



LETARC PROPAGATION

The official Newsletter of the Longview East Texas Amateur Radio Club



November 2018

Volume 2018-11

COAXIAL TRANSMISSION LINE

COMMON-MODE CURRENT

by

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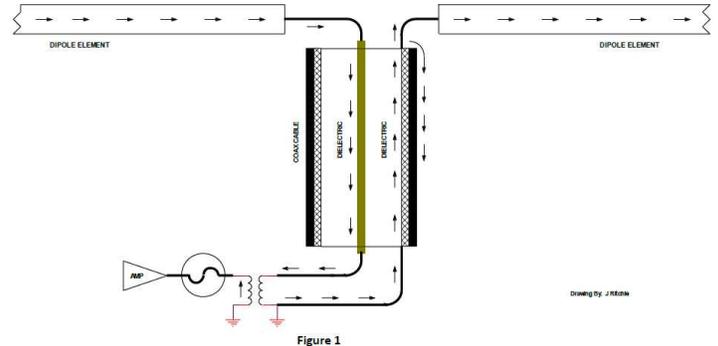


Figure 1

Introduction

Coaxial transmission lines are popular for their wide frequency bandwidth and high resistance to electromagnetic interference (EMI). Coax cables are unique because the propagation of RF current flows in both directions within the cable. Coax cables are classified as “unbalanced” because the impedance between its center conductor and shield is unequal.

Common-Mode Current

When RF current migrates to the outer shield surface of the coax cable, this is identified as “common-mode current”. By connecting an *unbalanced* cable to a *balanced* antenna, this will cause some level of RF common-mode current. Understanding how the RF energy migrates to the cable’s outer shield surface can be confusing. RF (AC) energy (unlike DC energy) travels on the “outer surface” of conductors. This phenomena is called the “skin effect” and plays a major role in how the RF energy travels within the coax cable. The drawing below (Figure 1) shows that the antenna driven element on the left is connected to the coax cable’s center conductor. Due to the “skin effect”, RF energy connected to the cable shield actually travels between the cable’s dielectric material and inner surface of the shield. When the RF energy reaches the cable end, it splits into two paths. Most of the RF energy goes into the element because of its wavelength, but some of the RF goes down the coax outer shield. The RF current on the shield’s outer surface is considered “common-mode current”. This RF current has no return path and is radiated into the air, so the shield outer surface becomes part of the antenna. At the lower HF frequencies, the antennas operational bandwidth is very narrow and operating out of this range will cause more RF energy to flow on the feedlines outer surface.

Problems Caused by Common-mode Current

Noise interference is the most common problem encountered when the antenna’s outer shield acts as part of your antenna system. Noise is usually vertically polarized and the vertical path of your coax cable provides an excellent antenna to pick up this noise. At HF frequencies, noise interference can override weak signals and most of this noise is vertically polarized. Many amateur operators have reported a significant reduction in their receive noise levels when the common-mode current was eliminated. If you search the Internet for “antenna common-mode current noise”, you will find numerous articles related to this problem. Radio frequency interference (RFI) at your QTH and to your neighbors has also been reported. Some antenna tuners have problems when common-mode currents are present. The antenna’s radiation pattern is also modified by common-mode current. Dipole antennas are notorious for having common-mode current problems, but vertical antennas can experience the same problem. If the vertical antenna’s counterpoise (ground-plane) provides a poor current path, the feedline outer shield will become part of the antenna. Common-mode current on a mobile antenna’s coax cable can cause interference to a vehicles electronic systems.

Measuring Common-Mode Current

Measuring the level of common-mode current is a non-scientific process. RF radiation levels on the coax cable’s outer shield is very high near the antennas feed point, but it dissipates as it travels down the coax. Measuring the RF current at the transmitters cable end can be deceiving. SWR meters, VNA’s and antenna analyzers cannot be used to measure RF common-mode current levels. I have a MFJ-984 RF current meter which uses a clamp-on transformer that snaps around the coax cable. It has a

current range of 3 mA to 3 Amps, but its maximum frequency range is only 30 MHz. For frequencies above 30 MHz, this would require an instrument that will detect RF energy above this frequency. Using a field strength meter (e.g. MFJ-801) that covers these VHF/UHF frequencies would work by winding two turns of wire around the coax cable and attaching it to the FS meter.

Baluns

If you are interested in obtaining the most efficiency from your antenna by reducing or eliminating common-mode current, this can be achieved by installing a balun at the antenna's feed point. There's a large selection of baluns being sold on the amateur radio market, but choosing the correct type for your antenna system can be confusing. There are two types of baluns available, voltage or current, with coupling ratios of 1:1, 4:1, 6:1 and 9:1. For most amateur applications, the 50Ω to 50Ω (1:1) ratio current balun will be used.

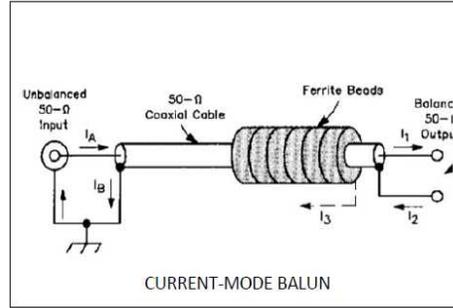
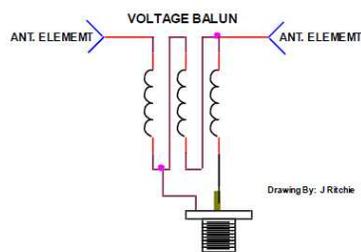
⌚ Voltage baluns convert the coax cable unbalanced termination to a balanced termination. They also do not provide common-mode isolation. Voltage baluns were the first designs to appear on the amateur radio market.

⌚ Current baluns, rather than voltage baluns, should be used whenever possible. Current baluns provide better balance and often have lower loss. Current baluns, especially 1:1 ratio baluns, tolerate load impedance and balance variations much better than voltage baluns. These baluns act as a RF choke to common-mode current.

Caution: Some balun manufacturers advertise their voltage baluns as being current baluns. It's easy to identify these baluns with an ohm meter by measuring the resistance between the connector center pin and connector ground. If the resistance is zero (short), it's a voltage balun. If your balun is already in your antenna system, just measure the resistance feedline end.

Balun Drawings and Photos

The drawings and photos on this page show the electrical and mechanical construction of baluns that are available on the amateur radio market. The first illustration is a voltage balun which is housed in the same enclosure as a current balun. These enclosures are normally sealed and can't be taken apart, but you can measure the difference with an ohmmeter.



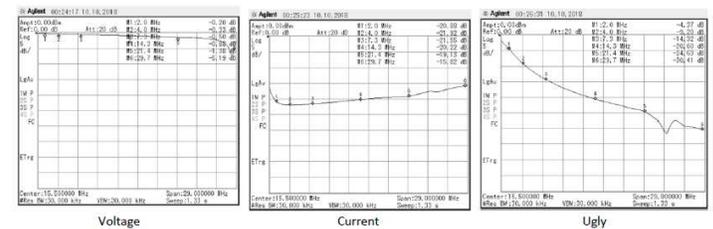
This article would not be complete without mentioning the “Ugly Balun” as seen below, which is technically a RF choke. For this type of balun to be effective on the 80 – 10 meter bands, you need at least 20 feet of close wound coax with a diameter of 4 to 6 inches. The 3 turn choke was designed for 10 meters.



Balun Performance Tests

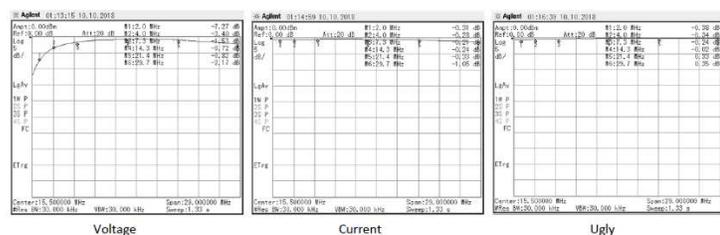
Measuring a balun's design performance on a test bench can be a challenge and manufacturers seldom provide any performance specifications. Each type of balun show in this article was tested for common-mode current rejection, insertion loss, return loss and SWR.

Common-mode Current Rejection:

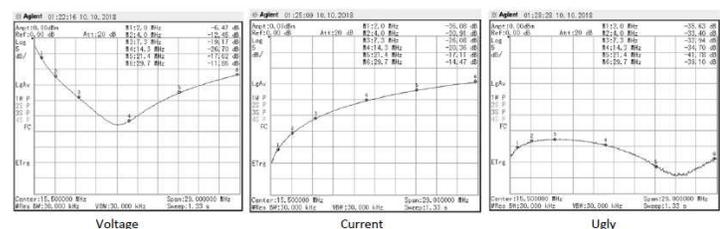


Voltage baluns are not designed to reject common-mode current. The Current balun provided the best common-mode rejection. The Ugly balun fail short on the HF low frequency end because it had only 17 feet of coaxial cable on a 4” diameter PVC pipe. You need 20 feet or more of coax cable for good performance on the 80 and 160 meter bands. My benchmark for common-mode current rejection is more than 15 dB.

Insertion Loss:



The insertion loss should be less than 1 dB for a well-designed balun. The Voltage balun failed to meet this specification across most of the HF frequency band. The Ugly balun had the best results because its insertion loss depends on the length and type of coax cable.



Band	Return Loss	SWR	Band	Return Loss	SWR	Band	Return Loss	SWR
160M	-6.47	2.80:1	160M	-36.08	1.03:1	160M	-35.63	1.03:1
80M	-12.45	1.62:1	80M	-30.91	1.06:1	80M	-33.40	1.04:1
40M	-19.17	1.24:1	40M	-26.08	1.11:1	40M	-32.94	1.04:1
20M	-26.70	1.10:1	20M	-20.36	1.22:1	20M	-34.70	1.03:1
15M	-17.62	1.30:1	15M	-17.11	1.32:1	15M	-41.78	1.01:1
10M	-11.86	1.68:1	10M	-14.47	1.47:1	10M	-39.10	1.02:1

Each balun was terminated with a non-reactive 50Ω load during the RL/SWR test. Most baluns will not function properly when the antenna SWR is above 3:1 even when antenna tuner is being used. Antenna tuners only provide a good impedance match between coxa cable and radio, the mismatch between antenna and balun unchanged. Baluns do not perform well with antennas that operate in a harmonic mode.

Summary

When the RF current reaches antenna, it will choose the path of least resistance. If you operate outside the frequency range of your antenna, the path of least resistance might be the outer surface of the coax cable. Using a poorly designed balun can cause more problems than it cures. Although voltage baluns are simple and cheap to build, they are not designed to eliminate common-mode currents. If you purchase a TV antenna, they are usually supplied with 300Ω/75Ω (4:1) voltage balun. When you purchase an amateur radio antenna, it seldom includes a balun. The Voltage balun used in this document was purchased at a ham fest and the manufacturer is unknown. The Current balun was a MJF-918 and the Ugly balun I built several years ago. Since balun manufacturer's specifications only include a baluns power rating and ratio, the buying decision can be difficult. Plus, some baluns being advertised as a Current balun, may actually be Voltage balun.

LETARC MEETINGS

City of Longview Fire Training Facility, 411 American Legion Blvd, Longview, TX.

LETARC's monthly meeting held the fourth Saturday of each month at 0900 hrs at the Longview Fire Training Facility at 411 American Legion Boulevard. Talk-in on 147.34 (+136.5). Presentations, free coffee and donuts and friendship!

The VE Sessions have also been moved to the fourth Saturday of each month at LeTourneau University. The time of the day not not changed. It still takes place at 2:00PM.

Minutes of the September 2018 Monthly Meeting Of The Longview/East Texas Amateur Radio Club

The September 2018 monthly meeting of the Longview/East Texas Amateur Radio Club was called to order at 9:00 am Saturday, September 22 by President Jim Quinn AA5CX. Introductions of guests and members were made. The minutes of the previous club meeting were read and approved after a motion to accept was made by Joe Gimbert AG5FJ and seconded by Buddy Walker W5DW. The current treasurer's report was read and approved after a motion was made by Jim Rogers N5VGQ to accept and was seconded by Joe Gimbert AF5FJ.

Because of the need to delay the technical program to improve internet access, several topics slated for the business portion of the meeting were then discussed. Terry Johnson KG5WO gave an update on the Gilmer Yamboree Special Event station W5Y. LETARC will assist the Upshur-Gregg County Ares Group with operators to man the HF and VHF stations during the Yamboree. An operator signup sheet was made available to those wishing to participate in this event.

Jim Perry then gave an update on the status of the radio room at the Mims VFD. An open house and soft opening of the facility will be held September 29. After work is completed on the air conditioning system, LETARC should be able to complete the radio room. Jim Rogers stated that he has to determine if the thrust bearing for the antenna is the correct size and if it is the appropriate size, work can then be completed on the antenna and tower installation.

It was decided by the membership that the October meeting would be held concurrently with the annual fall club picnic. Mary Jane Burnett KG5PZR will check with the city about the availability of Teague Park pavilions and an announcement will be made on the Wednesday night net. The meeting/picnic is tentatively planned for Saturday, October 27 from 12:00 noon to 3:00 pm.

The VE test session for the afternoon was announced and all available VEs were invited to assist. The tailgate sale to be held at the Texas Broadcast Museum on Saturday, November 10 from 7:00 am until noon was then discussed. Most of the arrangements for this event have been completed.

Election of new officers for 2019 will be conducted at the November meeting and nominations are being solicited. The Cotton Patch was selected as the site of the next Sunday evening informal dinner to be held at 6:00 pm October 14. With no further business to conduct, the meeting was adjourned at 10:45 am.

ATTENDEES

Dave Luchak	KL7BX
John Armstrong	KG5LWD
Chris Crawford	KG5SMZ
Pat Brown	AK5TX
Chris Howell	K5PHX
Don Gamble	KG5CMS
Terry Johnson	KG5WO
Jim Perry	KA5BCM
Joe Gimbert	AG5FJ
Jim Quinn	AA5CX
Jim Rogers	N5VGQ
Buddy Walker	W5DW
John Zenter	AE5OY
Mary Jane Burnett	KG5PZR
Cliff Scott	AE5ZA

Treasurer's Report for

September 23, 2018 to October 26, 2018

Brought forth from the last reporting period:	\$9,258.80
Expenses for this period:	
Donuts for September meeting (Adan)	\$34.00
Total Expenses	\$34.00
Ending Balance (as of October 26, 2018):	\$9,224.80

EVENTS AND CONTESTS

November 2018

- 3-5 [Nov. Sweepstakes – CW](#)
- 17-19 [Nov. Sweepstakes – Phone](#)
- 24-25 [EME - 50 to 1296 MHz](#)
- 11/30-12/2 [160 Meter](#)

<http://www.arrrl.org/contest-calendar>

REGIONAL CLUBS

Click on underscored name to visit site.

- [Tyler](http://www.tylerarc.org/) <http://www.tylerarc.org/>
- [Nacogdoches](http://w5nac.com/) <http://w5nac.com/>
- [Athens](http://www.athensarc.org/) <http://www.athensarc.org/>
- [Cedar Creek](https://k5ccl.wordpress.com/) <https://k5ccl.wordpress.com/>
- [Marshall](http://marclub.net/) <http://marclub.net/>
- [Minden](http://www.n5rd.org/) <http://www.n5rd.org/>
- [Shreveport \(ARCOS\)](http://www.qsl.net/nwlarl/arcos.htm) <http://www.qsl.net/nwlarl/arcos.htm>
- [Shreveport \(SARA\)](http://www.k5sar.com/) <http://www.k5sar.com/>
- [Rusk County \(Henderson\)](http://www.ruskcountyar.com/) <http://www.ruskcountyar.com/>
- Four States (Texarkana) <http://www.4444sarc.org/>
- [Palestine-Anderson County](http://www.pacarc.org/) <http://www.pacarc.org/>
- [Navarro, Freestone, Limestone and Leon County](http://www.nflarc.com/) <http://www.nflarc.com/>
- Panola County (no website)
- LeTourneau University – LUARC (no website)

Other Ham Clubs

Fond du Lac Amateur Radio Club, Fond du Lac, WI
<https://www.fdlhams.com/>

The Rare Ones Of New Orleans

Do a little rag chewing with a group of really nice fellows living in and around the Big Easy on 40 Meters – 7.260 Mhz (+/- 5 kHz) – Most Evenings About 1930-2130 CST.
<http://therareones.net> (New Web link)



“The “Rare Ones” of New Orleans was resurrected on February 22, 2017 after much deliberation and thought by nine (9) amateur radio operators in the Greater New Orleans Area. The purpose of the group is to promote the amateur radio HF Communications, the City of New Orleans, and the Audubon Zoo.

The original “Rare Ones” of New Orleans was established in 1965. The current “Rare Ones” are the third generation of this fine group, and are

excited to promote our wonderful City's unique culture, history and fine traditions. To learn about the History of the "Rare Ones" please click on the following link: [History of the "Rare Ones"](#)

The "Rare Ones" of New Orleans also promotes the Audubon Nature Institute. To show our appreciation for the Zoo, each member of the "Rare Ones" has adopted an animal figure to represent a personal connection with the Audubon Zoo. Of course, if you've been to the Zoo, they all asked for you! Well, the "Rare Ones" all ask for you to check in with us on the air waves!

One of the goals in resurrecting the "Rare Ones" of New Orleans is to provide a place where displaced New Orleanians could "pull up a chair" and chat with someone back home. Sharing childhood stories and memories with our displaced friends and family brings a great satisfaction to the "Rare Ones".

The "Rare Ones" of New Orleans love to tell the story of the City of New Orleans to new comers as well as displaced former New Orleanians. By all means, don't be a stranger and come by for a spicy taste of New Orleans!"

ETX LETARC Tail Gate Sale

This event is co-sponsored by the Regional Amateur Radio Clubs and the **Texas Broadcast Museum**.

When: Saturday, November 10, 2018, 7:00 AM till 12:00 PM

What: Free tailgate sale. Bring all of your new, old, & used amateur radio equipment that you would like to sell. This is an outdoor event and will be held rain or shine. **The Texas Broadcast Museum is planning on having an auction to sell off lots of stuff that are duplicates, triplicates or just not of real interest to the Museum. There will be various old radios, video and audio equipment people will find interesting. Vintage Radio & Phonograph Societies from Dallas and Houston have been invited to attend. Antique and classic cars will be on display. There is a donation to tour the museum: Adults \$6, Seniors, Military, Students & First Responders \$5, Kids 3-11 \$3 Under 3 free**

A separate flyer on this event will be emailed to LETARC membership and other radio clubs in the East Texas area to forward on to their memberships.

Useful Links

LETARC Web Site
<http://www.letarc.org>

Radio Tools and Utilities for amateur radio operators
<http://www.dxzone.com/catalog/Software/Utilities/>

eham.net – Product Reviews
<http://www.eham.net/reviews/products/41>

Android Apps – Tools

<https://play.google.com/store/search?q=ham%20radio%20tools&c=apps>

ARRL

<http://www.arrl.org/>

Freedom Link

<http://www.freedom-link.org/>

Testing – Get Upgraded

LETARC is working with LeTourneau University to help with facilities for VE testing. We would like to extend our sincere appreciation to the University for helping facilitate this endeavor.



Directions to LeTourneau Campus

Upon entering the main entrance to the campus, turn right at the stop sign and follow the road around past the Solheim Center parking lot on the right to the first intersection. The building across the street and to your right is Glaske Center. Turn right and go to the parking lot at the rear of Glaske Center. Enter Glaske Center rear entrance and go to classroom 103.

Now that you know where the place is, why not study a little and upgrade your license. If you have a Technician's license, you can upgrade to the General. And if you pass the General exam, the VE Volunteers will offer you the opportunity on the day of your exam to test for the Extra at no additional cost.

January is membership renewal month. Please complete the form on the following page to renew your membership and mail your check to the address shown at the top of the application. Application on last page.

Testing on the 4th Saturday of each month. 2:00 PM – VE Session at LeTourneau University is located on 2100 S. Mobberly Avenue in Longview, TX in the Glaske Engineering Center, Room C103.

NO NEW HAM LICENSES TO REPORT.

Nominations for 2019 LETARC Officers



WE WANT YOU!

Nominations for the 2019 LETARC Board members will begin in August 2018 and continue through the time club elections are currently held in December 2018 (See **Proposed Amendments to LETARC Constitution on Page 8 of this newsletter**). As it now stands, current board members are pretty burned out since they have served multiple years since no one else has stepped up to the plate to take over the reigns of the club

leadership. Most, if not all board members, have indicated they will no longer be willing to serve in 2019.

LETARC needs folks in the current membership to step up to the plate and take on leadership roles and provide some fresh ideas and a new direction they feel the club needs to go.

See Pages 7 and 8 of this newsletter for form to submit Nominations for 2019 Officers and proposed amendments to LETARC Constitution for electing club officers.

Nominations for 2019 Officers

President _____

Vice-President _____

Secretary/Treasurer _____

Media Director _____

Equipment Manager Jim Rogers _____

Nominations for election committee (Up to three people)

You may nominate yourself and do not need to sign this nomination form. The election committee will be appointed by the current board and those appointed will be responsible for talking to the nominees to assure they are willing to hold office. The Longview East Texas Amateur Radio Club can only grow and prosper if we have members who are willing to help it grow. Please consider serving.

NOTICE FOR AMENDING LETARC CONSTITUTION – CONSTITUTIONAL MEETING

Proposed amendments to the LETARC Constitution were presented at the July 27, 2018 LETARC Board Meeting on whether club elections should be moved from December to November in order to increase club participation and give the new slate of officers time to meet and plan for the next year. During the last month of the year, the Christmas Holidays present a problem since the club meeting in December seems to closely coincide near the holiday and interfere with attendance and voting on new officers. The move to a different month such as November for elections would alleviate this issue. This proposed change would require amending LETARC's constitution and notice is hereby being given to the membership of LETARC for that purpose.

As per the LETARC Constitution, proposed constitutional amendments shall be published in two successive issues of the newsletter along with a notice of a constitutional meeting. The constitutional meeting will be held in conjunction with a regular membership meeting in October 2018. The voting members present at such a meeting shall constitute a quorum. A two-thirds majority of the quorum shall be required to pass a proposed amendment.

Proposed Changes to LETARC Constitution: Article 1.2 and Article 1.25

ELECTION OF OFFICERS

- 1.2 Election of officers will be held at the ~~December~~ **November** meeting. A nominating committee will select candidates to present to the general meeting. Every effort will be made to have at least two candidates for each office. Even if only one is running, a vote will still be required to accept or reject the single candidate. Voting will be by secret ballot, simple majority required.

- 1.25 Ballots shall be MAILED to all members by the end of ~~November~~ **October** so that any member that can not attend the ~~December~~ **November** meeting may cast a vote by mail.

LETARC NOVEMBER 2018 CALENDAR

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6	7	8	9	10
11 Dinner – To Be Determined	12	13	14	15	16	17
18	19	20	21	22	23	24 LETARC Meeting VE Testing
25	26	27	28	29	30	

November 11, 2018 at 6:00PM – The restaurant where the monthly dinner was not voted upon by LETARC Membership since there was not a normal meeting on October 27, 2018 due to the club’s annual picnic. LETARC membership needs to vote on where the dinner needs to take place via the weekly LETARC Net.

November 24 ,2018 at 9:00 AM – LETARC Monthly Meeting at City of Longview Fire Training Facility, 411 American Legion Blvd, Longview, TX.

November 24, 2018 at 2:00 PM - VE Session at LeTourneau University is located on 2100 S. Mobberly Avenue in Longview, TX in the Glaske Engineering Center, Room C103.

**LETARC MEMBERSHIP
APPLICATION
PO BOX 5613
LONGVIEW, TX 75608-5613**

Membership: * New * Renew

Calendar Year: 2018

Date: _____

CALL SIGN: _____ **LICENSE CLASS:** _____

LAST NAME: _____ **FIRST NAME:** _____ **MI:** _____

ADDRESS: _____

CITY: _____ **ZIP:** _____

TELEPHONE: _____ **CELL PHONE (optional):** _____

E-MAIL ADDRESS: _____ **DATE OF BIRTH:** _____

ARRL MEMBER? * YES * NO

=====

TYPE OF MEMBERSHIP (check one)

- **Full Membership:** \$25.00 per year. A full member shall be an FCC licensed Amateur Radio Operator
- **Family Membership:** \$35.00 per year. A family membership is available to members of the same family, provided they reside at the same residence. Each member has the same privileges and same membership requirements as a full member.

Privacy: Member names, addresses, (including e-mail addresses and other personal information shall not be supplied to any third party without expressed consent of the individual.

Signature: _____ Date: _____

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Please list **all** of your Amateur Radio **Interests:** [Examples: Contesting, CW, 6 meter, 1.2 GHz, Kit building, ISS, AMSAT, Emergency Communications].

Entered master database;__ Confirmation letter sent:__ Entered master email list:___

For use by LETARC