Incident Command for Expanding Incident and Supervisors

FSC: 0509

Hours: *24 (Lecture: 11.0hrs / Lab: 13.0hrs)*

Prerequisites: Age 16 and up, ICS – 200, or NIMS ICS for the Fire Service, or NIMS ICS for Emergency Medical Service

Description: This course is designed to provide overall incident management skills rather than tactical expertise. The course will cover the implementation of the incident management process on Type 3 incidents; define a Type 3 incident, and the development of an Incident Action Plan. Determining capabilities to match Incident complexity will be discussed. When and how to add appropriate ICS positions to match the complexity of the incident will be explored. The use of Incident Management Teams will be discussed.

Cost: None

Class Size Limited: 25 Participants

Instructor: Mark Nalesnik

Course Date & Times:

Tuesday Oct. 12th, 2021	*18:00-22:00*
Wednesday Oct. 13th, 2021	*18:00-22:00*
Saturday Oct. 16th, 2021	*08:00-16:00*
Sunday Oct. 17th 2021	*08:00-16:00*

Registration Deadline: *Friday Oct. 8th, 2021*

Course Location:

Monroe County Public Safety Center
100 Gypsum Road
Stroudsburg PA 18360

Contact to register

Brad Harrison

570-992-4113

Or e-mail

bharrison@monroecountypa.gov

Monroe County Office of Emergency Management

100 Gypsum Road
Stroudsburg, PA 18360
EMAIL - mcoem@monroecountypa.gov
570-992-4113 Fax 570-402-7358

FACEBOOK - www.facebook.com/MCPAOEM

ICS-400: Incident Command for IC & General Staff for Complex Incidents

FSC: 0511

Hours: *16.0 (Lecture: 7.5hrs / Lab: 8.5hrs)*

Prerequisites: Age 16 and up, ICS – 300

Description: This course is designed to provide overall incident management skills rather than tactical expertise. This course will discuss how major incidents pose special management challenges. It will explore the circumstances in which an Area Command is established and describes the circumstances in which multi-agency coordination systems are established. This course is designed for senior personnel who are expected to perform in a management capacity in an Area Command or multi-agency coordination system.

Cost: None

Class Size Limited: 25 Participants

Instructor: Mark Nalesnik

Course Date & Times:

Saturday Nov. 20th, 2021 08:00-16:00
Sunday Nov. 21st 2021 08:00-16:00

Registration Deadline: *Friday Nov. 19th, 2021*

Course Location:

Monroe County Public Safety Center
100 Gypsum Road

Stroudsburg PA 18360

Contact to register

Brad Harrison

570-992-4113

Or e-mail

bharrison@monroecountypa.gov

From the Editor

Eric, N3SWR

I hate to admit it but I'm actually at a loss for words to type here at the moment. This is typically the last section I fill out before things are finalized and I create the final PDF version of this newsletter. Moving along..... :)

The hamfest was a complete success in my eyes. I'm sure we could nitpick it but what's the point? We all learned a bunch from the experience and I do know that planning is already going on behind the scene for next years event. And lets be honest here too - would you rather park cars instead - NO!

I talked to many folks and reconnected with those that I missed for months - that part right there was nice, even if I didn't buy a single item there. My wife Faith W3INK also had a blast and made some friends along the way.

Someone asked me - and I apologize since I can't remember who you are - about the older EPARA Beacon newsletter. Remember that?? Well it just happens I do have a copy from October 2017. I included it at the very end of this edition so you can truly see where the club has gone because it has definitely grown. You all have yourselves to thank for that. It's no lie that its been hard work and the efforts are paying off. Again, THANKS TO ALL for making our club what it is today! Now go have a good look at the BEACON and compare :)

Till next month, 73

Eric N3SWR

"Failure is an option here. If things aren't failing, you aren't innovating enough."
- Elon Musk

Topics of Interest

Have an idea you would like to share with your fellow hams? Interested in one of the new exotic digital modes and would like to get others interested in it too? Found a blog somewhere that you think others would find interesting? Members are encouraged to submit items of interest for publication. Submitted articles (are suggested) to be no more than a page or two in length and may be edited for content and grammar. The EPARA officers and newsletter editor reserve the right to determine which items will be included in The Beacon. The deadline for publication is the 15th of the month. The publication date will be at the end of each month. Copyrights are the property of their respective owners and their use is strictly non-profit/educational and intended to foster the spirit of amateur radio.

If you've taken pictures at an event and would like to submit them for possible inclusion in the newsletter, forward them to the newsletter editor. Please send action shots, if possible. Faces are often preferable over the backs of heads. Many hams may be way too overweight, so please consider using a wide-angled lens.

Disclaimer

The Beacon is not representative of the views or opinions of the whole organization, and such views and opinions expressed herein are of the individual author(s).

Bruce Draper, AA5B, aa5b.corral@gmail.com

Contest Corral

October 2021

Check for updates and a downloadable PDF version online at **www.arrl.org/contest-calendar**.
Refer to the contest websites for full rules, scoring information, operating periods or time limits, and log submission information.

Start - Finish				Bands	Contest Name	Mode	Exchange	Sponsor's Website
Date	Time	Date	Time					
2	0600	3	0600	1.8-28	Oceania DX Contest, Phone	Ph	RS, serial	www.oceaniadxcontest.com
2	0600	3	1800	3.5-28	TRC DX Contest	CW Ph	RST, serial, "TRC" if member	trcdx.org/rules-trc-dx
2	0700	2	1000	3.5, 7	German Telegraphy Contest	CW	RST, LDK (if member)	agcw.de/index.php/en
2	1200	3	1159	1.8-28	Russian WW Digital Contest	Dig	RST(Q), oblast code or serial	www.rdrclub.ru
2	1300	2	1330	144	Two-Meter Classic Sprint	CW Ph	Serial, 4-char grid square	fwrc.info/2021/05/21
2	1600	3	1100	3.5, 7	International Hell-Contest	Dig	RST, serial	darc.de/der-club/referate/conteste
2	1600	3	2200	1.8-28	California QSO Party	CW Ph	Serial CA county or SPC	www.cqp.org/Rules.html
2	1800	3	1800	All	SKCC QSO Party	CW	RST, SPC, name, 4-char grid	www.skccgroup.com
3	0500	3	2300	3.5-28	RSGB DX Contest	CW Ph	RS(T), serial	www.rsgbcc.org/hf
3	0600	3	0900	3.5	UBA ON Contest, SSB	Ph	RS, serial, ON Section (if ON)	uba.be/en/hf/contest-rules
3	2200	3	2359	3.5-14	Peanut Power QRP Sprint	CW Ph	RS(T), SPC, peanut nr or power	nogaqrp.org/PeanutPower
4	1900	4	2030	3.5	RSGB 80-Meter Autumn Series, CW	CW	RST, serial	www.rsgbcc.org/hf
5	0100	5	0300	3.5-28	ARS Spartan Sprint	CW	RST, SPC, power	arsqrp.blogspot.com
6	1700	6	2000	144	VHF-UHF FT8 Activity Contest	Dig	4-char grid square	ft8activity.eu/index.php/en
6	1900	6	2300	432	432 MHz Fall Sprint	CW Ph Dig	4-char grid square	svhfs.org
6	2000	6	2100	3.5	UKEICC 80-Meter Contest	Ph	6-char grid square	ukeicc.com/80m-rules.php
7	1700	7	2000	3.5	SARL 80-Meter QSO Party	Ph	RS, serial, grid locator	www.sarl.org.za
7	1700	7	2100	28	NRAU 10-Meter Activity Contest	CW Ph Dig	RS(T), 6-char grid	nrrlcontest.no
7	1900	7	2100	1.8-50	SKCC Sprint Europe	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
8	1400	9	0200	All	YLRL DX/NA YL Anniversary Contest	CW Ph Dig	Serial, RS(T), SPC	ylrl.org/wp/dx-na-yl-contest
9	0000	9	2359	1.8-28	QRP ARCI Fall QSO Party	CW	RST, SPC, mbr or power	qrparci.org
9	0000	10	1559	3.5-28	Makrothen RTTY Contest	Dig	4-char grid square	www.pi259.org/makrothen
9	0300	10	2100	1.8-UHF	Nevada QSO Party	CW Ph Dig	RS(T), NV county or ARRL section	nvqso.com/contest-rules
9	0600	10	0600	1.8-28	Oceania DX Contest, CW	CW	RST, serial	www.oceaniadxcontest.com
9	0800	9	1400	902 and up	Microwave Fall Sprint	CW Ph Dig	6-char grid square	svhfs.org
9	1200	10	1200	3.5-28	Scandinavian Activity Contest, SSB	Ph	RST, serial	www.sactest.net
9	1200	10	2359	1.8-50	SKCC Weekend Sprintathon	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
9	1500	10	0500	1.8-144	Arizona QSO Party	CW Ph Dig	RS(T), AZ county or SPC	www.azqp.org
9	1600	10	0400	144-432	Cosack's Honor VHF/UHF Contest	CW Ph Dig	RS(T), serial, 6-char grid	cshonor-vhf.ho.ua/eng1.html
9	1600	10	2200	1.8-UHF	Pennsylvania QSO Party	CW Ph	Serial, PA county or ARRL section	paqso.org
9	1800	10	1800	1.8-144	South Dakota QSO Party	CW Ph Dig	RS(T), SD county or SPC	www.sdqsoparty.com
9	2000	10	2000	1.8	160-Meter Great Pumpkin Sprint	Dig	RST, SPC	www.podxs070.com
10	0001	10	2359	28	10-10 International 10-10 Day Sprint	CW Ph Dig	Name, mbr or "0," SPC	www.ten-ten.org
10	0600	10	0900	3.5	UBA ON Contest, CW	CW	RST, serial, ON Section (if ON)	uba.be/en/hf/contest-rules
11	0000	11	0200	1.8-28	4 States QRP Second Sunday Sprint	CW Ph	RS(T), SPC, mbr or power	www.4sqrp.com
13	0030	13	0230	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or power	naqcc.info
13	1700	13	2000	432	VHF-UHF FT8 Activity Contest	Dig	4-char grid square	ft8activity.eu/index.php/en
13	1900	13	2030	3.5	RSGB 80-Meter Autumn Series, Data	Dig	RST, serial	www.rsgbcc.org/hf
16	0000	17	2359	3.5-28	JARTS WW RTTY Contest	Dig	RST, age of operator	jarts.jp/rules2021.html
16	0001	17	2359	28	10-10 International Fall Contest, CW	CW	Name, mbr or "0," SPC	www.ten-ten.org
16	1400	17	0200	All	New York QSO Party	CW Ph Dig	RS(T), NY county or SPC	www.nyqp.org
16	1500	17	1459	3.5-28	Worked All Germany Contest	CW Ph	RS(T), DOK or "NM" or serial	darc.de/der-club/referate/conteste
16	2000	16	2359	1.8-7, 21-50	Feld Hell Sprint	Dig	RST, mbr, SPC, grid	sites.google.com/site/feldhellclub
16	2130	16	2230	7	Argentina National 7 MHz Contest	Ph	RS, 2-digit year first licensed	www.lu4aa.org
17	0000	17	0200	14, 21	Asia-Pacific Fall Sprint, CW	CW	RST, serial	jstc.org/apsprint
17	0700	17	1000	144	UBA ON Contest, 2 Meters	CW Ph	RS(T), serial, ON Section (if ON)	uba.be/en/hf/contest-rules
17	1700	18	0100	1.8-144	Illinois QSO Party	Ph	RS(T), IL county or SPC	www.w9awe.org/ilqp
17	1900	17	2030	3.5	RSGB RoLo CW	CW	RST, previous 6-char grid received	www.rsgbcc.org/hf
17	2300	18	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or power	qrpcontest.com/pigrun
18	1300	22	2359	All	ARRL School Club Roundup	CW Ph	RS(T), Class (I/C/S), SPC	arrl.org/school-club-roundup
18	1900	18	2030	3.5-14	RSGB FT4 Contest Series	Dig	4-char grid square	www.rsgbcc.org/hf
20	1900	20	2030	3.5	AGCW Semi-Automatic Key Evening	CW	RST, serial, year first used a bug	alt.agcw.de/index.php/en
23	0000	24	2359	2.3 GHz and up	ARRL EME Contest	CW Ph Dig	Signal report	arrl.org/eme-contest
23	1200	24	1200	3.5-28	UK/EI DX Contest, SSB	Ph	RS, serial, District Code (if UK/EI)	ukeicc.com/dx-contest-rules.php
23	1500	24	1500	1.8	Stew Perry Topband Challenge	CW	4-char grid square	www.kkn.net/stew
24	0000	24	0400	3.5-14	North American SSB Sprint Contest	Ph	Other's call, your call, serial, name, SPC	ssbsprint.com/rules
24	1400	27	0800	1.8-144	Classic Exchange, CW	CW	Name, RST, SPC, radio model	www.classicexchange.org
24	1800	26	0300	1.8-UHF	Telephone Pioneers QSO Party	CW Ph Dig	Chapter nr or RS(T), name	www.tpqso.com
27	0000	27	0200	1.8-50	SKCC Sprint	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
27	2000	27	2100	3.5	UKEICC 80-Meter Contest	CW	6-char grid square	ukeicc.com/80m-rules.php
28	1900	28	2030	3.5	RSGB 80-Meter Autumn Series, SSB	Ph	RS, serial	www.rsgbcc.org/hf
29	1600	29	2359	3.5-14	Zombie Shuffle	CW	RST, SPC, Zombie nr or area code, name	www.zianet.com/qrp
30	0000	31	2359	1.8-28	CQ Worldwide DX Contest, SSB	Ph	RS, CQ Zone	www.cqww.com

There are a number of weekly contests not included in the table above. For more info, visit: **www.qrpfoxhunt.org**, **www.ncccsprint.com**, and **www.cwops.org**. All dates refer to UTC and may be different from calendar dates in North America. Contests are not conducted on the 60-, 30-, 17-, or 12-meter bands. Mbr = Membership number, Serial = Sequential number of the contact. SPC = State, Province, DXCC Entity. XE = Mexican state. Listings in blue indicate contests sponsored by ARRL or *NCJ*. The latest time to make a valid contest QSO is the minute listed in the "Finish Time" column. *Data for Contest Corral is maintained on the WA7BNM Contest Calendar at* **www.contestcalendar.com** *and is extracted for publication in* QST *2 months prior to the month of the contest. ARRL gratefully acknowledges the support of Bruce Horn, WA7BNM, in providing this service.*

Amateur Radio Special Event Stations!

09/01/2021 | 130 Year Anniversary of the First K.U.K. Telegraphy Course

Sep 1-Oct 30, 0000Z-2359Z, OE130KUK, Kirchberg am Wagram, AUSTRIA EUROPE. ADL 305 Tulln-Stockerau. 160 through 10 meters, CW SSB FT8. QSL. See website, for, information, AUSTRIA EUROPE. In 1891 a k.u.k cavalry telegraphist course was first established in the "Franz Josef-Casern" in Tulln (Lower Austria). In the following years (up to approx. 1917) infantry companies were also stationed in Tulln to learn telegraphy. That was unique in the imperial-royal monarchy Austria-Hungary. k.u.k stands for kaiserliche und königliche Monarchie Österreich-Ungarn. "k.u.k." was the inofficial abbreviation for the Austro-Hungarian Monarchy. www.qrz.com/db/oe130kuk

10/01/2021 | Rochester DX Association 73rd Anniversary

Oct 1-Oct 31, 0001Z-2359Z, W2RDX/73, East Rochester, NY. Rochester DX Association. 14.250. QSL. Chris Shalvoy- K2CS (W2RDX) , 512 Beechwood Dr., East Rochester, NY 14445. Help celebrate the 73rd anniversary of the Rochester DX Association - CW, SSB and Digital modes will be covered on all bands - Please go to RDXA.com for up to date operating and QSL information. Don't forget to enter the New York QSO Party (NYQP) which will be held on 16 October, 2021 - head to NYQP.org for contest rules. Best DX es 73! www.rdxa.com

10/02/2021 | Blount County Amateur Radio Club 35 Year Celebration

Oct 2-Oct 5, 1800Z-2300Z, W4BLT, Alton, AL. Blount County Amateur Radio Club. 21.370 14.270 7.275 3.870. QSL. Daryl Isbell, W4DAI, P.O. Box 51, Alton, AL 35015. Please include an SASE. www.w4blt.org

10/02/2021 | Lester Dent - Doc Savage Special Event

Oct 2-Oct 3, 1500Z-2359Z, W0D, Macon, MO. Macon County Amateur Radio Club. 14.250 7.200. Certificate. Dale Bagley, 1402 Eastern Dr., Macon, MO 63552. the Macon County Amateur Radio Club will operate the Lester Dent-Doc Savage Special Event W0D, in Macon, MO. The purpose of the Special Event is to honor of the accomplishments of Lester Dent, one of the most prolific writers of Pulp Fiction, and an Amateur Radio Operator. It is also the creation of his creation, the first "Superhero" Doc Savage. A colorful certificate will be provided to those that contact the Special Event Station and send a QSL including a # 10 SASE to the Macon County Amateur Radio Club, PO Box 13, Macon, MO 63552. dbagley@cvalley.net

10/02/2021 | World's Largest Horseshoe Crab Roadside Attraction

Oct 2, 1400Z-2000Z, K8HO, Hillsboro, OH. Highland Amateur Radio Association. 7.220 14.220. Certificate. Highland Amateur Radio Association, 21 Highland Drive, Hillsboro, OH 45133. highlandara@gmail.com

10/03/2021 | 2021 Yankee Steam-Up

Oct 3, 1300Z-2000Z, N1EPJ, East Greenwich, RI. Massie Wireless Club. 3.825 7.25 14.258 14.058. QSL. Massie Wireless Club N1EPJ, P.O. Box 883, East Greenwich, RI 02818. Special Event: Sunday, October 3, 2021, New England Wireless & Steam Museum Yankee Steam-Up. The Massie Wireless Club will activate call sign N1EPJ to commemorate Steam-Up Day, an annual event for over 50 years. For QSL, send a SASE to: Massie Wireless Club N1EPJ, P.O. Box 883, East Greenwich, RI 02818. Suggested CW frequencies: 3.558, 7.058, and 14.058. Suggested SSB frequencies: 3.825, 7.25, and 14.258. Operating from morning to late afternoon (13:00 - 20:00 UTC). Check the museum website (http://www.newsm.org)and QRZ page for updated details. NEWSM.ORG

10/03/2021 | Fire Prevention Week Special Event

Oct 3-Oct 9, 0000Z-2359Z, N0F-N9F+, East Hanover, NJ. Siemens Fire Safety USA Amateur Radio Club. 212.5 14.225 7.175 3.800. Certificate & QSL. Siemens Fire Safety USA Amateur Radio

Amateur Radio Special Event Stations!

Club, 8 Fernwood Road, East Hanover, NJ 07936. Promoting fire safety during the annual Fire Prevention Week. 12 stations including N0F-N9F plus bonus stations KF2IRE and VA3FIRE. Certificate for working any 10 of the 12 stations.All bands, all modes. Watch for spots. hamfire.com
10/03/2021 | National Royal Rangers Week

Oct 3-Oct 9, 1800Z-2200Z, KD9FDH, Madison, IN. Royal Rangers Amateur Radio Club. 28.435. Certificate & QSL. Jerry Barnes, 601 Spring Street, Madison, IN 47250. See us on Facebook KD9FDH Royal Rangers Amateur Radio Club and on QRZ. wjbarnes@cinergymetro.net or www.qrz.com/db/kd9fdh

10/04/2021 | Senator Barry M. Goldwater Memorial and AZ QSO Party

Oct 4-Oct 9, 1500Z-2100Z, K7UGA, Chandler, AZ. Central Arizona DX Association. All bands, all modes. QSL. Bob Davies, K7BHM, 1623 N. Los Altos Ct., Chandler, AZ 85224. Five-day Special Event leading up to AZQP. www.cadxa.org
10/09/2021 | 200th Anniversary of the Santa Fe Trail.

Oct 9, 1500Z-2000Z, KS0KS, Olathe, KS. Sant Fe Trail Amateur Radio Club. 7.280 10.118 14.280 18.080. QSL. SFTARC, P.O. Box 3144, Olathe, KS 66063. Operating from Lone Elm Park at the site of the original Lone Elm Campground that served travelers on the Santa Fe, California and Oregon Trails in the 1800s. sftarc.org
10/09/2021 | Get Your Park ON! Celebrating Earth Science Week

Oct 9-Oct 17, 0000Z-2359Z, many 1x1s, worldwide. US Affiliate (KFF), Worldwide Flora and Fauna. All bands, all modes. Certificate & QSL. See QRZ.com, for , information. Check WWFF website for a list of participating calls, including N2G, N4G, K5G, N5G, N6G, N9G, K8P, N0M. QRZ.com or www.wwff.us
10/09/2021 | Joplin Hamfest / Tailgater

Oct 9, 1300Z-1800Z, W0IN, Joplin, MO. Joplin Amateur Radio Club, Inc.. 147.210. QSL. Joplin ARC, Inc, P.O. Box 2983, Joplin, MO 64803-2983. jimjohannes@sbcglobal.net
10/09/2021 | USS Midway Museum Ship Special Event: US Navy Birthday

Oct 9, 1600Z-2300Z, NI6IW, San Diego, CA. USS Midway (CV-41) Museum Ship. 14.320 7.250 PSK and CW on various HF bands DSTAR on various reflectors. QSL. USS Midway Museum Ship COMEDTRA, 910 N Harbor Drive, San Diego, CA 92101. Please check spotting networks to find us on HF. Consult www.dstarusers.org to find our call sign NI6IW and Reporting Note to see what reflector we're using. Note: Typical QSL turn-around time is 4 to 6 weeks after receiving request with SASE. www.qrz.com/db/ni6iw
10/09/2021 | WWI Code Talker Commemoration

Oct 9-Oct 11, 1400Z-0200Z, W5D, Tuskahoma, OK. Vm Okla Nan Ola ARC. PSK31: 7.070, 14.070, 21.070; LSB: 7.218; USB: 21.318 14.318 . Certificate. WI5ND Attn: Holly Sharrock KG5SSJ, 12715 N 410 Road, Hulbert, OK 74441. https://www.facebook.com/Vm-Okla-Nan-Ola-104220878292184/ or https://www.qrz.com/db/wi5nd
10/16/2021 | Fort Massac Encampment Honoring Fort Massac Heritage

Oct 16-Oct 17, 2200Z-1700Z, W9DUE, Metropolis, IL. Massac County Amateur Radio Club. All bands, all modes. QSL. Massac County ARC, P.O. Box 5, Metropolis, IL 62960. https://www.facebook.com/groups/151861769202256
10/16/2021 | JOTA/JOTI

Oct 16, 1300Z-1900Z, W1M, Russell, MA. Western Mass Council--BSA. 7.060 7.250 14.060 14.250. QSL. Tom Barker, 329 Faraway Road, Whitefield, NH 03598. Worldwide scouting event in which young people use ham radio to connect with each other. W1M will also be on BrandMeister TG 907. Paper logging, eqsl and postal sase for qsl. This event is about spending time letting young people talk on the radio. It is not a contest. W1M is a portable station in a rustic camp setting.

Amateur Radio Special Event Stations!

10/16/2021 | Yorktown Surrender Day Event

Oct 16, 1400Z-2000Z, K4RC, Williamsburg, VA. Williamsburg Area Amateur Radio Club. 14.265 7.265. Certificate & QSL. QSL Manager, P.O. Box 1470, Williamsburg, VA 23187. 240th anniversary of the British surrender to the joint American and French forces in Yorktown, VA, ending the American Revolutionary War on October 19, 1781. K4RC.net

10/17/2021 | Shenandoah National Park Special Event

Oct 17-Oct 23, 0600Z-0600Z, W4DO, Charlottesville, VA. Albemarle Amateur Radio Club. 7.240 14.300. Certificate & QSL. AARC - SNP Special Event, P.O. Box 6833, Charlottesville, VA 22906. This special event will activate numerous overlooks and summits spanning the length of Shenandoah National Park. Participants are encouraged to make contact with all of the stations for a clean sweep and certificate. https://www.albemarleradio.org

10/22/2021 | 100th Anniversary of the 1921 hurricane, the last to directly hit Tampa Bay

Oct 22-Oct 24, 1400Z-2359Z, N4H, Tarpon Springs, FL. Upper Pinellas Amateur Radio Club. 14.265 7.265 14.074 7.074. Certificate & QSL. UPARC - QSL, P.O.. Box 1684, Tarpon Springs, FL 34688. See Website for details. w8rd.net/hurricane

10/22/2021 | Deer Island MS 0115 - US Islands Awards Program - Expedition

Oct 22-Oct 25, 2000Z-2000Z, K5D, Gautier, MS. The Jackson County Amateur Radio Association, Inc.. 14.250 to 14.260 MHz 7.250 MHz 21.350 Mhz. QSL. The Jackson County Amateur Radio Association, PO Box 234, Gautier, MS 39553. Activate Deer Island, MS 0115 under US Islands Awards Program

10/22/2021 | Mickey Mantle Day

Oct 22-Oct 24, 0000Z-2300Z, W5M, Spavinaw, OK. Mayes County Amateur Radio Club. 3.850 7.240 14.285. QSL. Mayes County ARC, PO Box 1195, Pryor, OK 74361. Sixth Annual Mickey Mantle Day. Honoring the birth of baseball legend Mickey Mantle from his birthplace, Spavinaw, Oklahoma. See www.qrz.com/db/wx5mc or www.mcarc.me

10/23/2021 | Historic Beaumont Hotel Special Event

Oct 23, 1400Z-2100Z, W0T, Beaumont, KS. Flint Hills Amateur Radio Club. 14.275 +/-. QSL. Wayne Schlueter, 1320 Elm, Andover, KS 67002. 9AM to 4PM CDT. Beautiful, historic Beaumont Hotel, Kansas. Pilots fly in on a grass strip and taxi down to main street for dinner! Event is at the towns depot. See QRZ page W0T. SASE requested. FHARC.org

10/30/2021 | Remembering the Edmund Fitzgerald (Split Rock Lighthouse)

Oct 30-Oct 31, 1500Z-2355Z, W0JH, Split Rock, MN. Stillwater, MN Amateur Radio Association - SARA. 21.360 14.260 7.260 3.860. Certificate. Certificate by email only, Confirm QSO at , SplitRock2021@radioham.org . Certificates will ONLY be sent via email in PDF. Confirm QSOs via . W0JH Stations operating from ARLHS (Amateur Radio Lighthouse Society USA 783) and POTA (Parks On The Air K-2524). Grid Square: EN47 radioham.org

10/31/2021 | A Night on Bald Mountain

Oct 31-Nov 1, 0300Z-0400Z, WA4TRS, Bat Cave, NC. The Road Show Amateur Radio Club, Inc.. 28.380 14.331 7.331. Certificate & QSL. The Road Show Amateur Radio Club, Inc, 57 Echo Lake Drive, Fairview, NC 28730. Join The Fun From The "Yard" The Graveyard that is, We even have "Guest Accommodations" Just for YOU! roadshowarc.org

10/31/2021 | Boo to You !

Oct 31-Nov 1, 0001Z-0400Z, KC5BOO, Cleburne, TX. Club KC5NX. 14.310. QSL. Judy Cox, 3701 Park Rd 21, Cleburne, TX 76033. kc5boo@yahoo.com

6HF5 Beam Power Amplifier

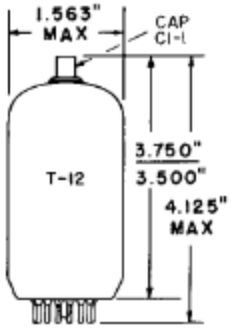
The 6HF5 is a beam-power pentode in the 12 pin compactron construction. It is designed primarily for use as the horizontal-deflection amplifier in color television receivers. This tube was used in Swan Amplifiers.

6HF5

TUNG-SOL

PENTODE

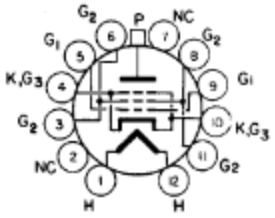
COMPACTRON



GLASS BULB
BUTTON 12 PIN BASE E 12-74
OUTLINE DRAWING
JEDEC 12-89

BEAM PENTODE
FOR
HORIZONTAL-DEFLECTION
AMPLIFIER APPLICATIONS
IN TELEVISION RECEIVERS

COATED UNIPOTENTIAL CATHODE
ANY MOUNTING POSITION



BOTTOM VIEW
BASING DIAGRAM
JEDEC 12 FB

THE 6HF5 IS A BEAM-POWER PENTODE IN THE 12 PIN COMPACTRON CONSTRUCTION. IT IS DESIGNED PRIMARILY FOR USE AS THE HORIZONTAL-DEFLECTION AMPLIFIER IN COLOR TELEVISION RECEIVERS.

DIRECT INTERELECTRODE CAPACITANCES
WITHOUT EXTERNAL SHIELD

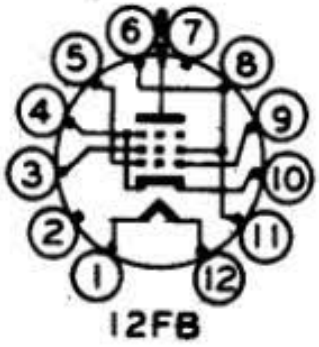
GRID 1 TO PLATE (G1 TO P)	0.56	pf
INPUT: G1 TO (H + K + G2 + G3)	24	pf
OUTPUT: P TO (H + K + G2 + G3)	10	pf

HEATER CHARACTERISTICS AND RATINGS

AVERAGE CHARACTERISTICS	6.3 VOLTS	2.25	AMPS.
LIMITS OF APPLIED VOLTAGE-AC OR DC		6.3 ± 0.6	VOLTS
HEATER-CATHODE VOLTAGE:			
HEATER POSITIVE WITH RESPECT TO CATHODE			
DC COMPONENT		100	VOLTS
TOTAL DC AND PEAK		200	VOLTS
HEATER NEGATIVE WITH RESPECT TO CATHODE			
TOTAL DC AND PEAK		200	VOLTS

CONTINUED ON FOLLOWING PAGE

TUNG-SOL ELECTRIC INC., ELECTRON TUBE DIVISION, BLOOMFIELD, NEW JERSEY, U.S.A., NOVEMBER 1, 1961 PLATE #6819



6HF5 Beam Power Amplifier

6HF5

TUNG-SOL

CONTINUED FROM PRECEDING PAGE

MAXIMUM RATINGS

DESIGN MAXIMUM RATINGS - SEE EIA STANDARD RS-239

DC PLATE-SUPPLY VOLTAGE - BOOST + DC POWER SUPPLY	990	VOLTS
PEAK POSITIVE PULSE PLATE VOLTAGE - ABSOLUTE MAX. VALUE	7,500	VOLTS
PEAK NEGATIVE PULSE PLATE VOLTAGE	1,100	VOLTS
GRID 2 VOLTAGE	190	VOLTS
PEAK NEGATIVE GRID 1 VOLTAGE	250	VOLTS
PLATE DISSIPATION [A]	28	WATTS
GRID 2 DISSIPATION	5.5	WATTS
DC CATHODE CURRENT	315	MA
PEAK CATHODE CURRENT	1,100	MA
GRID 1 CIRCUIT RESISTANCE	1.0	MEGOHM
BULB TEMPERATURE AT HOTTEST POINT	225	°C

A- IN STAGES OPERATING WITH GRID-LEAK BIAS, AN ADEQUATE CATHODE-BIAS RESISTOR OR OTHER SUITABLE MEANS IS REQUIRED TO PROTECT THE TUBE IN THE ABSENCE OF EXCITATION.

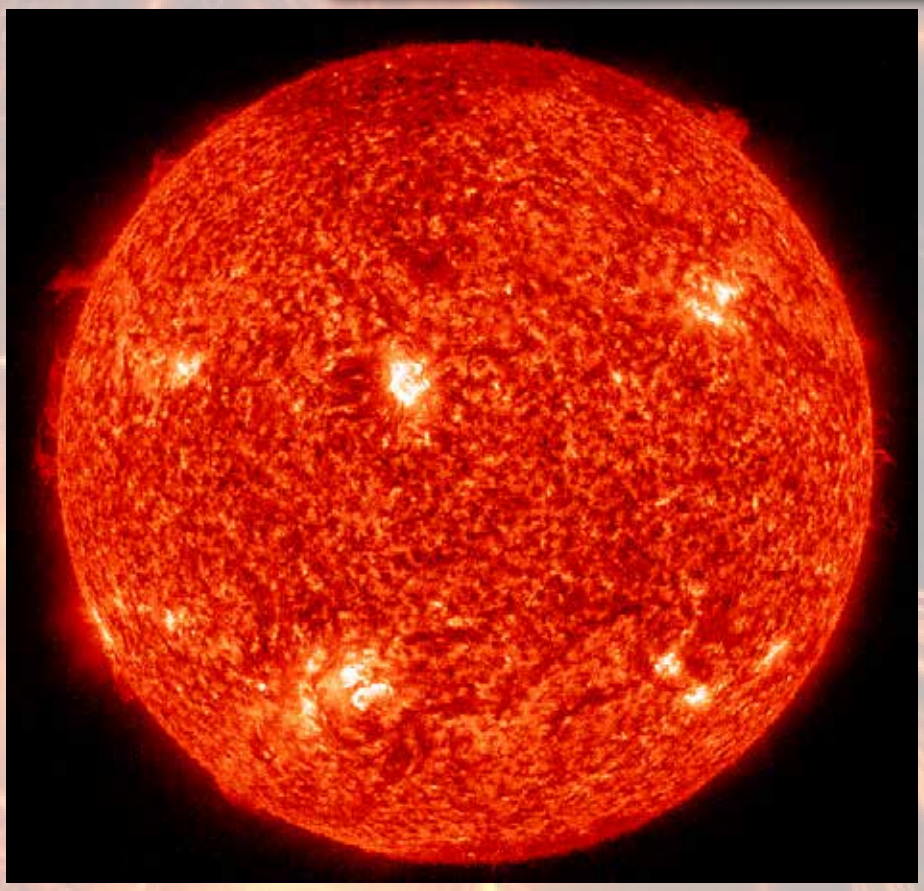
CHARACTERISTICS AN TYPICAL OPERATION

PLATE VOLTAGE	5,000	70	175	VOLTS
GRID 2 VOLTAGE	125	125	125	VOLTS
GRID 1 VOLTAGE	-	0	-25	VOLTS
PLATE CURRENT	-	570 [B]	125	MA
GRID 2 CURRENT	-	34 [B]	4.5	MA
TRANSCONDUCTANCE	-	-	11,300	μMHOS
PLATE RESISTANCE - APPROX.	-	-	5,600	OHMS
GRID 1 VOLTAGE FOR I_b = 1.0 MA-APPROX.	-140	-	-54	VOLTS
TRIODE AMPLICATION FACTOR [C]	-	-	3	

B- VALUES MEASURED BY A METHOD INVOLVING A RECURRENT WAVE FORM SUCH THAT THE PLATE AND GRID 2 DISSIPATIONS WILL BE KEPT WITHIN RATINGS IN ORDER TO PREVENT DAMAGE TO THE TUBE.

C- GRID 2 TIED TO PLATE - E_b = E_{c2} = 125 VOLTS, E_{c1} = -25 VOLTS

K7RA Solar Update



Tad Cook, K7RA, Seattle, reports: Last week, we reported a big increase in activity with the daily sunspot number reaching 124, but by the end of that week all sunspots had disappeared. The sun was blank for several days, but sunspots returned on September 19.

Average daily sunspot numbers this week were 28.7, which was below the 58.3 average reported a week earlier. Average daily solar flux was down by nine points from 87.4 to 78.4.

Geomagnetic indicators were higher, with the highest activity on September 17, when the planetary A index was 24 due to a minor geomagnetic storm triggered by a weak coronal mass ejection. The average daily planetary A index for the week increased from 7 to 9.1, and the average middle latitude A index went from 6.9 to 8.4.

Predicted solar flux for the next month is 90 and 92 on September 24-25; 95 on September 26-29; 92 on September 30; 84 on October 1-5; 82 on October 6; 80 on October 7-8; 78 on October 9-11; 75 on October 12-20; 80 on October 21-22; 82 on October 23-25; 84 and 82 on October 26-27, and 84 on October 28 – November 1.

Predicted planetary A index is 15, 8, and 20 on September 24-26; 35, 20, and 12 on September 27-29; 5 on September 30 – October 3; 8 and 12 on October 4-5; 5 on October 6-9; 12 on October 10; 5 on October 11-17; 8 on October 18-19; 10, 8, and 12 on October 20-22; 10 on October 23-24; 5 on October 25-30, and 8 and 12 on October 31 – November 1.

The autumnal equinox in the Northern Hemisphere occurred at 1920 UTC on September 22. Earth is bathed in approximately equal amounts of solar radiation over the Northern and Southern hemispheres, always a good sign for HF propagation.

Spaceweather.com reported on September 23 that at 0442 UTC, sunspot group AR2871 produced a strong M3 class solar flare. A coronal mass ejection is headed our way but not directly toward earth. “A glancing blow might be possible on September 26-27,” Spaceweather.com said. If so, then the predicted planetary A index of 35 on September 27 may turn out to be a lower number.

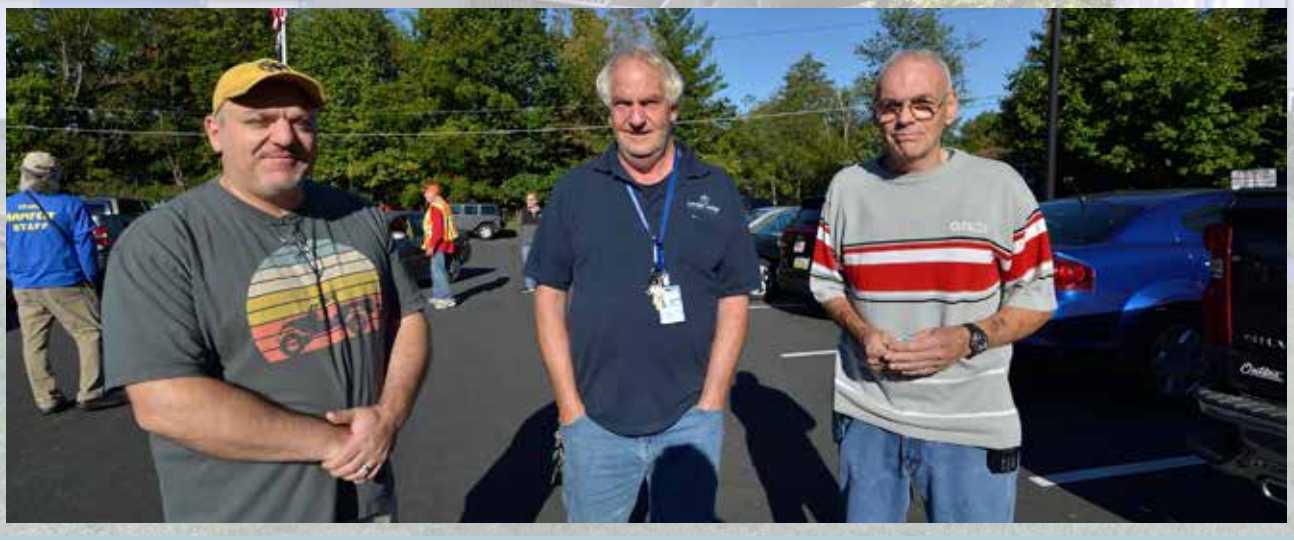
HAMFEST 2021 !!

HAMFEST 2021 !!

HAMFEST 2021 !!

HAMFEST 2021 !!

HAMFEST 2021 !!



HAMFEST 2021 !!


The radio

HOW TO CLEAN VACUUM TUBES

Vacuum means a space without anything in it i.e., a space that is devoid of all. Vacuum tubes revolutionized the world of electronics in the year 1904 when they were first developed by John Ambrose Fleming. Vacuum tubes are essentially a glass tube that has all the gas removed from it. In fact, it is safe to say that the branch of electronics started with the introduction of vacuum tubes. Vacuum tubes are also known as electron tube or valve. Electron tubes such as cathode ray tubes (CRT) were used in TVs for enhancing the display. Vacuum tubes were initially used as switches and amplifiers in various computers and audio devices.
Vacuum tubes control the flow of electrons in a vacuum. Since there is no gas inside the tube it ensures transparency. Vacuum tubes contain electrodes which control the electron flow. Vacuum tubes do the basic job of converting an alternating current in to direct current. Although semiconductor devices have taken over most of the vacuum devices they still play an important role in the field of nanotechnology.

JOHN AMBROSE'S VACUUM TUBE:

The tube consists of an anode and a cathode in a vacuum environment. Most tubes that you will see around normally are generally made of glass or aluminum and are cylindrical in shape and not more than six inches tall.

The basic concept in a vacuum tube is the Edison effect. Thermionic emission is the concept in which the filament heats up in the vacuum because of the current and at the right temperature the electrons are emitted and cross over to the positively charged plate thus completing the circuit. In John's vacuum tube the current flows only in one direction and these have been used to make diodes and logic gates which convert the AC to DC power.

There are many other kinds of vacuum tubes and these include

- **Diodes**
- **Triodes**
- **Tetrode Pentode**
- **Magnetrons**

Triodes have been used as amplifiers which have been helpful in the development of the oscillator. Oscillators bought about a change in how sound comes out of the radios. They are used to filter and amplify the signals which have played an important role in improving the function of clocks, television transmission, microwaves, radars and computers and many more things. Vacuum tubes are the reason that you could see the video images on your TV.

WHAT IS INSIDE THE TUBE?

Cleaning the vacuum tubes is a very delicate business and therefore it is very important that you understand what is inside the tubes that are there on your devices. Only one scientist Lee De Forest invented the Audion Vacuum tube which was similar to the original tube however it could amplify the signal much more sensitively which lead to the first loudspeaker in 1921. The Audion has an added electrode which forms a grid. In the Audion a heated cathode produces the electrons that when passing through the grid (or many) and then strike the anode place where they are absorbed. This means that the small AC signal is converted into larger AC signal. A typical vacuum tube is a glass bulb with wires passing through its bottom which connect to the

grid and electrodes inside. There are many shapes and sizes of vacuum tubes. As the users are expected to change the tubes themselves they are designed in the plug and play design.

- **CATHODE:**
  There are two different types of cathodes that are used. One is the thoriated filament which works like a light bulb but it has a very rare metal Thorium added to it. When heated to a temperature of about 2400 degree Celsius thorium makes better electrons then basic tungsten. The benefit is that the thoriated filaments last long and work well with high voltages. The second type of cathode is the oxide coated cathode also called the filament. This oxide coated filaments heat up at only 1000 degree Celsius and emits better electron than the thoriated filament. This oxide filament is generally used in small tubes. The life of the cathode tubes largely depends on the type of material that is used in the cathode. Impure cathodes are what that causes the tubes to wear out quickly.

- **TUBE LIFE:**
  This is a very important factor to remember when cleaning the vacuum tubes. If the tube is not operated at proper temperature then it will shorten the lifespan of the tube. Dirt and particles on the tube can make it difficult to operate properly and thus shorten the life of the tube. If you operate the tube too hot it will shorten its life and if you operate it too cool it will shorten its life. It has been suggested what operating the tube 20% below the suggested voltage is the ideal way to increase the life. If operated well a good quality tube can last for up to one lac hours or more.

- **THE ANODE OR PLATE:**
  The plate receives the electrons and then transmits the output. The anode plate can get hot and therefore a proper cooling method is needed. There are two ways to do it one is to design the plate to cool itself out by radiating heat through the glass or use liquid or forced air for cooling purposes.

- **THE GRID:**
  The control grid is generally a simple piece of plated wire. The wire plating is generally gold and the posts are made of soft copper. Since they have to handle a lot of heat they are made of tough metals like tungsten or molybdenum. A tube which has only one grid is called the triode. Specially designed triodes can be used in pulsed radars and other physics work where there is a requirement of energy physics work.

  If you add another grid to the triode then it becomes the tetrode. This works on the principle of Miller effect. Large ceramic tetrodes are generally referred to as the beam tetrodes. The pentode is the diode with three grids. The third grid is called the suppressor grid. There are more tubes with different kinds of grids but are no longer in production.

- **The heater:** the cathode does not heat itself and has to be at a very high temperature to emit electrons. This heater has to heat the cathode but not get too hot itself otherwise it will burn out. The heater is coated with aluminum oxide and insulation and does not touch the cathode.
- **The getter:** The essence of the vacuum tube is the getter. This ensures that the vacuum lasts for as long as possible. If there are any leaks in the tube it will not function properly. The getter can remove the stray gases left in the tube. The getter has a shape of a small cup and can react to and absorb even the tiniest bit of oxygen. The getter is the small silvery patch that you see inside the glass tube. If the seal of the tube is faulty then the getter will turn white.

Although the tubes were becoming obsolete for some time they are very reliable in amplifying and there they are making comeback in the form of specialized tubes. Vacuum tubes are used in High power RF applications because they are cost effective. They are used in guitar amps because of the excellent tone that they produce. This is because of the properties of beam tetrode or pentode amp which lets them have the kind of distortion that is needed and the speaker damping characteristics. Professional audio studies use tubes in microphones, preamplifiers, limiters, equalizers etc. to get the desired sound output. High-end audio systems use vacuum tubes to give the users excellent listening experience.

TIPS FOR CLEAN THE VACUUM TUBES:

It is easy to understand how to clean the vacuum tubes if you understand the parts and delicate nature of the parts. Therefore you have to be very careful when cleaning the vacuum tubes that you have. If you have been hearing a crackling or humming sound when using the tube then there is a chance that the tube needs cleaning.

Clean the pins: Pins are something that most people miss when cleaning the tubes whereas they are the first thing which you should clean when working with the tubes. In case of stainless steel pins, you can notice that there can be some corrosion in the pins. Dust, oil impurities are the most common reasons that can cause the pins to function incorrectly. As electrons flow through these pins the release impurities which cling to the pins. Copper sulfate and Iron Oxide and the two most common types of impurities that can prevent making a good connection especially in low voltage conditions hampering the electron flow. Tools that you will need to clean the pins:

1. **Microfiber towel**
2. **An exactor knife with a thin blade.**
3. **Old toothbrush**
4. **Eyeglass cleaner**

Hold the tube gently in your hands in the microfiber towel and then using the knife gently scrape the pins clean by using upward motions. You will notice the change in the color of the pins immediately. You can get the oxidation removed comfortably this way. Once you have removed the oxidation take the toothbrush and spray some eyeglass cleaner on it. Give the pins a nice cleaning. Make sure that you keep the microfiber towel close and tight at all times. Alternatively, you can also use a q tip and dip it in the cleaner and clean the tips of the tubes. Do not use rubbing alcohol too because they are not a friend of the tubes.

If you have the practice you can also use a small sandpaper to gently clean the tips. As a home remedy, some have claimed that even diluted lemon juice works well in cleaning the pins.

BE CAREFUL HOW YOU HANDLE THE VACUUM TUBES:

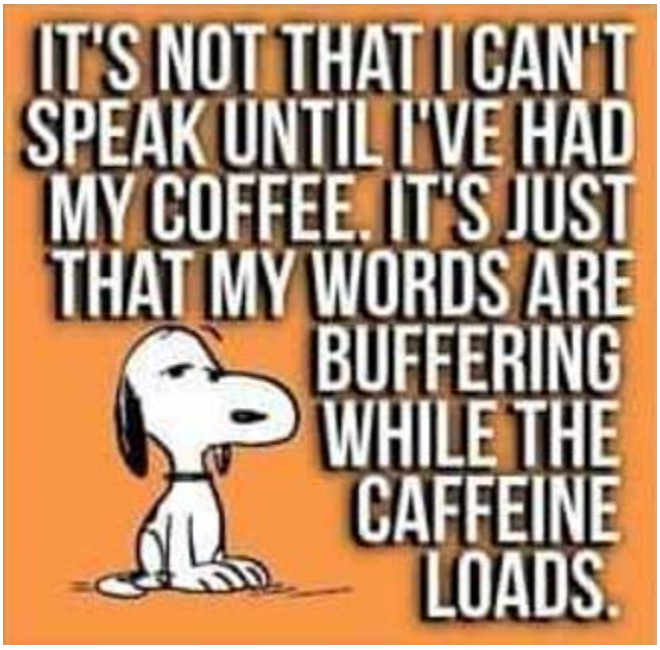
The tubes do not like to have contact with oils and dirt and fingerprints from the hands. These kinds of things cause them to get hotter than necessary and shortening their life. Always use a paper towel, microfiber towel or lint-free cloth to hold the tube. Do not try to touch the hot tubes always turn the component off and wait for it to cool down a few minutes. Do not try to pry out the tube from the socket. Use gently and firm motion to pull it out. You need to clean the socket too and you can do it by removing the pins and putting them back in to get them cleaned.

CLEANING THE GLASS:

There are details printed on the glass which you do not want to be wiped off therefore if you get any prints or marks on the glass then gently wipe the tube with a slightly damp lint-free cloth. Be very careful if you notice that the print is coming off then stop immediately. Once you wipe the print away its gone completely and trust us you don't want that.

Vacuum tubes can be your prized procession if you are an audio buff. They can help you produce sounds with a quality which you will not get with modern devices. Therefore take care of the tubes, understand how they work and how you can clean them to give them a long and full life.

Credit: https://cleaningkeeper.com/how-to-clean-vacuum-tubes/



Phil's Old Radios: Home: Beginners

The Radio Beginner

Replacing Capacitors in Old Radios and TVs

Why Replace Capacitors?

Second only to power cords, capacitors are the most failure-prone components in old radios and televisions. In a professional overhaul, it is common to replace all of a set's large electrolytic capacitors and small paper capacitors. This article explains how to do that. Often, this "recapping" is all that the radio or TV needs to be restored to health.

Incidentally, tubes are *much* more reliable than capacitors. Many tubes will last for decades. Professional restorers replace a tube only if it is defective. "Retubing" a radio—replacing all its tubes for no particular reason—is a waste of money and does not improve performance.

These photos show the underside of a Grundig 940W radio before and after recapping. The second photo shows the capacitors that were replaced. This is a multi-band radio with FM and two AM bands. A simpler radio will have fewer capacitors, often under ten.


The new capacitors in the second photo are colored yellow, orange, and blue.

Types of Capacitors

Before getting to work, let's make sure you know what to replace. Some kinds of capacitors—paper, molded paper, and electrolytics—are failure-prone and need to be replaced. Other kinds,

such as mica and ceramic, rarely need replacement. To avoid wasting time and money, you must be able to tell them apart.

Electrolytic capacitors are polarized, meaning that they have positive (+) and negative (-) leads.

Electrolytics are the largest capacitors in the radio, with values from about 5 mfd (microfarads) to as much as 80 or even 200 mfd. Common values are 20 mfd and 40 mfd. Electrolytic capacitors are very failure-prone and are usually replaced.

Non-electrolytic capacitors are not polarized. Neither end is positive or negative. They have smaller capacitance values than electrolytics, anywhere from .0001 mfd to .5 mfd. Common values are .01 mfd, .02 mfd, and .05 mfd. Below are the common types of non-electrolytic capacitors.

Paper. Very unreliable, should always be replaced. Even if working now, they may soon fail!

Molded paper (round). Very unreliable, should always be replaced. These are simply paper capacitors in plastic shells. The black ones are sometimes called Black Beauties or "bumblebees."

Molded paper (flat). Very unreliable, should always be replaced. These are also paper capacitors in plastic shells. Usually coded with colored dots.

Ceramic. Round and flat. Extremely reliable. Do *not* replace without specific reason.

Mica. Squarish and flat, thicker than ceramic, usually with color-coded dots. Reliable. Do *not* replace without specific reason.

Note that two of these types—mica capacitors and flat molded paper capacitors—look similar. Both are flat, often with color coding dots to indicate the value. It is easy to tell them apart by checking the value. *Mica capacitors have very small values*, typically under .001 mfd. The values of molded paper capacitors will be larger, similar to other paper capacitors, such as .01 or .02 mfd.

Understanding Farads, Microfarads, Picofarads

Capacitance values are expressed in units called *farads*, named after the British physicist Michael Faraday. The capacitors found in radios and TVs have values in tiny fractions of a farad.

A *microfarad* is one millionth of a farad, abbreviated as mfd, mf, µf, or uf.

A *picofarad* is one trillionth of a farad, abbreviated as pfd, pf, or µµf.

This website generally uses the abbreviation *mfd* for microfarads and *pf* for picofarads.

In vintage radios and TVs, capacitors typically have values in these ranges:

- Electrolytic: 1-200 mfd
- Paper: .001-1 mfd
- Ceramic and Mica: less than .001 mfd

Since a picofard is one trillionth of a farad, to convert from microfarads (mfd) to picofarads (pf), you move the decimal point six places to the right. For example:

.47 mfd = 470,000 pf

If you don't like doing such conversions in your head, you can look up the values in this handy chart from Justradios.com.

Checking Capacitors

You can't tell anything useful about a capacitor from its external appearance unless it has exploded or is physically broken.

A paper capacitor may look gooey or melted, yet test OK. Conversely, it may look perfect, but test bad on a capacitor checker. The leakage is internal, caused by water vapor that invisibly penetrates the wax or plastic coating over time, no matter what the exterior looks like. Melted wax is often the result of decades of normal operating temperatures inside the radio.

Electrolytic capacitors tell even less by their appearance. In extreme cases, the case may bulge or even blow its end out. Much more often, a failed one looks like new. Over the decades, the paste electrolyte inside the cap dries out and becomes useless—a condition that you can't detect with the naked eye unless you tear apart the capacitor.

Some people try to check capacitors for short circuits using an ohmmeter, but this test is not very useful, since the majority of bad capacitors fail in other ways.

The most common defect in old capacitors is leakiness. An ohmmeter can't test for leaking because the voltage that it applies is too weak. A capacitor might look OK when testing with an ohmmeter, yet leak like crazy when enough voltage is applied. The same is true of modern multimeters with a capacitor test function; that function can tell you the capacitance value of a modern, low-voltage capacitor, but it's useless for checking vintage capacitors.

To test old capacitors for leakiness, you need a capacitor checker that applies the correct operating voltage, often over 100 volts. Old capacitor checkers are available cheaply at swap meets and on eBay. Like all vintage equipment, they will need routine service—including capacitor replacement—before they are reliable and accurate. I own a couple of old capacitor checkers, made by Solar and EICO:


Disconnect one of the capacitor's leads before checking it. If it is an electrolytic, wax paper, or molded paper capacitor, I usually just replace it, which takes less time than disconnecting, testing, and (possibly) reconnecting. The test results for those capacitors are a foregone conclusion. If the capacitor isn't already bad, it will soon become so!

Follow the Schematic!

It's essential to replace old capacitors with new ones of the same capacity and voltage rating. I *strongly* recommend that you get a copy of your radio's schematic diagram. The schematic will show the location and value of every part in the radio, including capacitors. It often provides other information such as alignment instructions or stringing diagrams for broken dial cords.

Many US radio schematics can be downloaded at no charge from Nostalgia Air (Riders schematics) and BAMA. The Early Television Foundation website has many television schematics.

Larger public libraries in the US and Canada have radio schematics that you can copy for little or no charge. My library also has a subscription with Sams allowing library patrons to download any Sams manual free of charge.

You can order service literature for most radios and TVs from the sources listed in our Parts page. If you have trouble finding a schematic, phone one of these sources and ask for help.

British and Canadian schematics can be obtained from the British Vintage Wireless Society and Canadian Vintage Radio Society. For European schematics, go to the Norwegian Vintage Radio Society or contact other European websites listed on our radio websites page.

The ARRL has a good beginner's article on how to read a schematic (Part 1, Part 2). There are some variations in the symbols and conventions used in schematics, particularly older ones. For instance, in some older schematics, the letter M means one thousand, whereas in newer ones, it means one million.

Where to Buy Capacitors

New capacitors are readily available. Our Parts page lists a number of popular sources. Companies that cater to vintage radio collectors include Antique Electronic Supply and Just Radios. General suppliers such as Mouser and Allied carry capacitors along with thousands of other parts.

Identifying Capacitor Values

If you don't have a schematic, you can often read the value of a capacitor from its case. Different types have different markings.

Paper Capacitors usually have the capacitance and voltage rating printed on the case. You may need to wipe the case clean or even scrape away a little bit of darkened wax to read the value clearly.

Note: Some old paper capacitors are marked at one end with a dark circle or the word "foil." These markings indicate the lead that is attached to the outer foil of the capacitor (they do not indicate polarity). In some applications, such as RF circuits, the outer foil can be used as shielding. In general, you can replace these capacitors with ordinary non-electrolytics and it does not matter which way you install the new capacitor.

Round molded paper capacitors also show their values. Some, like the red ones shown here, have values printed on the case. Others, like the black ones, have values indicated by color-coded bands.

The following diagram from an old service manual shows how to interpret color bands on round molded paper capacitors. (Click the small image to see a bigger view that you can print.) In the example given in the diagram, bands of the colors yellow-violet-red indicate a capacitor of the value .0047 mfd. A capacitor with the colors yellow-violet-orange has the value .047 mfd, and so on.

Do not confuse molded paper capacitors with carbon resistors, which are also color coded. Resistors are much smaller and their background coloring often is dull brown rather than shiny black. You can easily confirm that a part is a capacitor by checking for resistance across its leads. Remove one lead from the circuit to test the part. Compare the observed resistance on your meter with the predicted value indicated by the striping on the part.

Flat molded paper capacitors show their values in colored coding dots, or less often, by values stamped into the case.

The capacitor shown in the previous photo has three colored dots, which indicate the value according to the 1-2-3 scheme shown in the diagram for round molded paper capacitors. For example, if the dots were colored yellow-violet-red, the capacitor's value would be .0047 mfd as in the previous example. The molded arrow shows the direction in which to read the dots (in this case, from left to right).

Mica capacitors also show their values in colored coding dots.

Mica capacitors rarely fail, but occasionally you'll find a bad one. The following diagram explains how to decode the common "six dot" scheme used in many micas.

For other color coding schemes, try this Google search.

Electrolytic capacitors, housed in large metal or cardboard tubes, usually have their values printed on the case.

Single section capacitor. Used in tone controls and other applications. Values normally printed on case.

Single section electrolytic capacitors require little explanation. Simply replace them with new units that have equivalent voltage and capacitance ratings. Some single electrolytics have rather low voltage ratings, such as 50 volts.

Multi-section cardboard. Often used as filters in a power supply. Mounted horizontally under the chassis. Contains two or more capacitors sharing a common ground connection. Values usually printed on case and keyed to color-coded wires.

Multi-unit capacitors in a cardboard tube are often found in cheaper radios. The case will have three or more colored wires coming out of one end. One wire, usually black, will be the common negative connection. The other wires will be the positive connections for each capacitor. The case often is labeled with the capacitance and voltage ratings for each capacitor. If those labels are absent, you will need to consult the radio's schematic diagram.

Multi-section vertical mount. Often used as filters in a power supply. Mounted vertically on top of chassis. Contains two or more capacitors sharing a common ground connection. Values usually printed or stamped on case and keyed to shapes on terminals at bottom. Case usually metal, occasionally cardboard.

Multi-section capacitors mounted in cans above the chassis are found in better-quality radios. The values are either printed or stamped on the side or top of the can. The bottom of the can often has metal terminals rather than colored wires. Small geometric shapes on the side and

bottom of the case tell you which terminal belongs to which capacitor. By convention, these shapes are a square, a triangle, and a semicircle. (In older radios, the can may lack coding and you will have to consult the radio's schematic to determine what each wire is connected to.)

The following photo shows the value markings on the side of a four-unit metal-cased capacitor. Note the semicircle, square, and triangle shapes.

The unit shown above contains four capacitors, each 20 mfd in value and rated for 450 volts. In this case, all the capacitors happen to have the same capacitance and voltage ratings, although that is frequently not the case. As the photo shows, the first three capacitors are marked with semicircle, square, and triangle shapes, respectively. The fourth has no marking. The next photo shows the underside of this capacitor.

Seen from underneath, the capacitor has four terminals. Three are marked with the semicircle, square, and triangle, while the fourth has no marking. These four terminals are the positive (+) connections for each of the four capacitors.

As with the cardboard multi-capacitor unit, all of the capacitors share a single negative (ground) connection. In this instance, it is the metal case itself which forms the ground connection. The case has metal tabs which fit into slots in the chassis. To install this unit, you slip the tabs through the slots, twist them about one-quarter turn to secure the can, then solder one of them (it doesn't matter which) to the chassis to ensure a good electrical connection to ground.

Certain other metal can capacitors are insulated from the chassis and have a separate terminal for the ground connection. These have an insulating washer between the can and the chassis. Don't forget to put the washer back when replacing such a capacitor.

If a metal capacitor can has an outer cardboard sleeve, that's a sign that its can has a higher voltage potential than the chassis. The insulating sleeve protects against inadvertent shocks; if you remove it, be sure to replace it when you're done.

Choosing New Capacitors

Each capacitor has two values: a voltage rating and capacitance value. Both are important. The general rule for replacing capacitors is to use values that are equal to or higher than the originally-specified values.

Voltage rating tells how much voltage the capacitor can withstand. Tube radios use high voltage, so for safety reasons the voltage rating of the replacement must be *equal or higher* than the original. It does no harm to exceed the original rating somewhat. For instance, it is fine to

replace a 250-volt rated capacitor with a 450-volt one. Almost all of the capacitors that I buy are rated for 450 volts. A few capacitors may require a higher voltage rating, such as 500 or 600 volts. Don't waste money buying capacitors with voltage ratings vastly higher than the originals. Your radio will not work any better with 1000-volt capacitors than with 450-volt units.

Capacitance value indicates how big an electrical charge the capacitor can store. This value should also be *equal or higher* than the original, as explained more fully in the two following sections.

Choosing Values of Non-Electrolytic Capacitors

For small, non-electrolytic capacitors, the capacitance value of the new cap should be the same as the original, with a margin of error of about 20%. It is OK to "round off" odd values. For instance, if the original is .05 it is fine to use .047 to replace it. The difference between .05 and .047 is only .003, less than 20% of the original value. Likewise, you can replace a .02 capacitor with .022, and so on.

The 20% margin-of-error rule works because most old radio components were manufactured within a tolerance of about plus-or-minus 20%. That is, a capacitor marked as .02 mfd could have an *actual* value as low as .016 (20% below the marked value) or as high as .024 (20% above the marked value). If you stay within 20%, you are well within the performance criteria for the radio's original design.

In practice, the operating tolerances of most radio designs allow for even more variation in small-capacitor values in certain circuits. An experienced repairman knows these circuits by heart and knows when he can safely substitute a quite different value than the original. If you already know that much about radio repair, you don't need to read this article, however! If you are still in the non-guru ranks, you will never go wrong by following the 20% rule.

Naturally, if you have the exact value on hand, you should go ahead and use it. If nothing else, this will aid you (or a future repairman) in identifying that component should it need further repair.

Certain applications call for a more precise capacitance value, and in those cases the schematic and/or parts list will specify a smaller tolerance, such as 5% or 10%. Be sure to choose your replacement with the same tolerance.

Who Made Up These Weird Capacitor Values?

Beginners sometimes wonder why so many capacitors (and resistors, for that matter) have odd values such as .22 or .039. Why didn't they use .2 or .04 instead?

In the early days of radio, capacitor values *were* often specified in regular values such as .2 and .04, but for technical reasons, the International Electrotechnical Commission later devised a system of preferred values that efficiently cover the commonly-used values in a world where components have a given tolerance. That is why you'll see a 0-100 number progression such as 10-12-15-18-22-27-33-39-47-56-68-82. When shopping for capacitors, you may find that .047 caps are easier to find than .05 caps, because .047 is a preferred value and .05 is not.

If you have a very old schematic that calls for a regular value such as .02, remember that .022 is functionally equivalent. Similarly, .047 is the practical equivalent of .05. If you have trouble finding a capacitor with a "round number" value, look for the nearest preferred value within 20% of that figure.

Choosing Values of Large Electrolytic Capacitors

For electrolytic capacitors, the same rules apply, except that you can safely use a capacitance value that is considerably higher. In general, you can go as much as 100% higher than the original capacitance value.

For example, when replacing a 10-mfd electrolytic capacitor in the radio's power supply, it is OK to use a 20-mfd or 22-mfd replacement. Likewise, you could replace a 20 with a 33. The higher capacitance may do a marginally better job of removing 60-cycle AC line "hum" from the audio output of the radio.

Don't get carried away. Higher-value electrolytics are more expensive and won't improve the radio's sound. Don't waste money on a 100-mfd electrolytic if your radio sounds great with a 20-mfd unit! Increasing the value too much may also raise the radio's B+ voltage level beyond prudent limits.

Substituting for Unavailable Values

In a pinch, you can combine two capacitors to create one with the desired value. Simply remember that when two capacitors are wired in parallel, their values are *added*. When wired in series, their capacitance values are *reduced*.

For example, say that you need a .04-mfd capacitor, but all you have on hand are .02-mfd units. Wire two .02s in parallel, and you now have a .04-mfd capacitor. Likewise, wiring two 22-mfd capacitors in parallel creates a single capacitor of 44 mfd.

Conversely, wiring two .02-mfd capacitors in series produces a .01-mfd capacitor. The capacitance is halved.

Wiring in parallel or series also affects the voltage rating of the resulting capacitor.

For capacitors connected in parallel, the voltage equals the *lowest* voltage rating of either capacitor. For example, wiring two 22-mfd/150-volt capacitors in parallel results in a 44-mfd/150-volt capacitor. Both voltage ratings are equal, so the resulting voltage is 150 volts. If you wire in parallel one 22-mfd/150-volt capacitor and one 22-mfd/35-volt capacitor, the resulting capacitor will be 44-mfd/35-volt. The capacitance is doubled and the lower voltage rating is 35 volts.

For capacitors connected in series, the voltage is added up. For example, wiring two 22-mfd/150-volt capacitors in series results in a capacitor of 11 mfd and 300 volts. The capacitance is halved and the voltage is doubled.

Observe polarity when combining electrolytics. When wiring them in parallel, wire both positive ends together and both negative ends together. When wiring them in series, connect the positive end of one capacitor to the negative end of the other.

Here's a real-world example. I needed a .25-mfd capacitor rated for 200 volts. Not having that exact value, I wired in parallel a .22 and a .033, both rated for 630v. The result is a .253-mfd/630-volt capacitor, which worked perfectly.

Incidentally, these rules work exactly the opposite for resistors. Wiring resistors in parallel reduces the resistance, while wiring them in series increases it.

What Type of Capacitor Should I Buy?

In the non-electrolytic category, there are several types of modern capacitors, such as polyester film, polypropylene film, metalized polyester, and so on.

It makes *no practical difference* which of these types you choose, as long as the capacitance and voltage ratings are appropriate. New capacitors—even the cheapest ones—vastly exceed the originals in performance and reliability, so don't waste your money buying expensive, super-audiophile-quality replacements. The circuitry in your old set is not sophisticated enough to respond to such subtle differences.

The next photo shows an assortment of new non-electrolytic capacitors, ranging in value from .0015 to .01 mfd. The orange ones, known as "orange drops," were a traditional favorite with restorers. The yellow cylindrical caps are smaller than orange drops and are a great choice for cramped quarters. Cylindrical caps are also cheaper than the orange drops. Both are more than adequate for any radio or TV restoration.

In the electrolytic category, many old radios use multi-unit capacitors, as mentioned earlier. These are two or more capacitors inside a single can or tube. It is sometimes possible to order replacement multi-unit capacitors that exactly match the original values. However, new multi-unit caps can be quite expensive and it may be hard to find the right value assortment in one container (one supplier of such caps is Hayweed Hamfest).

It is economical to replace a multi-unit capacitor with individual capacitors of the desired values. For instance, if your original can contained capacitors of 20 mfd, 20 mfd, and 30 mfd, you can replace it with two new 22-mfd capacitors and one 33-mfd unit. Your radio will work exactly the same whether you use a multi-unit can or individual caps. The next photo shows typical new electrolytics, ranging in size from 5 mfd to 100 mfd.

If you plan to fix many radios, you can save money by buying an assortment of capacitors of common values. Some merchants, such as Antique Electronic Supply, offer a "kit" of common caps at a good discount. You can usually save money by ordering 10 or more of a given value, as well. The most common values needed in old radio repair are .01, .02, .05, and .1 mfd for non-electrolytics, and 10, 20, 30, and 40 mfd for electrolytics.

You will use many more small non-electrolytic capacitors than large electrolytics. For a typical five-tube radio, you might replace a couple of electrolytics and half a dozen of the smaller capacitors.

Capacitors are not expensive. The electrolytics that you'll need will usually cost from one to five dollars each. Most non-electrolytics cost less than a dollar. Recapping the Grundig radio shown at the beginning of this article cost me about ten bucks.

Replacing Non-Electrolytic Capacitors

Now that you have the parts you need, let's install the new ones! Replacing small capacitors is the simplest operation, so we'll look at that first, then turn to the electrolytics.

Note, however, that in practice it's preferable to replace the large electrolytics first. That will help eliminate power-supply problems and simplify testing the radio while later replacing the small caps.

Replacing a capacitor requires a wire cutter, small pliers, and a soldering iron. Another nice thing to have is a "solder sucker," a small rubber bulb with a heat-resistant tube at one end, or a metal tube with a spring-loaded sucking mechanism. I'll illustrate this section with photos from the restoration of my Clavioline. The basic method is the same for every vintage tube device.

I *strongly* recommend that you replace only one capacitor at a time and double-check the wiring of each replacement against the schematic. That way, if you make a mistake, it will be easy to correct. If you replace several capacitors at a time, it could be much harder to figure out where you went wrong! I often take notes, as well, writing down each capacitor's value and part number when it is replaced, or checking off the capacitor on the schematic and parts list.

Before replacing anything, of course you must unplug the radio from the wall and remove the chassis from the cabinet. Use a small plastic bag to hold the chassis mounting screws, knobs, and any other parts.

Turn the chassis on its side or back so that it will lie still while you work. Be careful not to damage delicate parts when you turn it over. Don't rest the radio upside down on its tubes. If

necessary, you can prop up one side of the chassis with a book, small block of wood, etc. My Midwest DD-18 article describes a simple holder for large and heavy chassis.

Some purists go so far as to hide new capacitors inside the shells of the small non-electrolytic paper capacitors. This preserves the original appearance, but it is rather tedious. I have done this only in a few cases, for my most valuable radios. If you are interested in doing this, read the restoration articles for my Sparton Bluebird or Colonial Globe.

Step 1. Remove the Old Capacitor

Using your wire cutters, snip the leads of the old capacitor about one-half inch from the terminals where they are connected. Leaving a little "tail" on the snipped wire makes it easier to remove. Set the old capacitor aside.

Use your soldering iron to melt the solder on the terminal, suck the excess solder from the terminal, and use your thin pliers to remove the snipped wire tail from the terminal. You may need to unbend the tail a bit to work it free. If it is very firmly crimped onto the terminal, try snipping the bent portion to free it in two pieces.

Sometimes, a thin implement such as a nut pick or dental pick is handy for nudging the snipped tail out of its lair. A round wooden toothpick may help to clean out little circular holes in a terminals, since melted solder doesn't stick to wood.

If the snipped tail is attached to a pin of a tube socket, avoid using too much force to pull it loose. You might yank the pin right out of the socket or even tear it in two. The same goes for other components that are attached to the same terminal. Old carbon resistors are brittle and will break if handled too roughly.

Once in a while, a capacitor will be mounted in cramped quarters, so that you need to unsolder another lead or component to gain access. In such a case, make a note or draw a picture so that you can reconnect everything correctly.

After you remove the snipped tail from the terminal, look carefully to make sure that you didn't leave any bits of wire or solder crumbs in the chassis. Small bits of metal can cause problems if they lodge in between two connections and make a short circuit.

At this stage, the old capacitor has been removed and the terminals are clean.

Hint: if you do a great job of cleaning the old terminals, it may not be obvious to the eye where the new leads should go. If you are interrupted at this stage in the process, loosely stick the leads of the new capacitor into the terminals so that you won't be scratching your head with puzzlement

when you return. It's easy to forget exactly where things went, after an hour or two. You can also temporarily attach the ends of clip lead to the connection points as a reminder.

Step 2. Install the New Capacitor

It is good practice to test every new capacitor before installing it in the radio. Modern capacitors are generally high quality, but every now and then a bad one slips through. If you don't have a capacitor checker, you can at least test the capacitor's resistance using a multimeter. The ohmmeter should show infinite resistance on all scales. Any continuity is a sign of leakage and a leaky capacitor must be replaced.

New capacitors usually have wire leads somewhat longer than needed. Your first job is to trim these leads and bend them to fit the spot.

Hold the new capacitor near the place where it is to go, bend the leads to fit, and then trim the excess wire from the end of each lead with the wire cutters. Leave enough length on the lead to allow for crimping it around the terminal. Again, be sure to avoid leaving stray bits of wire inside the chassis.

If the terminal is the type with a hole, slip the end of each lead into the hole. If you did not clean all the old solder from the terminal, you may need to heat the terminal to soften the solder before slipping in the lead. After the lead is through the terminal, carefully bend it around the terminal. Before soldering the new capacitor in place, you want to make sure that it has a solid metal-to-metal connection with its terminal!

When both leads are securely crimped onto the terminals, heat each joint with the soldering iron and apply new solder.



Apply solder *to the joint*, not to your soldering iron. If the solder doesn't melt when touching the joint, then the joint is not yet hot enough. Don't jiggle the connection while the solder is cooling. That can create a "cold" joint that is not reliable.

Sometimes, when a delicate component is connected to a terminal, I'll temporarily clip a metal tweezer onto that component's lead, to act as a heat sink and prevent overheating damage.

Step 3. Check Your Work!

After replacing the capacitor, double-check your work against the schematic to make sure that you connected the right component to the right places.

If the radio or TV is in working order, I often turn it on for a quick test after replacing each capacitor. Even professionals make absent-minded mistakes from time to time, and this brief road test will reassure you that you haven't made things worse!

If your set doesn't work at all, you will obviously need to do some other diagnosis and remedy the problem before turning it on. The "test after each replacement" routine applies only to radios and TVs that are basically working in the first place.

Obviously, if you are testing the radio with the chassis exposed on your workbench, use extreme caution to avoid getting a shock. Temporarily put the knobs back on their shafts before turning it on. Don't touch *anything* except the knobs while the radio is plugged in. Unplug the radio before resuming your recapping. An "AC/DC" type radio can give you a fatal shock from its chassis when plugged in, even when its power switch is turned off.

That's all it takes! If you can replace one capacitor, you can replace 'em all, so go to it. Replace the remaining paper or molded paper capacitors one by one until you reach the end of your list.

Step 3. Record Your Work

It's good practice to make a note of each replacement as you go along, to prevent confusion and to make sure that you haven't skipped anything. I usually check off each part on the schematic and parts list:



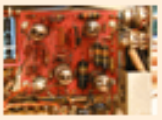
The component shown in those photos is a resistor, not a capacitor, but you get the idea.

Digital photos are extremely useful, and since they're virtually free, why not take a lot of them? I take detailed photos of every radio or TV chassis' underside before starting work. If confusion arises later, those photos will show you how things were connected before you started messing around. I take more photos from time to time as my work proceeds, whenever I want to record something important.

Replacing Capacitors on Printed Circuit Boards

Starting in the 1950s, manufacturers introduced printed circuit boards. Instead of wiring every component separately, the wiring was pre-applied to a board and the component leads were soldered into little holes in the board.

Replacing caps on PC boards is usually not difficult, but you'll need to use slightly different techniques. Those are explained in a portion of my Philco Miss America TV article entitled, Replacing Caps on PC Boards.




Replacing Electrolytic Capacitors

The mechanics of disconnecting the old capacitor and soldering in the new one are the same for electrolytic capacitors, so refer to the previous section for those basics.

Electrolytics are special in a couple of ways, however. First, their large capacitance value means that they can store an electrical charge—enough to deliver a painful shock—even when the radio is turned off and unplugged. Before touching the leads of an electrolytic capacitor, discharge the cap by shorting its leads together with an insulated clip lead.

Secondly, their large size introduces some complications in installing the replacements, which we discuss in the following sections.

Most electrolytics contain metal foil and a paste, which dries out over time and causes failure. In 1930s or earlier radios, you may find a "wet" electrolytic, which contained a weak solution of boric acid rather than paste. You can read about wet electrolytics in my Philco 60B restoration article.

To Hide Or Not To Hide?

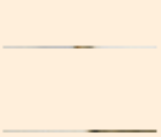
When replacing large multi-unit electrolytics, you have two choices.

The simplest option is to disconnect the old can and leave it in place for appearance's sake, then wire the new capacitors out of sight underneath the chassis. The radio looks original from above and you will save a lot of time and effort. This method was used in the Grundig radio shown at the beginning of this article. The big blue components are new capacitors installed under the chassis.

The second option is to "restuff" the can. You remove the old can, pull out its innards, hide new capacitors inside, and reinstall it. This takes more work and I do it only for special or valuable sets, or in the rare case where there's no room for a new capacitor under the chassis.

This process is detailed in the articles for my DuMont RA-113 and DuMont RA-103 and RCA CTC-11 televisions, and Midwest DD-18 and Hallicrafters SX-42 radios.





There are various types of can electrolytics, so the procedure used to restuff will differ, accordingly.

The previously listed articles show cans that are completely removed, stuffed, and then replaced like before. An alternative is to cut the can above the chassis, install the new cap leads through the old base, and then put the emptied can back on. This technique is explained in my RCA CTC-7 TV article, in the section entitled, Restuffing Electrolytic Cans on Undisturbed Bases.

Installing New Electrolytics

The first thing to remember about installing electrolytics is that polarity matters! You *must* install them with the positive and negative leads in the right places. If you reverse the leads, the capacitor may overheat and explode. Needless to say, your radio will not work, either.

New electrolytics are always marked to indicate which end is positive and which is negative. Most often, a band of arrows and minus signs is printed along the length of the capacitor. The arrows point to the negative (-) end. In the following photo, the negative ends of the larger capacitors are all to the right.

If you don't hide the new caps inside the original can, you must decide how to mount them under the chassis. Many sets have enough "elbow room" underneath to fit in a couple of additional components. Some battery portables, however, pack components tightly into a small chassis and may have little if any spare room. The important factors are to mount the new capacitors securely and to insulate all connections.

Multi-section cardboard capacitors are often mounted on the chassis with a metal clamp. In the next photo, the clamp has been removed from the top unit.

If the clamp is attached with a screw, you might be able to reuse it as a mounting point for your new capacitors. When the clamp is riveted on, I usually cut through the band with a Dremel Moto-Tool and cutting wheel (don't forget the safety glasses!) and discard the whole business.

As mentioned earlier, sometimes the metal can itself comprises the ground connection for a vertically-mounted unit (see following photo). If you replace such a can with a compatible metal-cased unit, you will need to make sure that the new can is well grounded to the chassis.

The can of a vertical-mount unit does not always provide the ground connection, however. In the following photograph, the middle unit in the bottom row has a can that is electrically isolated from the chassis. The common ground connection is made through a terminal or wire coming out of the can's bottom.

Note: The "ground" connection point in a radio is not always the chassis. In many radios with transformer-type power supplies, the chassis acts as the common ground point. In others, however, including many transformerless AC/DC radios, ground is "floating," meaning that it's a separate circuit not connected to the chassis. When you replace electrolytic capacitors, take care to connect the negative lead of each new capacitor to precisely the same location (or terminal) at which the negative lead from the old part was connected in the chassis.

When you wire up the new capacitors, keep the leads as short as practical. Depending on the layout under the chassis, sometimes it will work better to remove the old capacitor leads completely and solder the new leads directly to the appropriate terminals. In other cases, where the old leads were quite long but still in good condition, it is acceptable to solder the new capacitor leads to the old leads. You can insulate the new connection with a short piece of plastic heat-shrink tubing.

If the underside of the chassis is cramped, you may need to mount the new capacitors somewhat distant from the original location. Look carefully at your schematic and at how things are connected under the chassis. As long as your capacitor connects to the right points in the circuit, its physical location might not be too critical. For example, if the common negative point is the chassis itself, there may be a closer ground connection available, making for a neater chassis layout when you are done.

As a rule, position your new electrolytics as close as possible to the original connection points. If you relocate a power-supply capacitor, don't place it next to RF tuning circuits or high-frequency circuits, where it may create RF interference and cause buzzing or other misbehavior.

Avoid locating the new capacitor in a place that blocks access to other components. Some day in the future, you or someone else might need to make more repairs, so don't make that job more difficult.

Sometimes, you can use a plastic tie to hold the new capacitor in place. For instance, you could tie the body of the capacitor around a nearby bundle of wires. Don't use a plastic tie to go around uninsulated leads or any component that gets hot. If the leads of the new capacitor are short enough, they alone may hold the capacitor in place. I have also used metal clamps or even a dab

of epoxy glue to secure new capacitors. Don't use hot glue for this purpose; the heat of the radio may soften the glue and allow the capacitor to fall loose.

No matter how you install the new capacitors, use spaghetti tubing or other insulation as needed, to prevent short circuits. The hot ends of these capacitors carry comparatively high voltage; you will be sorry if one of them slips loose and fries other parts.

While you are replacing electrolytics, it is also an excellent time to replace the power and cord and install a fuse on the power line if your radio does not have one. A fuse is an important safety feature which many old radios lack. A 1-amp fast-blow fuse works fine for most radios. Install it on the "leg" of the power cord which is switched by the on/off switch.

If you replace the electrolytic capacitors in the power supply circuits and your radio still emits a loud hum that is not affected by the volume control, carefully check your wiring against the schematic diagram. It is a common beginner's mistake to wire an electrolytic backwards (with positive and negative reversed).

Mounting Electrolytics on a Terminal strip

Sometimes, when installing electrolytics separately under the chassis, the best solution is to mount them on a terminal strip. The strip is secured to the chassis with a screw or a solder joint. The installation is very secure and it will look tidy and professional.

To learn how, see Mounting Electrolytic Capacitors on a Terminal Strip in my article about restoring a Philco Miss America TV television.

Mounting Electrolytics On a Can Base

A further variation is to install new electrolytics on the base of the original can. Earlier, in the explanation of restuffing, I listed an example in which the old can tops would be put back in place to preserve the can's original appearance.

If you don't care about the appearance, or the new caps can't possibly fit inside, you can simply toss the old can. For an illustration, read Mounting Electrolytic Capacitors on a Can Base in my Philco Miss America article.

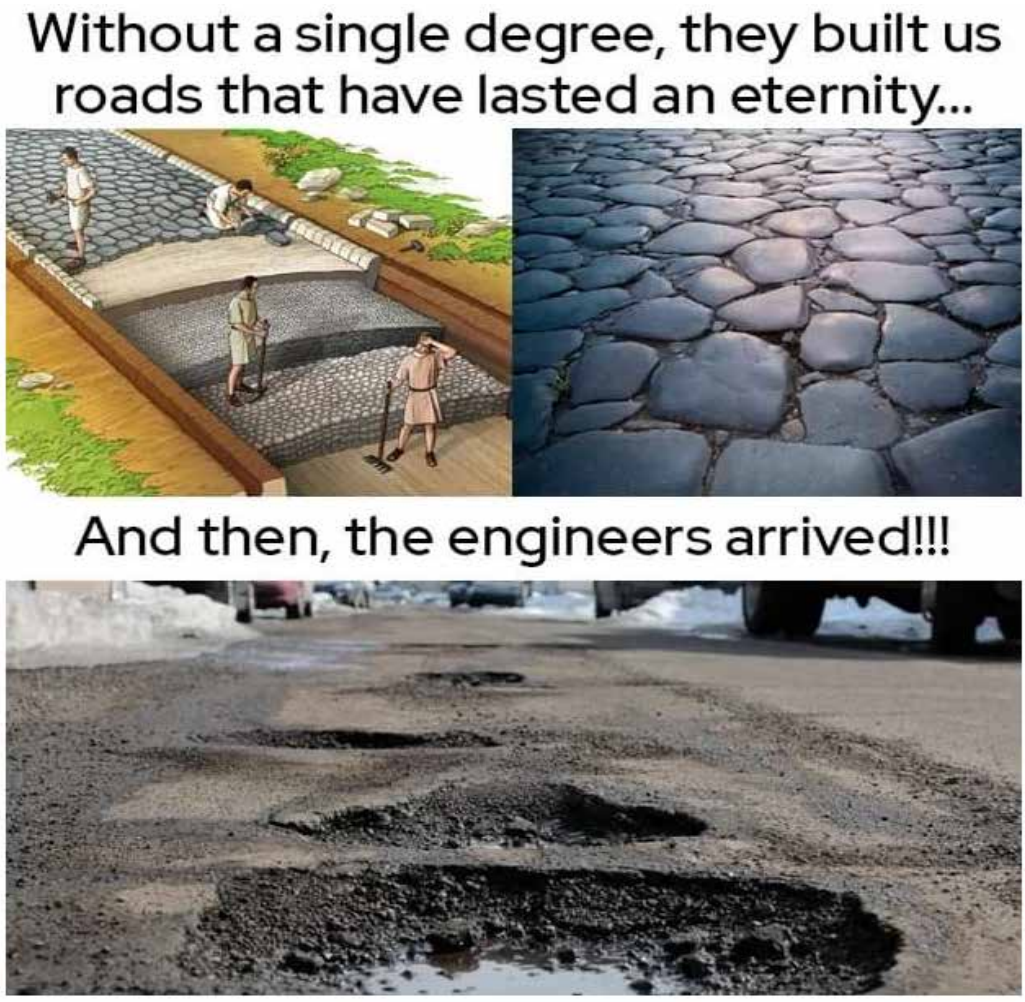
It's Easier Than It Sounds!

Recapping is easier than this article makes it sound. I have included many details to explain the process clearly, but with a little practice you will find that you can recap a simple radio in one evening.

Even if the radio "worked" before you started, you will often find that replacing the capacitors improves its performance. You will certainly improve its reliability. The new capacitors that you installed might last your lifetime!

Old radios can suffer many other ills, of course. If replacing capacitors doesn't bring your set back to life, you will need to do some further diagnosis, which goes beyond the scope of this article. Our Restoration section has many articles with further information about radio and television repair.

Credit: https://antiqueradio.org/recap.htm



A TDOA Antenna Unit for Fox-Hunting

At some point in your hunt for the elusive "fox", you will (with luck) be so close that simple field-strength direction-finding techniques may no longer work. The "fox"'s signal will be so strong that it will swamp your attenuator and leak through the plastic parts of your radio's case, resulting in "S9+" signal-strength readings in every direction, regardless of attenuator settings or antenna orientation. A "Time Difference of Arrival (TDOA)" antenna unit will put you back on the "hunt".

(How big a truck will I need?)

A TDOA antenna unit is simple and easy to build, and will work with any 2m FM mobile or handheld. There are many different designs of TDOA units, and some have additional "bells and whistles" (such as left/right indicators), but the basic design (which is all you really need) consists of a small dual-antenna array and an electronic antenna-switching unit.

The antenna array usually consists of two vertical dipole antennas separated 12 to 36 inches apart, often mounted on a T-shaped support so that the array can be rotated. The purpose of the antenna-switching unit is to alternately and rapidly switch the input of your FM receiver between the two dipoles. The switching rate is typically 1000 times per second. Switching is accomplished by a square-wave oscillator which alternately forward- or reverse-biases diodes connected in the circuit path between each dipole and the receiver. Common silicon switching diodes will work OK, but PIN diodes work best.

(How does it indicate direction ?)

The TDOA works by detecting the difference in the phase of the RF signal received by each dipole. If both dipoles are exactly the same distance from the RF source (the "fox"), the phase of the RF signal will be the same at each antenna. If you rotate the array, or the RF source moves to the left or right, then one dipole will be closer to the source than the other one, causing a small phase difference between the signals received. Your FM receiver will then detect an abrupt change in the phase of the RF signal it receives as the antenna switching unit switches rapidly back and forth between the two dipoles. To the receiver, the signal looks like square-wave- modulated FM ! Your receiver's speaker will emit an audio tone at the antenna-switching frequency. As the phase difference increases, the tone becomes louder. When both dipoles are equidistant from the source, the tone almost completely disappears.

One disadvantage of the TDOA is that when you have found the "null" or antenna position where the tone disappears, you cannot tell if the source is directly in front of you or directly behind you. Fortunately, there are other ways to determine this. A quick way, if you are using a handheld, is to use the "body shield" method - disconnect the antenna, hold the handheld close to your chest so that you can see the signal strength indicator, and turn your body. When the indicated signal strength is minimum, the source is somewhere behind you. Another technique involves converting the TDOA antenna to one which has a cardioid or heart-shaped radiation pattern - the null (which corresponds to the "notch" in the heart-shape) can be used to point a rough bearing to the source.

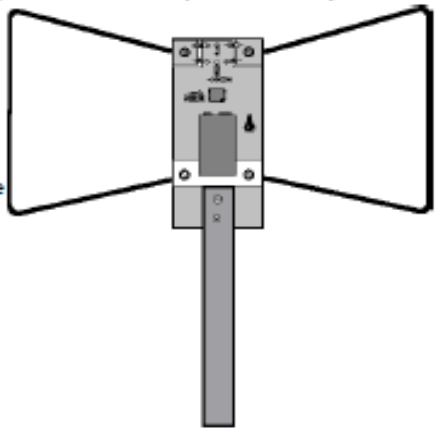


Fig. 1 - The assembled TDOA antenna unit - coaxial cable to receiver runs behind the PCB and through the PVC pipe handle.

A quick (1-2 evening) TDOA antenna unit

You can build a simple TDOA unit in an evening or two for about $10 or less (depending on the size of your junk-box). The circuit, shown in Fig. 2, is based on one in an article by Paul Bohrer (ref 1). U1 is a 555 timer powered by a 9V battery, oscillating at about 1kHz. R1, R2 and C1 determine the frequency of oscillation. The output of U1 is a square-wave from +9V to ground. C2 allows the square-wave to be level-shifted to between +4.5V and -4.5V. The positive half of the

square-wave's cycle turns on (forward-biases) D1 and turns off (reverse-biases) D2; the negative half of the cycle does the opposite. R3 and R4 limit the forward bias current for each diode to about 9mA. When the diode is turned on, the RF signal received by that diode's dipole is conducted through the diode and coupled through C4 to the coaxial cable to the receiver. When the diode is turned off, the RF signal (from that diode's dipole) is blocked. RFC1 presents a high impedance to the RF signal so that it is not shunted by the oscillator circuit, but passes the relatively low-frequency square-wave to the diodes. RFC1 together with C3 also comprise a low-pass filter to prevent the high-frequency components of the square-wave from getting into the antenna circuit and the receiver. If you forget to install C3 (I did), you'll hear a continuous "hash" of switching noise.

A rough PCB layout with approximate dimensions is shown in Fig. 3. Layout is not critical, but try to keep the wiring between the antenna elements, diodes and coax as short as possible. I also tried to keep the battery and coaxial cable exactly centered so that they would not affect one antenna element more than the other, but I'm not certain if this is really necessary. The coaxial cable lead to the receiver runs down the back of the PCB and through the PVC-pipe handle.

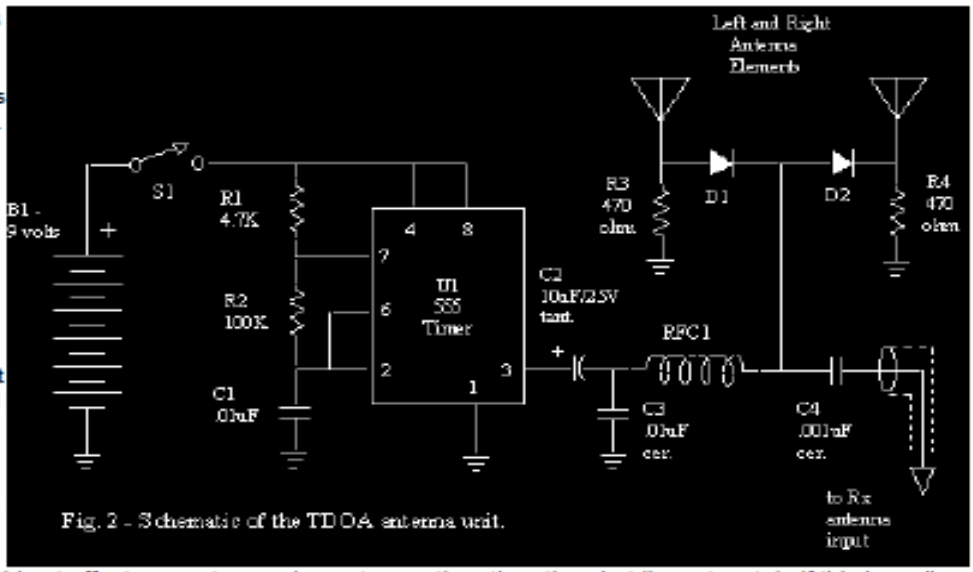


Fig. 2 - Schematic of the TDOA antenna unit.

The PCB can be "etched" using a sharp exacto-knife (watch your fingers!) and a drill-bit. Score around the areas of copper-clad that you want to remove with the exacto-knife, then peel away the copper. I use a pad-cutter tool to isolate pads in the copper, but you can clear the copper around holes with a sharp 1/8" drill bit - for a handle, use a 1/8"-shaft knob with set-screws. This prevents shorts between the copper ground-plane and component leads which pass through holes in the PCB.

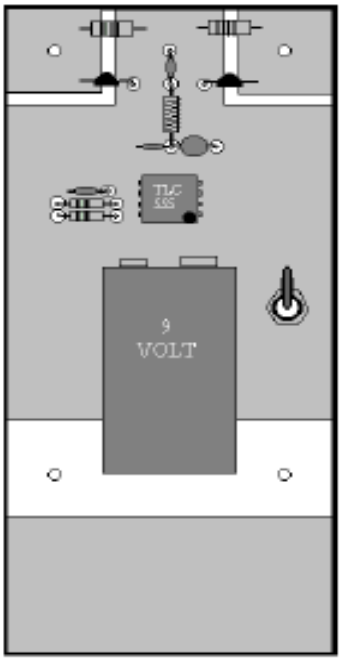


Fig. 3 - PCB component layout.

I made a "bow-tie" antenna based on the "Handi-Finder" article (ref 2). Each element is a square "U", 6 inches across the bottom with 6-1/2" long arms. Each arm has a loop at each end for mounting to the PCB with #6 nuts and screws. It does not give as loud a tone or as sharp a null as two dipoles spaced 3 feet apart, but it's a lot smaller. I used coat-hanger wire, but stiff #12 copper wire or brass brazing rod would probably be better. The handle can be anything, preferably non-metallic, such as a short length of PVC pipe, wooden dowel or broomstick with a slot sawed in one end for the PCB.

Any 555 timer IC will work with this unit (there must be over 15 different semiconductor companies making them) but the CMOS part will nearly double your battery life. You can adjust R1 and C2 to vary the oscillator frequency (if you find a particular tone annoying). RFC1 is not especially critical, figure 1kohm impedance or better at 144MHz. If you have something in your junk-box, try it out by tuning your rig to a QSO

in progress with the TDOA antenna unit connected but not switched on, then touch the leads of the RFC between ground and the connection between D1 and D2. If the signal strength drops appreciably, then the RFC does not have a high enough impedance at VHF.

Using the TDOA antenna unit

TDOA antenna units are not designed for transmitting. If your handheld has a "TX inhibit" feature, it's a good idea to enable it when foxhunting with a TDOA. Transmitting into the TDOA may damage your HT, the TDOA, or both.

The TDOA works best with a strong, vertically-polarized signal. Strong multipath reflections caused by nearby vehicles, buildings, fences, powerlines, steel lamp-posts, etc. can make the null difficult to detect, or even appear on a wrong bearing. (Note that wily foxes look for places just like these to hide). If possible, look for open areas clear of obstructions and reflectors when taking bearings. If the bearing appears to change as you move around, your location may be affected by multipath. With practice, you'll be able to tell from the tone whether you have a good signal or one distorted by multipath.

Parts List for the TDOA Antenna Unit (Fig. 1)

1. U1 - CMOS 555 timer
2. R1 - 4k7, 1/4W, 5%
3. R2 - 100K, 1/4W, 5%
4. R3,4 - 470R, 1/4W, 5%
5. C1 - 0.01uF, 50V ceramic
6. C2 - 10uF, 25V tantalum
7. C3 - 0.01uF, 50V ceramic
8. C4 - 0.001uF, 50V ceramic
9. D1,2 - PIN diode, MPN3404
10. RFC1 - RF choke, 8 turns magnet wire space-wound over 1/4W carbon comp resistor (100k or greater).
11. S1 - Switch SPST (toggle or slide)
12. Misc. - PCB, 9volt battery, battery holder, stiff wire (for ant.), RG-58 coax and BNC connector.

Parts Sources - Toronto Area

- **Electro Sonic, 1100 Gordon Baker Rd., Toronto**
- -- PIN diodes : Motorola MPN3404
- -- 555 timer : National LMC555CN, Motorola MC1455P1
- -- 9V battery holder : Keystone No. 1291
- -- switches : Mode Electronics
- **Double-H Electronics, 3800 Victoria Park Ave., Toronto**
- **Daiwa Semitron, 3800 Victoria Park Ave., Toronto**
- -- copper-clad PCB (single- and double-sided)
- **Radio Shack**
- -- 555 timer : Texas Instr. TLC555
- **(all locations listed above carry the resistors and capacitors).**

References and related articles

1. "Foxhunt Radio Direction Finder", Paul Bohrer, W9DUU, 73 Magazine Jul '90, pp.9-11, (construction article for TDOA unit with left/right indicators).

2. "Build the HANDI-Finder!", Bob Leskovec, K8DTS, QST May '93, pp.35-38, (construction article). See also "Sense the Right Way to Go with the Handi-Finder", by Joe Moell, K0OV, QST Oct '93 Technical Correspondence, pp.77-78, for cardioid pattern modification.
3. "The HANDI-Finder", Dave Martin, W6KOW, 73 Magazine Dec '93, pp.26-27, (product review).
4. "Homing DF Units", Chapter 8, "Transmitter Hunting - Radio Direction Finding Simplified", Joseph D. Moell K0OV and Thomas N. Curlee WB6UZZ, TAB Books, 1987.
5. "Monitoring and Direction Finding", Chapter 38, The ARRL Handbook - 1993 (70th Edition), the Amateur Radio Relay League.
6. "Direction Finding Antennas", Chapter 14, The ARRL Antenna Handbook - 1991 (16th Edition), the Amateur Radio Relay League.
7. See also the "Homing In, Radio Direction Finding" column by Joe Moell, K0OV, every month in 73 Magazine.

"It is not the class of license the Amateur holds, but the class of the Amateur that holds the license"

CUSTOM WOOD PLAQUES DONE VIA CNC ROUTER!

Plaques and other projects are made to order. Contact Bill AB3ME for more info.

Prices do vary depending on the style ordered and start at $40 shipped locally to your door for a "basic plaque" Wood available is Butternut, Oak - light and dark, Black Walnut, Cherry and Hemlock Pine. Various fonts are also available. Local shipping via USPS is $8 and $15 for out of area. Construction time is expected to be a minimum of a few days due to the engraving and finishing process.

Keepsake boxes are also being offered using the same materials along with brass hardware and finger joint construction. Engraving for boxes is free up to 10 square inches and can be done on the top and inside of the boxes. Pricing starts at $225 per box. Work time is a minimum two weeks for construction. PayPal is the preferred method of payment, checks accepted however work will not start until your check clears my bank. My PayPal address for payment is... ab3me47@gmail.com

For more information please visit: Carpenterwoodworksusa.com

EQUIPMENT FOR SALE BY AB3ME

These items were purchased by myself for field day 2018 and have not been used since. Have been kept in weatherproof storage cases with desiccant since. I have kept the removed pluck foam for all weatherproof cases.

Additional items for sale:

1. 1 each Dentron Super Tuner, 1000 watt, w/ balun, wire or coax feeds 5 star eham rating..... Price = $175.00 see pic,excellent condition.

2. 1 each Dentron Junior Tuner, 300 watt, w/balun, wire or coax feeds 4.9 star eham rating..... Price = $125.00 see pic, excellent condition.

MEMBERSHIP APPLICATION

E P A R A

Eastern Pennsylvania Amateur Radio Association
Address: PO Box 521, Sciota, PA 18354
Email: N3IS@qsl.net
Website: www.qsl.net/n3is

Date: _____

Name: _____ **Callsign** _____

License: Novice Technician General Advanced Extra

Address: _____

City: _____ **State:** _____ **Zip:** _____

Home Phone: _____

Cell Phone: _____

Email: _____

* **Note:** We do not publicize your phone or email information.

ARRL Member: _____ **Skywarn Spotter:** _____ **ARES/RACES Member:** _____ **VE:** _____

Interests:
DX _____ Contest _____ CW _____ QRP _____ Digital Modes_____ Antique Radio Equipment _____
Building Antennas _____ Electronic Repairs _____ Elmering _____ Kit Building _____ EmComm: ____

Others: _____

How did you get interested in Ham Radio?

_____

Please list any relevant qualifications or assets you have or are willing to share/contribute to the club.

Use reverse side if needed:

_____

_____

_____

Sponsored or Reviewed by: _____ **Callsign:** _____

Membership Rates,

Membership: **$20.00** per year Spouse: **$10.00** per year
Full time Student: **$15.00** per year Senior:(Over 62 years of Age): **$15.00** per year

EPARA

The EPARA Beacon

October 2017

UP Coming Events...

Next meeting is October 12th 2017.

Ham Cram, November 18th 2017.

Club Christmas Party/Dinner
Date TBA

Eastern Pennsylvania Amateur Radio Association

In Search Of Amateur Radio Excellence

N3IS

Tower Side Chat – October Issue
By N3SEI

Well I completed my 67th trip around the sun on September 10th but unfortunately I spent my birthday in the hospital. Scary thing those hospitals with all of those sick people. The doctors still don't know what caused the bacteria in my blood. The antibiotic regimen that I am on seems to be working so far.

OK enough of that, now on to club stuff. EPARA was formed in 1995 by about a half dozen relatively young amateur radio operators. Our first field day was at Dancing Ridge. Everyone had a great time. Since the first field day we have been on top of Camelback for field day and two other weekends.

When we started EPARA it was our goal to gather up the Hams that had dropped out of the other club, PARK. Once we accomplished that then we would try to put the two clubs together as one. It took almost 20 years for that to happen and now there is only one club, EPARA. PARK has folded up I am sorry to say.

From the start of EPARA there has been only three presidents, N3SEI, KB3EJM, and N3TIM. N3TIM served one year, KB3EJM served 3 years, and N3SEI has served the rest. It has been a great trip thru the past 20+ years. I have seen several members become silent keys and that part hurts the most. EPARA has been a very active club in community events over the years. I have fond memories of EPARA's past and I plan on sharing these memories and the history of EPARA in my future columns.

Chris, AJ3C, is busy working on the repairs to the club trailer. Thank you very much Chris.

The October meeting will be a busy one with Rick and Dick attending and giving a discussion about DMR radio. I hope to see everyone there.

My question to all members still is "Where do you want the club to be in five years?" I would love to hear from all of you on this subject. My email is cameras@ptd.net.

Some of the activities that are being planned are Fox Hunt, Simulated Emergency Drill, Winter Field Day, and the Christmas Party. I would like to suggest that we return to Billy's Pocono Diner in Tannersville for the Christmas Dinner. We will discuss these items further at the October meeting.

Until next month this is N3SEI wishing all 73

EPARA MEETS ON THE SECOND THURSDAY OF THE MONTH AT THE MONROE COUNTY 911 EMERGENCY CONTROL CENTER WITH THE BUSINESS MEETING STARTING AT 7:30 P.M.

NETS:

Monroe County ARES/RACES Sunday 8:30 PM
146.865 PL 100.0

SPARK Information/Swap Net Tuesday 8:30 PM
147.045 PL 131.8

EPARA Tech Net Friday 8:30 PM
147.045 PL 131.8

Executive Officers

President
Jerry Truax N3SEI

Vice President
Charles Borger KB3JUF

Secretary
Naomi Lepes KC3GVO

Treasurer
Ernie Miller KC3EJE

Vice Presidents Report

Hey, welcome to my first article in the beacon! If you'd like your monthly newsletter, contact Chris AJ3C, and he'll put you on the list.

For my first article I'd like to speak about what I think is the most important aspect of Amateur Radio, EMCOMM. I don't ever remember a time when so many disasters were occuring one right after the other! Hurricanes, floods, wildfires, earthquakes. Ham radio is in invaluable resource when power and communications go down. According to my records, we only have 6 people in Monroe county that have any training in emcomm and county certification!! We simply need more folks to be prepared. Please contact me at a club meeting or email me for the info to get the training. You will need the certification in order to get your county ID badge. Without that badge you may be turned away should something big happen. Simply having a radio and a ham license is not enough anymore!

Look for my next Beacon article next month!
Charlie KB3JUF
ARES AEC

Club news:

Elmer Weekend

Elmer Weekend was on September 15th, 16th, and 17th at Big Pocono State Park. Several club members participated, Frank, KF2FI set up his buddipole antenna system and set it up in a multitude of configurations. We also setup the 40-80 NVIS antenna and proved it can be setup by one man in under 15 minuets. With the addition of a 20 meter hamstick and a 20 meter SOTA dipole we had a total of five different antennas setup and working at one time. We made contacts on sideband and several digital modes. Frank even had a QRP contact on SSB with a station in Los Angeles, California. As usual everyone had a good time and learned from the experience! With the high participation of the membership EPARA has had a great year so far in 2017!

Club Trailer

The club trailer is undergoing needed repairs, so far the soft spots in the floor and walls have been repaired. Now clean out and organization are under way. The next step is to get the wheel bearings repacked and to have a mechanical checkup. The goal is to have the club trailer ready for member use by the next event and to be deployed with minimal effort, and without the need to do excessive setup.

Club Announcements

New membership badges are available to all members in good standing. Several members have already gotten their new membership badges. If you would like to get one please send a photo suitable for identification to Chris AJ3C at AJ3C@gmx.com or get you photo taken at a club meeting. The badges are free of charge!

Our October EPARA meeting will feature a presentation and demonstration of Digital Mobile Radio (DMR) by Rick N3TXG. The presentation on DMR radio has been rescheduled from the September meeting.

We will be holding another Ham Cram on Saturday November 18th. If you know anyone who wants to become an amateur radio operator be sure to let them know.

September Meeting Minuets

Salute to the flag
Moment of silence
Discussion of the hurricanes
Introductions
Request for club to purchase an item for a member by Jerry
Vote approval for Jerry's request
Discussion of getting trailer to Camelback for Elmer weekend
Reading of last meetings minutes
Discussion of modification for club membership application
Treasurer's report
Antenna committee report, eval. done waiting on final decision
Discussion about monthly club presentations
Request by Bill AB3ME for members email, wants to send request for interest in Tech Night, presentations
Discussion of replacing batteries in radios in the Radio room
Discussion about redoing the current fan dipole antenna on roof
Chris asked anyone wanting a club Id to see him after meeting for a picture
Discussion of the SET, waiting on Jerry
Discussion of trailer work and location for storage
Discussion of keys for file cabinet or adding a second cabinet
Donald WK2RP announced Carbon County offering IS-100, 200 and 700
Tommy KB3UFB stated that Naomi does not want to sign for checking account and Naomi told Tommy she would quit the Secretary position if she must sign checks.
Discussion of the yahoo group for club
Vote for new member Karl, KC3JQR , approved
Discussion of changing club dues to allow reduced rate for disabled members
Announcement of Elmer weekend
Meeting adjourned

Submitted by Don WK2RP

Tech Corner

Fall Maintenance for Antenna systems:

Check and prune branches

Over the summer Trees are growing their limbs and adding new branches. This means they can also be contacting and interfering with your wire antennas. Trees make great antenna supports, but they are growing and can cause trouble. Prune out any branches that touch or interfere with your antenna, so that you have a clear path from end to end. Take note of branches above your antenna systems because snow and ice will weigh down branches and cause trouble, also inspect bigger limbs that could potentially fall on your antenna to make sure they're healthy.

Inspect support wires and guy lines

Trees are growing in the summer, so if you are using a tree as a support structure, make sure that the tree's growth isn't stretching out your antenna wire and support line. Check your support lines, sunlight and friction against the trees can cause rope to weaken and fray. Weathered and worn supports only need a storm with a few good gusts to take the whole line down.

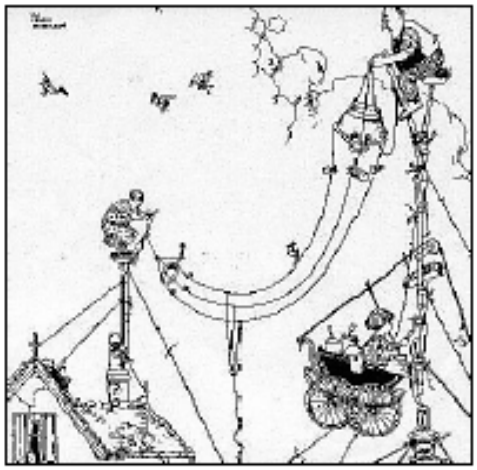
Tighten loose bolts and connections

Check your tower bolts and antenna mounts. Wind load vibrations can loosen bolts and connections. The last thing you want to do in the middle of January is to climb a tower to replace a broken mount.

Check you feedline connections.

Are your antenna connections taped and well sealed? The freezing / thawing / freezing cycle in the winter drive moisture into poorly sealed connections, causing high SWR and premature failure of your feed-line. If your connection points are up too high to inspect well from the ground, use a pair of binoculars to check them visually. If anything looks suspicious, either lower the connection or safely climb up to inspect it.

The fall is a great time to do your inspections, leaves are falling off the trees and you still get a few warm days before things turn really cold. A little maintenance now may just save you a mid winter headache.



From the General question pool

Knowledge Test

Which element of a triode vacuum tube is used to regulate the flow of electrons between cathode and plate?

A. Control grid
B. Heater
C. Screen Grid
D. Trigger electrode

Check your answer in next months issue

Last months question and answer:
What is the effect of intermodulation products in a linear power amplifier?
answer :

A. Transmission of spurious signals

Explation:
When two or more modulating signals are mixed, "the intermodulation between each frequency component will form additional signals at frequencies that are not just at harmonic frequencies (integer multiples) of either, like harmonic distortion, but also at the sum and difference frequencies of the original frequencies and at multiples of those sum and difference frequencies."

Have an Idea or article suggestion?

We are always in need of content, If you have an idea or article submission that would be of interest of fellow EPARA members please send it to aj3c@gmx.com. Anything ham radio related is good. Are you planning a special event? Working on a radio project? We want to know!

If you would like to be included in the email distribution of the EPARA Newsletter please send a request to aj3c@gmx.com