



Next Club Meeting: January 8th

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: Meeting begins at 7:30PM!

<https://www.zoom.com/>

Meeting ID: 937 744 4514 Password: epara25



Contact Information

President: Ed Hugel KC3OLB (kc3olb@gmail.com)

Vice President: Pete Scarfaro KB3YKJ (pjssr47@ptd.net)

Secretary: Kevin Forest W3KCF (w3kcf.radio@gmail.com)

Treasurer: Mike Oprihory WR8TH (wr8thmo@gmail.com)

Members at Large: Chris Saunders AJ3C (aj3c@gmx.com)

Postal Address:
EPARA
P.O. BOX 521
Sciota, PA. 18354

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Send Newsletter submissions to:
Ray Loewenthal W3RIL EPARAnewsletter@outlook.com

From The President





EPARA General Membership Meeting Minutes

November 14th, 2024
General Membership Meeting 7:00PM

Open meeting:

Meeting called to order at 7:44 pm on November 14th, 2024 by Ed - KB3OLB

Quorum:

Total attending: 21 Present at 911 Center: 16 Present on Zoom: 5 Visitors present: 3

Pledge of Allegiance / Moment of silence:

Membership Meeting – Minutes Oct 10th, 2024

Secretary – Kevin - W3KCF:

Meeting minutes for Oct 10th, 2024 were posted on the EPARA website. Ed-KC3OLB 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, Ed asked for a motion to accept the minutes as presented:

Motion to accept minutes as read: Bill – AB3ME and 2nd Dave – KA2TSM Motion Passed

Treasurer's report:

For the November 14th, 2024 EPARA Club

By Mike – KC3ZFW

Mike stated we are in the process of obtaining the ledgers from Scott and will have more detail at our next meeting in January 2025. We plan on doing an audit and making sure everything is correct going forward. Payments through PayPal have been discontinued and we are in the process of setting up alternative means for paying your dues. Membership dues for 2025 are due in January. All payments not received by March 2025 will be considered delinquent and membership will become inactive.

For anyone that is not currently active and wishes to pay their dues for 2025, there will be a onetime forgiveness for all those wishing to renew their membership.

Bank Account 11/14/2024 statement Balance.: \$6559.22

Income:

Interest:

Expenses:

Closing Balance:

Motion to accept minutes as read: Pete – KB3YKJ and 2nd Bill – AB3ME Motion Passed

Comments from the President: Ed – KB3OLB

Christmas Party in December: Please note, all those planning to partake of the Christmas Party buffet at Marita's on December 12th, we need a head count.

EPARA General Membership Meeting Minutes

For those that are not sure they can attend and would rather not commit in advance, you are still welcome to show up the night of the event. You may or may not be able to eat at the buffet. However, you can always order off the menu. Either way, we look forward to seeing everyone.

Financial Audit in January 2025: Ed said we will be doing a full audit.

PayPal Account will be deactivated: The current PayPal account is Scott's personal account and will no longer be used.

Club Nets: Ed mentioned all nets are up and running on the WX3OES repeater. Everyone is encouraged to participate. Bill – AB3ME said he would act as NC on the Friday Night TechNet, to get things up and running.

- Swap Net Tuesday at 2030 WX3OES 146.865 PL 100
- DMR Rag Chew Wednesday at 2030 TG - 3149822
- Tech Net Friday at 2030 WX3OES 146.865 PL 100
- ARES Net Sunday at 2030 WX3OES 146.865 PL 100

Reports of officers and committee's:

Bill AB3ME – Program Committee

Bill said there would be no presentation tonight as John - K3WH had to work and is unable to attend. He then said he would do a presentation in January on how to solder, add connectors and repair coax.

Ed mentioned that he and John – N1JIE will be doing a presentation on Radioactive Materials in February.

Ray and Ed stated they would do a presentation on basic electronics in March

ED said he has been in contact with Sarah Johnson a MaryEllen regarding a SkyWarn class.

ARES/RACES: Martin – KC3TOE

Martin asked Len to relay the following information as he was unable to attend.

Len said Monroe ARES has been participating with Red Cross. He also stated that ARES is fully in the loop with the Office of Emergency Management Course Offerings. Len then said we had participated in the Fall Eastern Pennsylvania Simulation Test and took 1st place.

Monroe ARES has been working with Luzerne County ARES and we'll be working together in the future. We have also joined the Keystone Emergency Management Association. We believe they will be a great resource and wealth of information going forward.

The **Keystone Emergency Management Association (KEMA)** is a non-profit organization that was established in 1977 in Pennsylvania, *originally as Pennsylvania Civil Defense Association*, to provide a platform for individuals and organizations involved in emergency management, emergency preparedness, and homeland security to exchange ideas, share best practices, and collaborate in order to enhance the overall emergency preparedness in the Commonwealth of Pennsylvania.

EPARA General Membership Meeting Minutes

ARES - Red Cross Liaison: Len – KC3OND

Len said four members of Monroe County ARES completed Red Cross sheltering training in November. Those successfully taking the sheltering class included Len Lavenda, KC3OND, Martin Gonzalez, KC3TOE, Julia Fernald, KC3TOF and Nick Puccio, W3NJP.

The six-hour training course covered Red Cross shelter setup and organization. Topics included onboarding clients, feeding, dormitory setup, management of service animals and pets, food safety and guidance on which issues can be addressed by volunteers and which have to be forwarded to Red Cross supervisors.

Martin said ARES now has the opportunity to work with Red Cross personnel including Seth Hoch and Len Lavenda to organize the physical positioning of ARES support teams in or around a Red Cross shelter. Martin states the Monroe County ARES team will have an opportunity in the coming months to participate in tabletop exercises among the Red Cross and the local Office of Emergency Management.

Ruth Ann, W9FBO – PIO:

RuthAnn was on Zoom in the beginning but was disconnected.

The Veterans Day Parade went off without a glitch. Kevin – W3KCF used his truck and trailer. Sam – W3GZ operated the radio. Pete – KB3YKJ, Dave – KA2TSM, Russ – W3TN and Bob rode along for support. Overall, it was a great day.

QuarterMaster: John – K3WH (John was absent)

Ray – W3RIL – Social Media:

Ray said we are still in the process of changing things over.

Ray – W3RIL – Newsletter:

Ray said he is pleased with how things are going.

If you want to be added to the newsletter email group, contact Ray at:

eparanewsletter@outlook.com

AL, KB3OVB: Membership

AL said we have 43 paid members, but it may change after further review of our ledgers.

Sat-Com / EME Group: (Alex was absent)

GOES Group: (Geostationary Satellite Server)

Nothing new

EPARA General Membership Meeting Minutes

Old Business:

ID cards are on hold until the county updates their software and equipment.

New business:

None

Votes/New Members:

We are honored to add three new members to our club. Welcome!

Joe Krol – KC3VLN
Sean Farrell – KC3TPD
BJ – W2BZT

A motion by Kevin – W3KCF and 2nd by Ray – W3RIL to approve the new members (passed)

Announcements:

Nothing new

50/50 Raffle: Tonight's 50/50 Raffle was won by AL - KB2OVB and he received \$35.00 in cash.

Adjournment...

Meeting was adjourned at: 9:15pm

Motion to close Mike – KC3ZFW and 2nd by Pete – KB3YKJ Motion Passed

Secretary

Kevin Forrest
W3KCF





EPARA Net List

EPARA Information/Swap Net -- Tuesday's 8:30 PM, 146.865 Mhz, PL- 100 Hz

EPARA Hot Spot DMR Rag Chew Net -- Wednesday's 8:30 PM,

Talkgroup: 3149822 (time slot 2) N3IS Talkgroup

EPARA Tech Net -- Monday's 8:30 PM, 146.865 Mhz, PL- 100 Hz

ARES-RACES Net List

Monroe County ARES-RACES -- Sunday's 7:30 PM, 146.865 Mhz, PL- 100 Hz

President

Ed Hugel KC3OLB

Vice President

Pete Scarfaro - KB3YKJ

Secretary

Kevin Forest W3KCF

Treasurer

Mike Oprihory WR8TH

Member at Large

Chris Saunders AJ3C

Field Day Coordinator

Chris Saunders AJ3C

Quartermaster

John Victor K3WH

Membership Coordinator

Al Brizzi KB3OVB

Newsletter Editor

Ray Loewenthal W3RIL

Public Information

Ruth Ann W9FBO

Social Media

Chris Saunders AJ3C

HAMFEST Coordinator

Walter Korab W3FNZ

Technical Program Coordinator

Lead VE

Chris Saunders AJ3C

Webmaster

Chris Saunders AJ3C



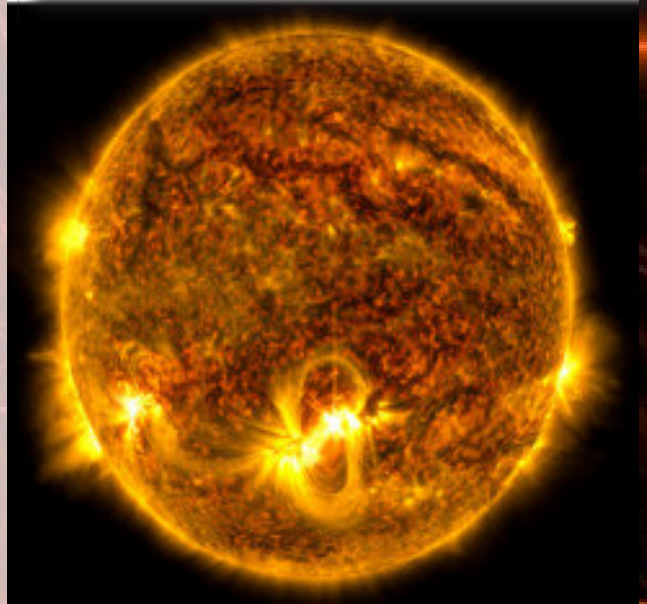
Announcements

AND UPCOMING EVENTS



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.

K7RA Solar Update



01/10/2025

Solar activity was a bit weak during recent days. Average daily sunspot number was 159.1. During the previous week the average was 194.7.

Predicted solar flux for the near term is 165 on January 10-11, 160 on January 12, 155 on January 13-17, 200, 210 and 220 on January 18-20, then 230 on January 21-25, then 225, 220, 215, 210, 205 and 200 on January 26-31, 170 on February 1-2, 165 on February 3-4, 170 on February 5-6 and 175 on February 7.

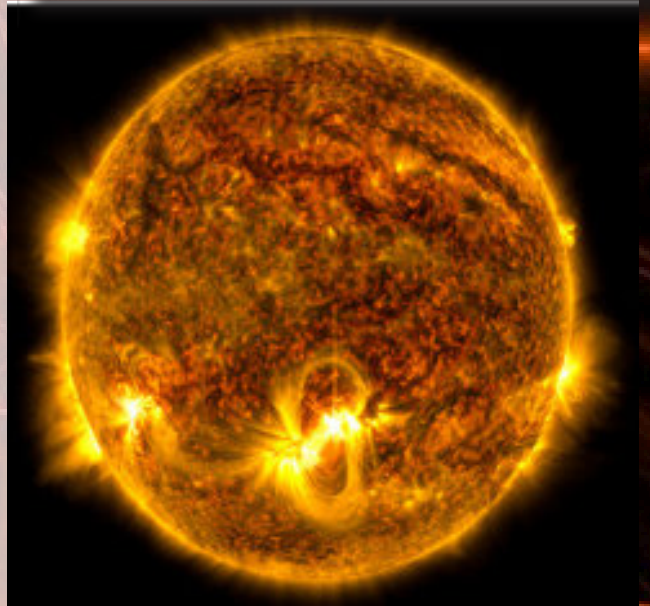
Predicted planetary A index is 8 on January 10-11, then 10 on January 12-13, 5 on January 13-14, then 8 on January 15-16, 10 on January 17-20 and 5 on January 21-30, then 18, 15, 12, 10 and 8 on January 31 through February 4.

Weekly Commentary on the Sun, the Magnetosphere, and the Earth's Ionosphere - January 9, 2025, from F. K. Janda, OK1HH:

"For most of the eleven-year solar cycle, two numbers are more or less sufficient to give us a rough estimate of the state of the ionosphere and shortwave propagation conditions: the solar activity index (optimally the solar flux) and the geomagnetic activity index (usually the daily A index or the three-hour K index is sufficient).

We need more information during the high solar activity period and much more at the peak of the high cycle.

K7RA Solar Update



"It may not yet be enough to understand what is going on, let alone predict it. These include the solar wind speed and particle density (free electrons and especially energetic protons) and the strength and polarity of the longitudinal component of the interplanetary magnetic field. Another excellent tool is ionospheric probe measurements, especially ionograms. Unlike the pre-Internet era, we all have access to them.

"Yet, or perhaps because of this, we often experience surprises, whether a lull or disturbance. The quiet post-Christmas period and the big solar flares on 30 December were followed by geomagnetic disturbances on 1-2 January, accompanied by auroras and SAR, observable even in the mid-latitudes. The following decrease in solar activity and irregular rises in geomagnetic activity (3-7 January) mostly resulted in a deterioration of shortwave conditions. The improvements were mostly brief and occurred irregularly. Moreover, forecasts of further developments were unreliable.

"A further upsurge in solar activity is not expected until the second half of January, after large sunspot groups begin to reappear in the eastern part of solar disk. With few exceptions, major geomagnetic disturbances should follow after the active regions on the Sun reach the central meridian, in February."

EPARA Equipment Loan Request and Agreement, + OEM Radio Room Training

Club Members that want to borrow equipment from the club, please print and fill out the form below and send it to our Quartermaster. (John Victor **K3WH**)

Also, for anyone interested in OEM radio room training, please contact John by phone or email to schedule time.

Contact info Below:

John Victor

jvictor@ptd.net

K3WH

(610) 906-4268



EPARA Equipment Loan Request and Agreement

Requested Equipment Description:

Manufacturer: _____

Model Number: _____

Serial Number: _____

Check Out Date: _____

Return Date: _____

Borrowers Information:

Name: _____

Call Sign: _____

Phone Number: _____

Address: _____

I, _____ have inspected for deficiencies and checked out the above piece of equipment and agree to return the equipment no later than the return date indicated above and in the same operational condition as it was loaned to me.

I understand that if the equipment is lost or damaged, the borrower is responsible for replacement cost or repair cost within 30 days of the return date indicated above.

I agree that the equipment will be returned with programable settings as was originally checked out.

Borrower Signature: _____

EPARA Quarter Master Signature: _____

Date: _____

MC ARES 1 RACES Radio Room Instructions for WX3OES Station Radio Room at the Office of Emergency Management (Aug 4, 2023)

- When broadcasting from radio room, use call sign WX3OES an any ARES/RACES business or emergency use. Use of your own call sign is only permissible on the very rare occasions when the radio room is being used for demonstration on non-MCARES operation.

VHF/UHF via Repeater with Yeasu FT-2900 1 FT-8100

Using The FT-2900 for Repeater Operation

- FT-2900 is VHF only, and has 20 memory settings (numbered 0-19) on the 2m band; programmed for the 20 closest repeaters. o See the list on the wall by map.
- Go to OONO power pole distribution switch mounted on forward edge of wooden shelf; On the OONO...
 1. See switch on left labeled "Astron 50" and verify green light next to "normal." If not, then look at the Astron 50 on the floor under the table, and put its (red) power switch to "on" (lit up)

2. Lift up on the switch labeled FT-2900

If FT-2900 does not power up, press crange power button on the FT-2900 radio.

3. Litt up on the switch labeled Speakers (this powers up speakers for both radios)

- On the Radio: Tune to desired repeater o It will likely already be tuned to the WX3 OES repeater 146.865 MHz = memory register (MR) #0
- If it is not, turn the big tuner knob on the front right of the radio to move through memory settings.
- To tune through frequencies instead of memory channels, press the "Set MHz" button; the display will show frequencies, and the tuner knob will move in frequency increments (VFO). (In VFO mode the memory channel # will display if tune into a frequency that is also a programmed memory setting) o To display call signs of repeaters press 'MW" button to move through memory channels again.

You are now ready to transmit on the FT-2900

TO SHUT DOWN:

Please tune the FT-2900 back to WX3OES memory setting.

On the OONO, press down on the switches for "speakers" and 'FT-2900",
(Astron 50 remains on constantly)

The FT-8100 for repeater operation • FT-8100 is both VHF and UHF capable.

- it has dual tuners so 2 frequencies appear on the display.
 - The left side is set with VHF memory channels on the 2m band; approx. memory channels 1-21, with closest VHF repeaters.
 - The right side is set with UHF memory channels on the 70 cm band: approx. memory channels 1-44, with closest UHF repeaters.
 - (This means memory channels 1-21 on left will NOT be the same as 1-21 on the right)
 - Go to OONO power pole distribution switch mounted on forward edge of wooden shelf; On the OONO...
1. See switch on left labeled "Astron 50" and verify green light next to "normal." If not, then look at the Astron 50 on the floor under the table, and put its (red) power switch to "on" (lit up)
 2. Lift up on the switch labeled FT-8100
If FT-8100 does not power up, press "PWR" button on the FT-8100 radio.
 - a. Behind the old speakers on shelf, bright blue rotating switch - move it to 8100 (not 9700)
 3. Lift up on the switch labeled Speakers (this powers up speakers for both radios)
 - On the Radio: Tune to desired repeater
FT-8100 will likely already be tuned to WXOES 146.865 on the left side (VHF 2m) and KG3I/R 447.275 on right side (UHF 70 cm) The bottom left (larger) tuner dial will change the channel for the side of the display which has the mountain/shark fin icons near it.
 - Push INWARD on the upper smaller knob (same knob rotates for volume, but for this push in) on the side of the display that you want to change; this causes the mountain/shark fin icon to appear on that side, and to give tuner knob control to change that side.
See list on wall (pinned up near map) with list of which repeaters are in programmed in which memory channel.
 - The display will show the memory channel number just above and left of the frequency (this display does not show letters for call signs, only numbers for frequencies) so cross reference to the list on the wall for call signs.
 - (WA3 MDP has been damaged by lightning with no known repair date so is no longer a programmed channel. For reference, in case of return to function, that frequency is 147.045 to toggle the function of the tuner knob between scrolling through memory channels and scrolling VFO by frequency, press the button marked "VFO/MR" which is the 2nd bottom down from top, on right hand side of radio.
- VOLUME is the front outer rotating little knob and SQUELCH is the back liner rotating little knob right behind it — so be careful not to accidentally move SQUELCH when you only want to change VOLUME.

TO SHUT DOWN:

Please tune the FT-8100 back to the WX3OES 146.865 on the left and KG31441.575 on right on the OONO, press down on the switches for "speakers" and "FT-8100" (Astron 50 remains on constantly)

VHF/UHF Simplex with Yeasu FT-2900 / FT-8100

- Go to OONO power pole distribution switch mounted on forward edge of wooden shelf; On the DONO...
 1. See switch on left labeled "Astron 50" and verify green light next to "normal." If not, then look at the Astron 50 on the floor under the table, and put its (red) power switch to "on" (lit up)
 2. Lift up on the switch labeled FT-2900
If FT-2900 does not power up, press orange power button on the FT-2900 radio.
 3. Lift up on the switch labeled FT-8100
If FT-8100 does not power up, press "PWR" button on the FT-8100 radio.
a Behind the old speakers on shelf, bright blue rotating switch — move it to 8100 (not 9700)
 4. Lift up on the switch labeled Speakers (this powers up speakers for both radios)
 5. On FT-2900, turn big VFO tuner knob on right to one of the designated ARES/RACES frequencies:
memory register (MR) 2 for SPLEX 1 = 147.420 MHz or
MR 3 for SPLEX 2 = 147.435 MHz o If you want to use a different frequency, press the "Set MHz" button to cause tuner to scroll through frequencies (VFO) rather memory settings.
O Press the "MW" button to have tuner scroll through memory settings.
 6. On FT-8100:
O Left side memory is programmed for VHF I Right side is set for UHF.
o Push the top smaller knob inward to bring mountain/shark fin icon to side you want to tune.
Use tuner knob (lower left) to one of the designated ARES/RACES frequencies.
 - **Left side.**
 - SPLEX 1 = 147.420 MHz on memory setting#2
 - SPLEX 2 = 147.435 MHz on memory setting #3
 - **Right side**
 - SPLEX 3 = 446.050 on memory setting #2???
 - SPLEX 4 = 446.075 on memory setting #3???
 - To toggle between tuner knob controlling scroll through memory and scroll through frequency (VFO), on the right side of front of radio, press the 2 ad button from the top labeled "VFO/MR."
- "
- TO SHUT DOWN:
Please tune the FT-2900 back to WX3OES repeater 146.865 MHz, and the FT-8100 back to WX3 OES on left and KG31, 441.575 MHz on right
On the OONO, press down on the switches for "speakers", "FT-2900", "FT-8100".

VHF/UHF with the Icom| 9700

1. Turn ON power via OONO Power Distribution Switch:
 - confirm Astron 50 light is green (if not, switch on Astron 50 power supply under desk)
 - turn on Icom 9700
2. Behind the old speakers on shelf, bright blue rotating switch — move it to 9700 (not 8100)

On the Icom 9700 for VHF • push in upper MAIN button – to make top display active.

- Push VIM button until MEMO shows on screen to indicate memory mode.
- Top Right MULTI button will now scroll through memory channels.
- Rotate to memory channel 19 for VHF 147.420 MHz (in FM mode) o Rotate to memory channel 13 for WX3OES repeater.

On the screen underneath "FM" there is a small font display that should say S&SWR - touch to scroll through its various functions until S&SWR appears. o S for incoming signal strength o Key mic to see SWR for outgoing — will only show when mic is keyed but you don't need to talk b/c on FM the carrier signal is pushing through. (On SSB would need to talk)

Push inward on the upper right MULTI button to see the Power screen. it's a 100-watt radio, so % will = watts (Push MULTI again to make it go back to regular display?)

- No need to tune this antenna (vertical dipole)
- You can push the VIM button to come out of memory mode.
- Beware this hand mic has buttons on top for channel UP and channel DN (down) so be careful to only push the push-to-talk on the SIDE of the mic if you want to hold frequency. Use the buttons on the top of the mic if you want to pop through memory channels without touching the radio box to do it.

TO TURN EQUIPMENT OFF

- Turn OFF power via OONO Power Distribution Switch:
- turn off the 9700 (indicator light will go out)
- leave Astron 50 power supply on (light is green)

HF SSB with the Yaesu| FTDX10

Note: equipment manuals are located in horizontal file in black file cabinet on left as you walk in the door

1. Turn ON power via OONO Power Distribution Switch:
 - confirm Astron 50 light is green (if not, switch on Astron 50 power supply located under desk)
 - turn on (push up) FT-DX10 power switch (indicator light will turn green)
 - optional: turn on SWR meter power switch (indicator light will turn green)
2. Set antenna switch to radio position (not to dummy load position).
3. To select desired band: press BAND button, then tap desired band on screen.
4. To select desired frequency: turn VFO knob.
5. To set power: press FUNC knob, tap RF POWER on screen, turn FUNC knob to desired power level (up to 100 watts). Press FUNC knob again to return to normal display.
6. To tune antenna: once desired frequency is dialed in, press, and hold TUNE button for one or two seconds, release and wait until tuning is complete. Radio is now ready for transmitting. NOTE: In the unlikely event the tuner fails to bring SWR to an acceptable level, the radio will not transmit. You must select another frequency and/or band. Also, notify ARES/RACES leadership to troubleshoot the problem.
7. To access commonly used functions (e.g., monitor level, mic gain): press FUNC knob and tap appropriate display function.
8. To widen or narrow display range: tap SPAN at bottom of display and select desired range from pop-up.
9. To quickly access ARES/RACES frequencies on 20, 40 and 75 meters: press M button, rotate FUNC knob to desired band/frequency and press FUNC knob. Press the VIM button to return to normal display.

TO TURN EQUIPMENT OFF

1. Turn OFF power via OONO Power Distribution Switch:
 - turn off FT-DX10 power switch (indicator light will go out)
 - if on, turn off SWR meter power switch (green indicator light will go out)
 - leave Astron 50 power supply on (light is green)
2. Set antenna switch to dummy load position.

Simple, Small 2- and 6-Meter Yagis

Gain, pattern, and an easy, wide-band match.

Joe Reisert, W1JR

Sometimes a ham needs a small, efficient handheld 2-meter antenna with moderate performance, especially for emergency communication. They may also need an entry-level 6-meter antenna, especially for chasing DX and utilizing F2 propagation as we approach the peak of Solar Cycle 25.

The basic Yagi is still a good choice for a compact and efficient antenna. Radiation pattern and impedance are determined by the number of elements, the length and diameter of the elements, and the spacing between the elements. Many trade-off studies were conducted 25 years ago on Yagis with 0.1 – 1.0-wavelength booms. The results, which you can read at www.arrl.org/qst-in-depth, were published in the winter 1998 issue of *Communications Quarterly*. For a visual representation of these concepts, see the sidebar, “Yagi Gain.”

A three-element Yagi on a 0.35-wavelength boom can have a gain of 5 dBd. Inserting an additional director between the driven element and the existing director, and readjusting the element lengths and spacing, can improve the radiation pattern. A front-to-rear ratio greater than 20 dB is possible, and the gain will increase to about 6 dBd with a direct 50 Ω match increased bandwidth. The lead image shows this Yagi as built, and its radiation pattern is shown in Figure 1. It uses a $\frac{3}{4}$ \times $\frac{3}{4}$ -inch square boom that is at least 36 inches long, but similar round tubing can be used. Booms with square tubing tend to have improved symmetry and better, long-lasting contact between the elements and the boom.

In this design, the antenna elements are placed on the top and front ends of the boom to leave room for either handheld or mast-mounting clamps on the



The 2-meter Yagi mounted in the vertical polarization. [Joe Reisert, W1JR, photo]

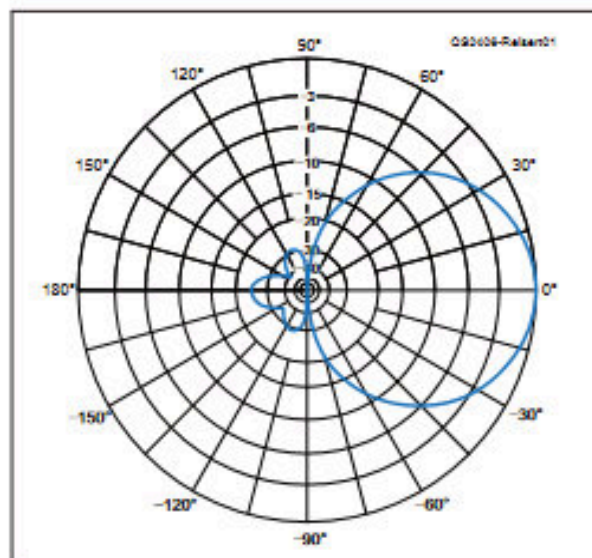


Figure 1 — The NEC calculated pattern for the 2-meter Yagi, redrawn for clarity. The front-to-rear ratio is very good.

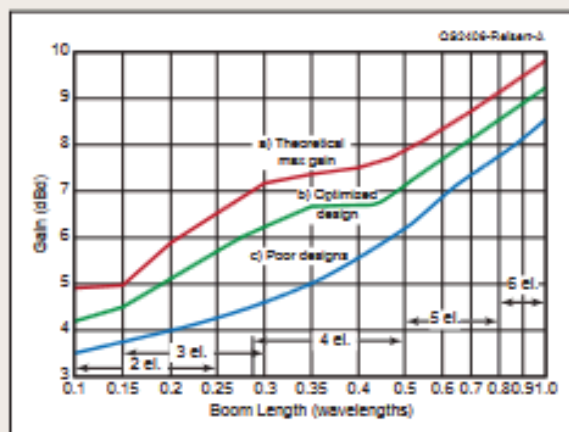
Yagi Gain

Most Yagi antennas work to some extent. High-gain Yagis often have narrow bandwidth and low driven-element impedance (typically 20 – 25 Ω), thus requiring special impedance-matching networks. As mentioned, many trade-off studies were conducted 25 years ago on Yagis with 0.1 – 1.0-wavelength booms. Different optimizing software programs and additional background material have also been published. My article "Yagi/Uda Antenna Design," in the winter 1998 issue of *Communications Quarterly*, is available for reference at www.arri.org/qst-in-depth.

Nothing has changed since this original study was conducted. Performance detailed in the study has been verified with programs such as *EZNEC*. The final results are shown in this sidebar's graph; I call it the "Yagi Truth Graph," and it should dispel any false claims about the gain of Yagis.

One group of short, optimum-length-boom Yagis has a so-called "sweet spot" between about 0.25 and 0.35 wavelength. These designs tend to have higher gain, wider bandwidth, and a typical impedance of 50 Ω . A typical two-element Yagi has a gain of up to about 3.75 dBd, but the front-to-rear ratio is typically low at 8 – 11 dB. A three-element Yagi on a 0.35-wavelength boom can have a gain of 5 dBd.

By inserting an additional director on this Yagi between the driven element and the existing director, and by readjusting the element lengths and spacing, the radiation pattern can be improved. A front-to-rear ratio (90 – 270 degrees) greater than 20 dB is possible and generally considered to be adequate. Also, the gain increased to about 6 dBd, and the 50 Ω impedance match bandwidth increased. A typical radiation pattern for this Yagi is shown in Figure 1 of this article.



A graph of the actual gain attainable and the recommended number of elements versus the boom length for a Yagi. The upper curve is the maximum gain attainable if other parameters are sacrificed. The middle curve shows an optimized Yagi. The lower curve represents a poor performance design.

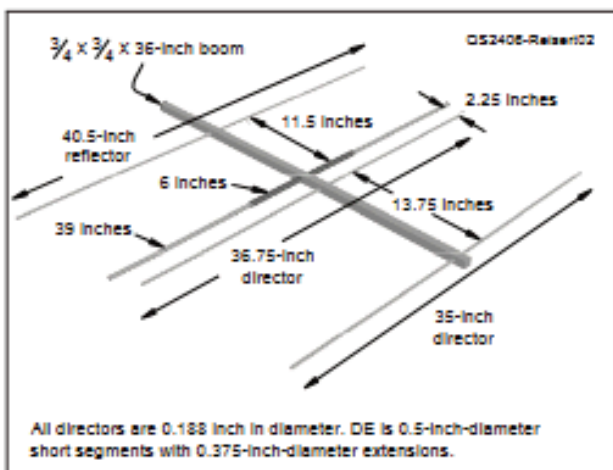


Figure 2 — Dimensions of the 2-meter Yagi.

rear of the boom. The dimensions are shown in Figure 2. It can be used with either vertical or horizontal polarization. The reflector and directors use 0.188-inch-diameter aluminum rods that are connected to the boom with small aluminum clamps. The 39-inch driven element consists of 12-inch-long, 1/2-inch-diameter aluminum tubing with 3/8-inch sliding extensions, and it is split in half at the center to ease feed-line attachment and length adjustment (see Figure 3). The driven element tubes are held in place between resin support blocks, which insulate them from the 2 x 4-inch plate. A 4-inch, low-loss Delrin® or equivalent insulating rod with a 3/8-inch diameter helps support the feed point and keep the split-driven element straight.

The feed line is directly connected to the center of the split driven element. It should be at least 2 feet long and used with a small-diameter coax (such as RG-58), and it should face the rear of the boom. Three or more ferrite beads placed on this feed line choke common-mode currents. Beads with 1/4-inch hole diameters and permeabilities of 800, such as Fair-Rite 2643540002 beads, are widely available on the internet. These are about 1 1/4 inches long with just more than a 1/2-inch outside diameter.

This four-element Yagi design does not require any impedance-matching networks to obtain a 50 Ω impedance match across the 2-meter band. Adjusting the length of the driven element optimizes the voltage standing wave ratio (VSWR) at your operating frequency. A typical VSWR plot is shown in Figure 4.

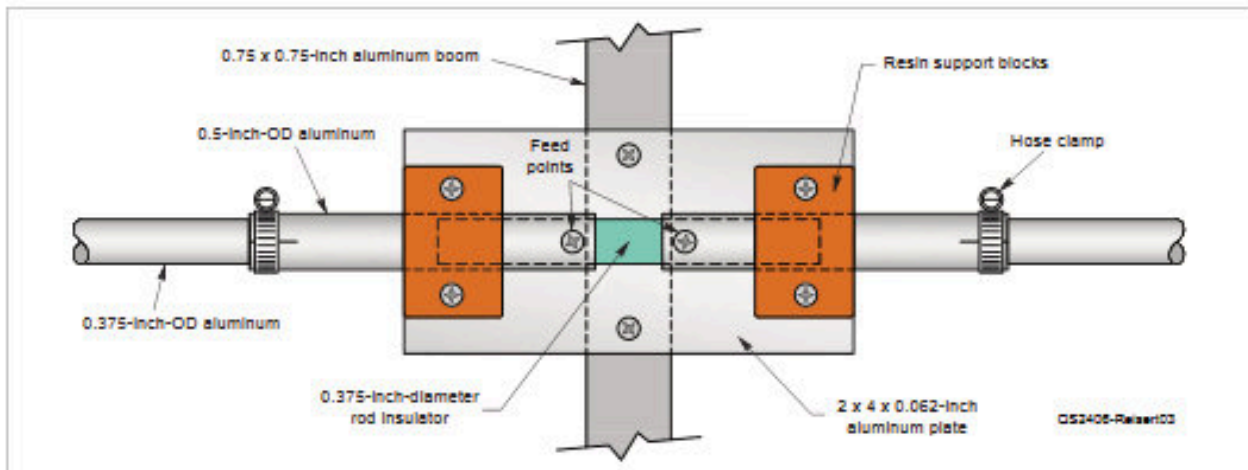


Figure 3 — Driven element construction details.

A 6-Meter Version

I also designed a four-element, 0.29-wavelength 6-meter Yagi. The boom length was shortened slightly in order to accommodate a commonly available, 6-foot-long aluminum boom with only a few tenths of a dB of less gain. The center elements all use 48-inch-long \times $\frac{1}{8}$ -inch-diameter 0.057-inch wall aluminum tubing. The end tubes use $\frac{1}{2}$ -inch-diameter aluminum tubing. Overall recommended element lengths and spacing are shown in Figure 5.

Construction details for the driven element are similar to those for the 2-meter version, except the diameter of the insulating rod should be half an inch. Insulated resin-type clamps similar to those used on the 2-meter Yagi's driven element hold the inner tubing of the driven element. The element mounting plate is larger than that of the 2-meter Yagi to accommodate boom attachment clamps.

It is recommended that the reflector and director elements use the same resin clamp configuration

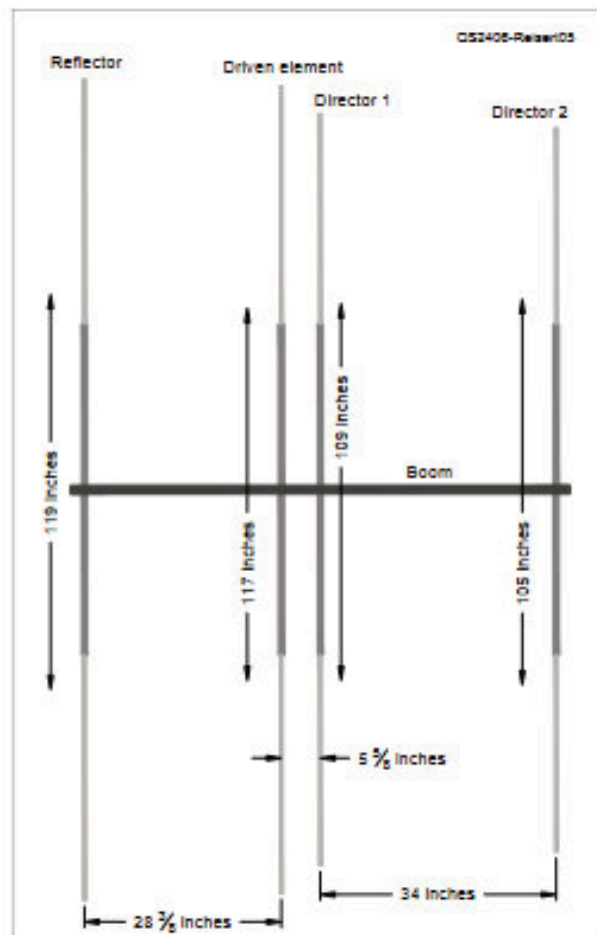


Figure 5 — Dimensions of the four-element, 0.29-wavelength 6-meter Yagi.

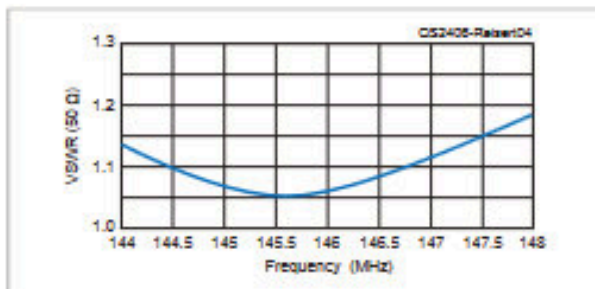


Figure 4 — Voltage standing wave ratio (VSWR) versus frequency, as calculated by NEC and redrawn for clarity.

used on the driven element. The element-holding plates should then be attached to a 6-foot-long boom with at least a 1.25-inch diameter. This mounting method holds the elements firmly and symmetrically in place without boom-to-element interaction. Because only two element tubing diameters are required, the strength of the element is increased.

The feed line should use at least a foot of RG-58 or equivalent coax. Use five ferrite beads for the choke, similar to the ones used on the 2-meter feed line. If high power (greater than 250 W) is being transmitted, it is highly recommended that you use seven ferrite beads and a polytetrafluoroethylene dielectric coax, such as RG-303 or equivalent. Don't forget to put a suitable sealant on the feed points to prevent moisture ingress.

The 6-meter antenna boom should be mounted on a 6 × 6-inch aluminum plate that is at least 0.188 inch thick and attached to a suitable mast using four boom clamps. Remember that feed-line loss between an antenna and the radio decreases the antenna gain when both receiving and transmitting. Therefore, if the feed line is long — especially on 2 meters — a larger-diameter, low-loss coax is recommended.

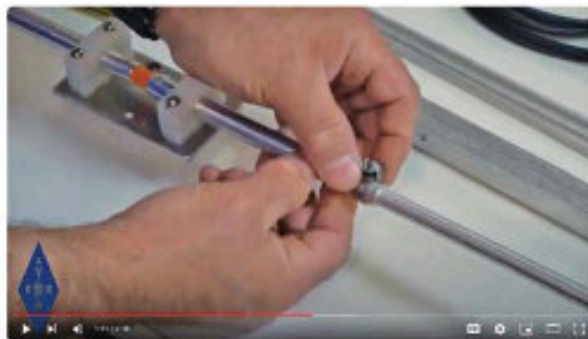
An SWR meter can be inserted between the antenna and the feed line to test the impedance match. After that, the length of the driven element can be slightly adjusted for minimum VSWR at the desired center frequency.

Both 2- and 6-meter Yagi designs use short, optimum boom lengths. More photos of each design can be seen at www.arrl.org/qst-in-depth. The 2-meter Yagi may be a good candidate for a club project, especially for emergency or portable communications. The 6-meter Yagi can be a starter antenna to help get you active on the 6-meter band. These designs can also be easily scaled for use on the HF bands.

See QST in Depth for More!

Visit www.arrl.org/qst-in-depth for the following supplementary materials and updates:

- ✓ The author's article, "Yagi/Uda Antenna Design," from the winter 1998 issue of *Communications Quarterly*
- ✓ More photos of the 2- and 6-meter Yagis described in this article



Access the digital edition of *QST* (www.arrl.org/qst-in-depth) to watch W1AW Station Manager Joe Garcia, NJ1Q, build the 2-meter Yagi described in this article.

ARRL Life Member and Amateur Extra-class licensee Joe Reisert, W1JR, was one of the first licensed Novices in 1951. In 1956, he received his AAS degree in Electronic Technology from the State University of New York in Farmingdale. Joe has been employed at Sperry, IBM, Lockheed Missiles and Space Company, Fairchild Microwave, The MITRE Corp., Wang Labs, and Cushcraft. In 1992, he founded Antennaco, Inc., and he designed and manufactured commercial VHF, UHF, and microwave antennas. Joe is interested in DX from HF through the microwaves and was an early EME pioneer in the 1970s. He has earned DXCC 392/340, DX Challenge 3180, 13BWAS, 11BDXCC, and DXCC, with 315 entities confirmed on 160 meters. He was inducted into the CQ DX Hall of Fame in 2014. Joe has served on the ARRL DX Advisory Committee and was Chairman of the VHF/UHF Advisory Committee. He has published more than 150 technical papers and given more than 130 invited talks on various amateur radio subjects. You can reach Joe at w1jr@arrl.net.

For updates to this article, see the *QST* Feedback page at www.arrl.org/feedback.

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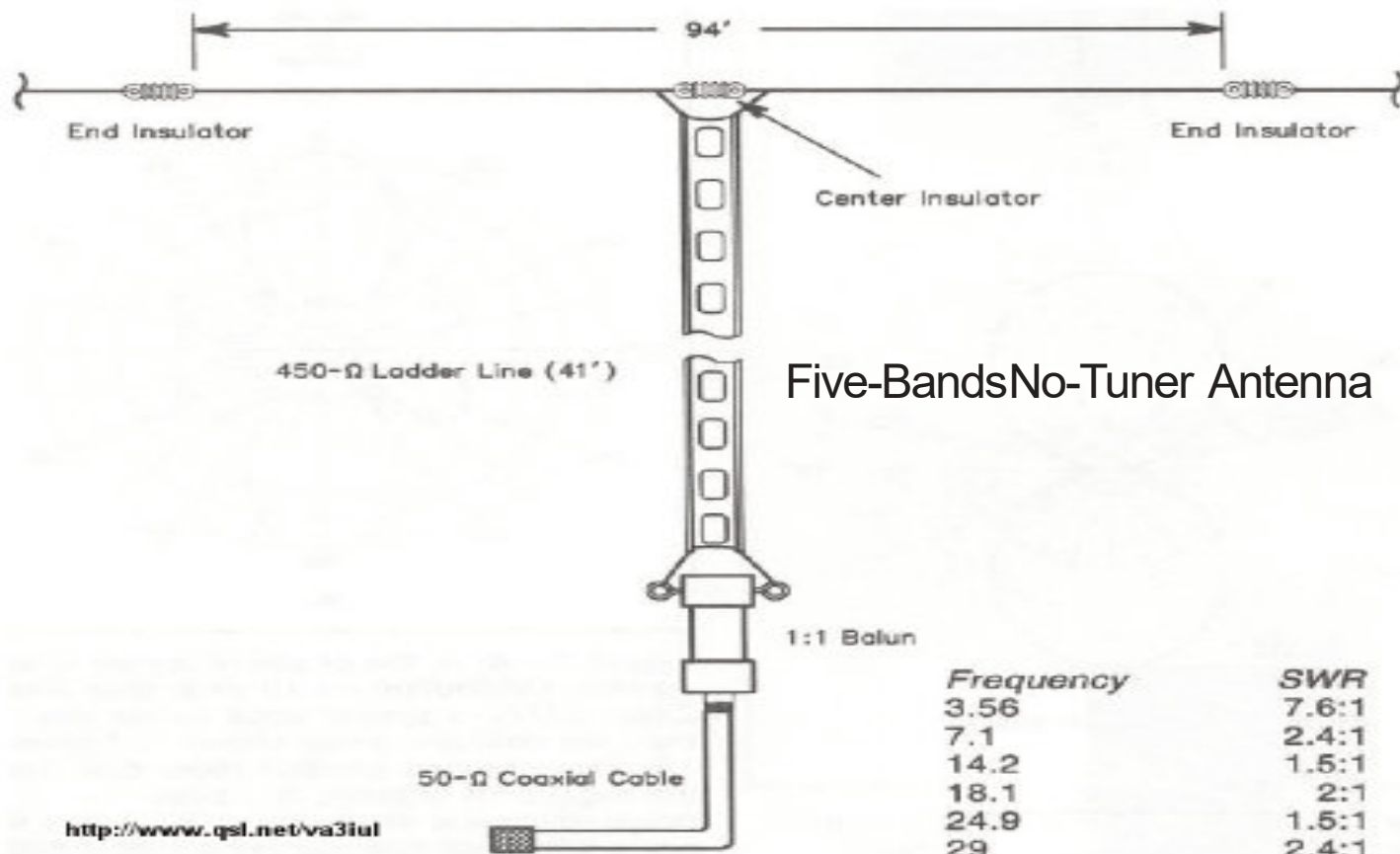
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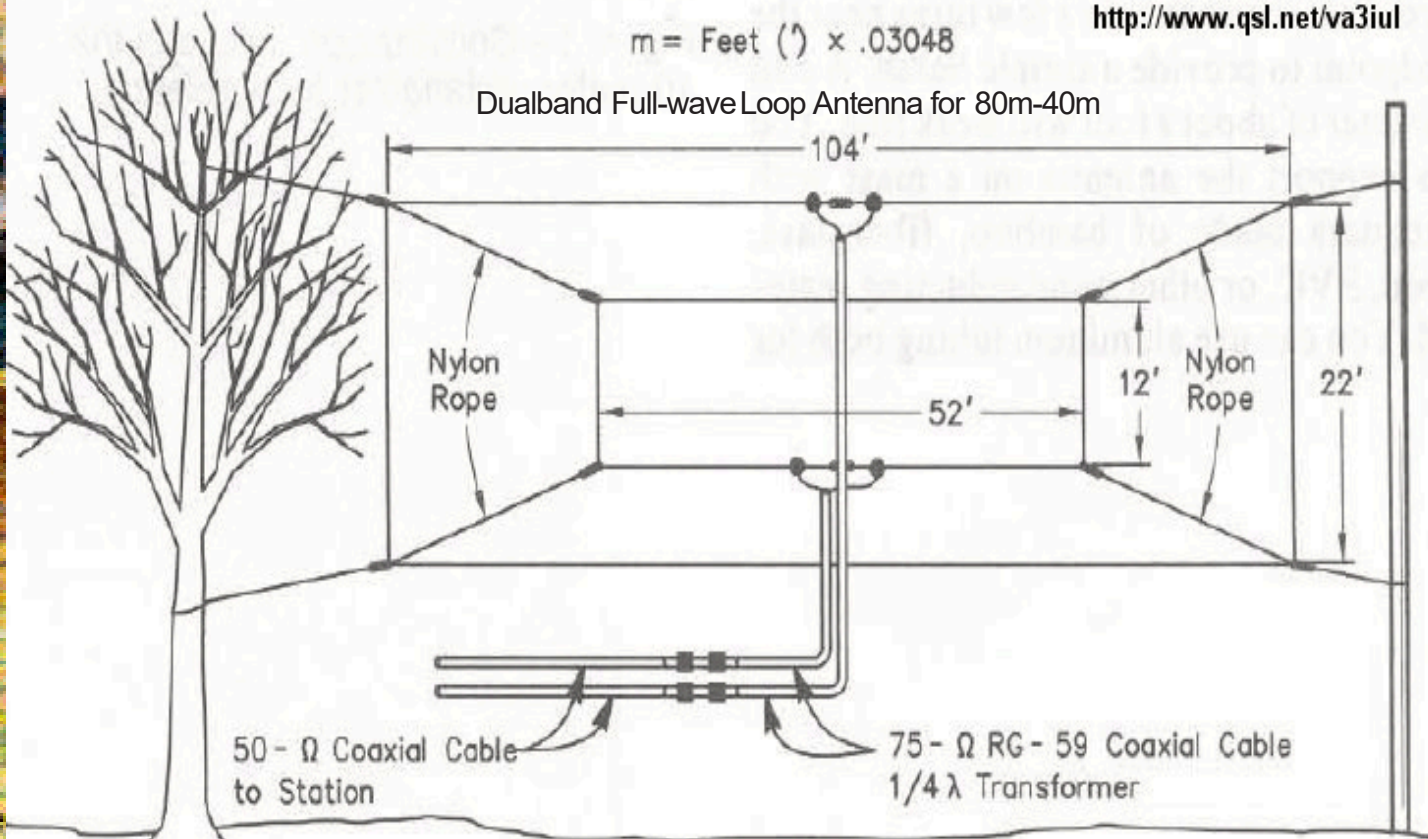


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