LETARC PROPAGATION

The official Newsletter of the Longview East Texas Amateur Radio Club

February 2018 Volume 2018 -2

MiniVNA Tiny Antenna Analyzer

If you've been in ham radio for any length of time, the use of an antenna analyzer has become important in the tuning of our antenna system. One of those trusty analyzers that is commonly used is the MFJ 259. This analyzer had been the work horse for most of us through the years since it is accurate, durable, easy to use and won't break the bank buying it.

With the MFJ analyzer, finding your antenna's SWR and resonance has been made considerably easier. In fact, you can also determine velocity factor, coax cable loss, the length of coax and the distance to short or open in feet. On top of this, you are able to obtain inductance and capacitance information for RF frequencies. And it does other things as well like being a signal generators, RF resistance and Reactance Analyzer. Now you see why this is the workhorse in the ham radio world. And for many of us, this is better than sliced bread. LETARC has one of these analyzers that can be used to look at our antenna systems.

But, hold on. We have another tool that has now been made available. Jerry Ritchie (WA5OKO), who has been one of LETARC's main stays, has donated through his generosity additional tools for the members of LETARC to use in analyzing their antennas. Jerry has donated a miniVNA Tiny Antenna Analyzer and a laptop computer to put into the clubs arsenal of tools to use when we need to fine tune our antennas or when we set up a new one. And these not not cheap tools by any means when it comes to shelling out our hard earned dollars.

So, what is a miniVNA Tiny Antenna Analyzer? Well, it does everything the MFJ 259 does, and even more. The miniVNA Tiny, is a handheld PC based Vector Network Analyzer that makes available a multitude of features and capabilities which are perfect for checking antennas and RF circuits for hams and commercial users.

And when coupled with your laptop computer, you will definitely have a first class VNA test instrument that will analyze frequencies up to 3GHz.

Specifications

•– Frequency step of 10Hz

•– Range of Z from 1 to 1000 ohm

•– RF Generator power output of -6dBm @ 500 MHz

•– – Supply is Powered from USB

Features

•– SMA connectors for better isolation

•– Calibration using open-short-load for accurate results

•– Two ports VNA with S11 and S21; displayed and save results

•– Full Phase measurement

•– Export data in several formats JPEG, EXCEL, ZPLOT, S2P, PDF

•– Boot loader for future firmware upgrades

•– User friendly interface for PC Windows Linux and Mac

•– Integrated Smith chart in software

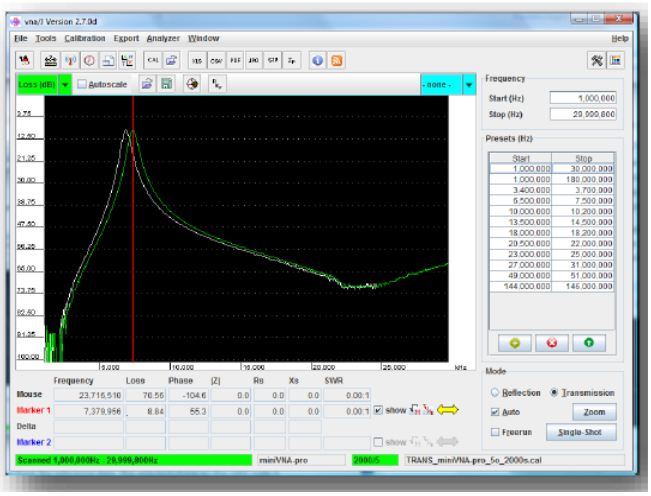
•– Android Mobile Phone software free

When the miniVNA Tiny is coupled with the laptop computer, is provides a tremendous mount of information in a matter of seconds via graphical display as opposed to the MFJ that gives you a limited snapshot of characteristics that are only available at the time testing is performed. The miniVNA Tiny allows the user to see the antenna characteristics throughout the band and see how it is performing while in the comfort of the Ham Shack. The analyzer allows the user to save data and export it to other software such as MS Excel for more analysis. This is a feature the MFJ 259 does not do. This additional functionality also allows the user to save and see either graphically or in tabular format the results of making changes to the antenna.

The miniVNA Tiny software is Java based and can work on Windows or Linux computers. For some, running Java on their computers may expose them to security breaches on the internet and create some heart burn. It takes a little little effort to start using and the users manual is good in some ways and others there are some huge gaps. Jerry has

written a "Quick Start" manual to allow the user to start testing antennas right away and if more detail is needed, the manufacture's User's Guide is also provided. The software developer could go a long way by adding a few more clarifying paragraphs throughout the User's Guide. But, I guess trying to figure out things not said can be used as a learning experience. And there seems to be a few software glitches when trying to save plots since the scales are not always included.

Overall, this donated device is a very useful tool for LETARC. The miniVNA Tiny will certainly make life easier in understanding how our antennas are performing. And if you are like me and do not necessarily understand Smith Charts, this useful tool finally helps explain what is shown in those graphs other than looking at a bowl of spaghetti.



	Freq. (Hz)	RL (dB)	RP (°)	|Z| (Ω)	Rs (Ω)	Xs (Ω)	Theta	SWR
M	1,935,378,611	-1.65	158.11	10.8	4.9	9.6	62.9	10.57:1
1	628,366,036	-1.08	167.51	6.3	3.1	5.4	60.0	16.10:1
Δ	480,030,073	0.47	142.03	212.2	32.3	210.2	0.0	
2	1,108,396,109	-0.61	25.48	218.5	35.5	215.6	80.7	28.30:1
3	1,669,223,323	-1.24	-112.73	33.4	5.1	-33.0	-81.2	14.03:1
4	2,519,969,690	-16.85	59.26	57.8	56.0	14.1	14.2	1.34:1

Newbie Corner - The Best First Antenna, Hands Down

by Tony Kurlander - WN6EBN (alias for N3WK)

eHam.net June 26, 2014 - Article reprinted with permission from author.

I see new hams asking all the time, "What's the best antenna for HF?" Some are thinking of buying "no radial" verticals. Others are thinking of a three element beam that's being sold on-line, or the so-called "Wondertenna Deluxe" they've heard so much about. These new hams are dazzled by the claims of the manufacturers and purveyors of these antennas, which are claimed to be the greatest thing since sliced bread, useable on all bands from 160 meters to 2 meters, and great for both DX and NVIS. Many of these new hams seem to think, "Well, I just bought my rig...I'd better buy my antenna, too!"

Don't do it! Just say no! There is a BETTER antenna out there! It is the very, very best antenna for a new ham—and for many old-timers, too. You've probably even heard about it before, either in QST or eHam or from your friends, but it bears repeating. This antenna is...wait for it...an antenna YOU make yourself! A wonderful first antenna is a coax-fed 40 meter inverted vee. If you were to feel really adventurous, you could feed the 40 meter inverted vee with ladder line and, using a tuner, use it on 40-10 meters.

But I digress. For the sake of simplicity, and because most new hams are most comfortable using coax as a feedline, this short article will describe a 40 meter ½ wave inverted vee dipole. The feedline is coax. If your rig has an internal tuner, or you're using a tube-type vintage radio, this antenna will also work FB ("fine business") on 15 meters as a 3/2 wave dipole.

Why should you roll your own antenna? There are many reasons, but the best reason is that it's **far more fun** to make a contact on your own homebrew antenna. Fumbling around for what to talk about after you exchange signal reports? Wow the other operator by telling him or her about your homebrew inverted vee! Are today's propagation conditions less than ideal? Don't sweat it—I'm convinced that any signal is at least one S-unit better when you're using your own wire antenna! Other good reasons for building your own are: it's cheap; it's a wonderful learning experience; it will inspire you to learn more about the technical aspects of our hobby and go on to build even more wire antennas; the components are re-useable; the components are easy to find; and you will feel the pride that stems from doing something so true to our amateur heritage.

There is absolutely nothing new about what I'm saying here. My Elmer told me to build my first antenna when I was a Novice in the early 1970s. His Elmer told him. Joe Tyburczy, W1GFH, wrote a wonderful—and hilarious—primer on an inverted vee that I first saw here on eHam. You can find it now at http://www.hamuniverse.com/fourdollarspecialw1gfh.html. I heartily recommend you read it! There are similar articles on eHam now and then.

You can use 14 gauge wire (but anything from 12 ga to 18 ga is common) from a ham store, from thewireman.com, from Lowe's or Home Depot, or from Radio Shack. It can be insulated or uninsulated, solid or stranded. I usually prefer 14 ga, stranded, and insulated—but you can use whatever is on hand. I always use a center insulator (such as: http://www.universal-radio.com/catalog/antsup/1782.html) or a current balun (such as: http://www.universal-radio.com/catalog/antsup/1888.html), but you don't have to. If the length of your coax is less than 100 feet and you're running no more than 200 watts on HF, RG-8X is the way to go. If you're running more power than that, or really want to minimize power loss at the higher frequencies, then use a better quality coax, such as RG-213. RG-213 is thicker, heavier, more expensive, and less flexible, but is generally preferable, in my opinion, from 10-20 meters. For a barefoot HF rig, though, RG-8X will be just fine.

There are plenty of "how-to" guides on building your first dipole on-line. Here is a good one that I just found: http://www.aa5tb.com/dipole.html

I recommend installing your new dipole as an inverted vee. The center support could be a tree branch, a flagpole, or a wooden or fiberglass pole. The ¼ wave legs of your inverted vee should each have an end insulator on them, and then some nylon, dacron or other guy rope leading out to a handy attachment point. That attachment point could be your fence post, a tree, or a tent stake shoved into your lawn. In this way, you only need one tall support, which is the center of your inverted vee. The center of your inverted vee won't sag when you attach your feedline, as would a horizontal dipole supported only at the ends. And, if you're using fiberglass tubing as the center support, the ¼ wave legs of your antenna do an admirable job of guying the center support. Just

make sure that the enclosed angle of your inverted vee is at least 90 degrees. And, although plenty of purists might disagree with me, when you adjust the length of your new inverted vee for minimum SWR, anything less than 2.0:1 is fine at HF. Don't sweat the small stuff.

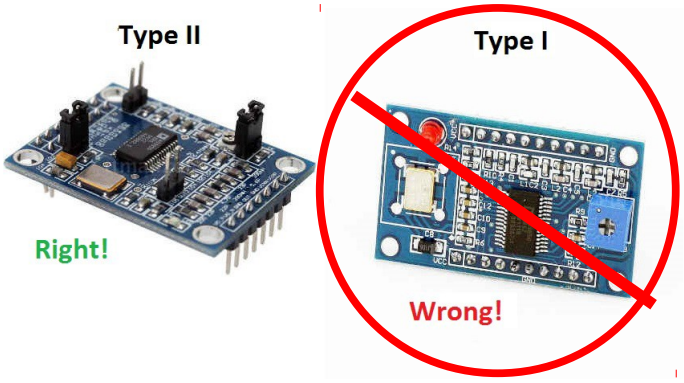
This is not a "how to" article. This is, instead, a "just build it" article. Take my word for it: Building your own antenna is loads of fun. In fact, you might just get so much satisfaction from your new inverted vee (not to mention those glowing signal reports!) that next weekend you'll want to tackle another wire antenna project. Hmm, is a multiband doublet on the program for the next sunny weekend?

Building Your Own Arduino Based Antenna Analyzer – Part 1

In the November 2017 ARRL QST Magazine, there was an article about building your own Arduino Based Antenna Analyzer. This analyzer seems to have caught the attention of many radio operators around the nation, including some in the LETARC and Tyler ARC. This analyzer would be an excellent project for a LETARC group build during one or two weekends. And the finished product would be an antenna analyzer that would provide SWRs for all HF bands. It's a simple analyzer, yet effective in providing information in tuning an antenna and very portable.

To my knowledge, Jim Quin (AA5CX), Gerald Cooper (AG5MY) and John Armstrong (KG5LWD) are the only individuals who are currently building these analyzers in LETARC. We all thought it would be a great project for LETARC members to undertake as a club activity after the kinks have been ironed out in putting things together. This will be the first in a series of articles to be published in the LETARC Propagation Newsletter on the steps taken to put one of these analyzers together. This article will deal with securing the needed parts and where to get them.

First of all, the article in QST indicates the analyzer can be built for about



$55. This is not the case if you don't have many parts already on hand in your ham shack. A more realistic cost will be about $75-$85 plus shipping costs if you buy everything off the Internet from eBay, Aliexpress, Banggood, Amazon, etc and if you are going to do things on your own and not part of a group effort. Otherwise, buying the materials for a group build, the costs can be reduced significantly since resistors, capacitors, header blocks, jumper connectors, are typically sold in quantities of 20, 40, 80, 100 or more for just a few dollars and the costs are shared among the group members.The **Arduino AD9850 Type ii** is the backbone to the entire project in addition to the **printed circuit board** that is purchased separately for $10 from W8TEE and K2ZIA at http://qrpguys.com/w8tee-k2zia-antenna-analyzer. The Arduino module will cost about $22-$28 depending on where you buy it on eBay, Aliexpress, Banggood or Amazon and "if" you can find it, This module seems to either be in high demand or manufacturers are not making many of them at this time. It took some effort to find a source on eBay since not all Arduino AD9850 modules are equal. In fact, there are two types of Arduino AD9850: Type 1 and Type 2 (Type ii). In this project, the Type I module WILL NOT WORK. You must buy the **Type ii** module since the printed circuit board is much different from the Type 1. For quantities of 25 or more, one supplier will provide at $10 discount and bring the cost down to about $12-$16 per module. However, holding someone in China to that price may be a challenge on its own. What the supplier tells you today may be different tomorrow. It's a crap shoot at best.

There is a parts list provided by W8TEE and K2ZIA at http://qrpguys.com/w8tee-k2zia-antenna-analyzer for this project. The Antenna Analyzer Manual can be downloaded from there, as well. As you read through this manual, you may notice there are one or two parts overlooked in the parts list that you will need to buy (Page 19 – Header Block 8 Pin).

As it was mentioned earlier in this article, many of the parts are purchased in bulk, where there maybe 20, 40, 80, 100 or more when when you start researching on eBay or other sites. When resistors and capacitors are purchased, they can be purchased in lots of 100 or more per resistance value. So for example, if you need 2 – 51Ω 1/8w 1% metal film resistors, you'll probably end up paying a couple of dollars for 100 – 200 of them. Instead of paying around $2 per resistor value, I purchased a package of different resistance values for about $8 that had over 2400 different resistors with 97 different resistance values. Yeah, that's a lot of resistors, but buying that way saved a few dollars. And, most likely I will never use most of those 1/8 watt resistors unless I get busy building many Arduino projects. By the time I use them all, I'll probably be six feet under looking at the south side of grass and daisies. I'll just leave them to my heirs.

While you are at it, I suggest buying a $10-$20 capacitor, resistor, transistor and inductor tester. I purchased an LCR-T4 Mega328 for about $10. This is all you really need to find out which of these components is good or bad before you solder them into place. On top of this, to make life a little easier while soldering, buy an Aven 17010 Adjustable Circuit Board Holder. This holder will definitely make soldering a more manageable task on very small components.

When buying rosin core solder, if you buy it at Lowes, Home Depot or even radio supply houses, it may come in 1.5 mm diameter. That's a little too big for the very small printed circuit board that you buy for project and you'll most likely get solder in places were it does not belong. Instead, I suggest buying 1 mm rosin core solder. I stumbled upon a small coil of this solder while shopping an O'Rielly's Auto Parts for about $3.25. It should work perfectly for the small spaces on the board and 30 watt soldering iron.

Ok, now you have the very basics of buying electronics off eBay from China. I suggest using a PayPal account since I don't trust Chinese Internet security with my credit card number. PayPal will not release money to the vendor until after proof of delivery. So, you've got a little protection when buying form China.

Now the only thing to do is to wait for the next 30 or so days for parts to arrive from China on a slow boat and to go through US Customs.

In the mean time and if you are interested, start reading the materials for building and using the analyzer. All of this can can be downloaded via http://qrpguys.com/w8tee-k2zia-antenna-analyzer. It may do you some good to read the assembly instructions 2-3 times.

There is one final note. The Arduino AD9850 seems to be more difficult to obtain. It will take some looking around on the Internet to find it. Some were found on eBay. If it gets to the point where these modules are no longer available, the Arduino **AD9851 Type ii** can be used in its place. But there are differences in what must be done on the printed circuit board. If you go this route, then it is highly suggested that you go https://groups.io/g/SoftwareControlledHamRadio and review the "FILES" and various postings on this alternative before doing anything.

Morse Code Anyone?

Terry (KG5WO), Lloyd (WO5W) and I were talking about how many passing references we hear about people wanting to learn morse code. So we decided to try to do something about it. In order to do something about it, we need to determine who, when, and where. If you're interested, send me an email ("my callsign" AT arrl DOT net) and I'll start to compile a list of names.

Let me caution you about the term "interested." There's a difference between "interested" and "wanting it." Being "interested" is not enough to learn morse code. It's going to take a commitment on your part. If you're willing to commit, we're willing to commit. Commit to what? Well, learning morse code is not a short-term effort. What's long-term, you ask? Initially, I'll put together a lesson plan that will require 12, one-hour meetings. Whether we meet twice per week or once per week, week night or weekends is to be determined. Where we meet is to be determined. Once we have a list of names (who are willing to pledge a commitment), we'll try to figure out what works for everyone. If we meet only once per week, there will be home work for sure. If we meet twice per week, there may still be some homework.

Cost to enroll? It'll be FREE. However, you'll have to provide your own pen/pencils and paper to write on.

If we do this, the graduating class members will be able to copy 5 words per minute morse code. And who knows? Since that'll be quite a significant mile-stone in your journey to experience the wonders of ham radio, you might get a nicely engraved plaque suitable for hanging in your ham shack!

We'll bring this up at the next LETARC club meeting.

Guy
WB5UAA

LETARC In 2018

Members of LETARC will be seeing some changes during 2018 that are designed to make the club better and to promote amateur radio in the Longview area.

For much too long, LETARC has been stuck in a two meter radio world; where most of the club's activitiy has been centered around 2-meter nets and equipment. This seems to have put the club into a comfortable rut where we don't do anything else. Now, things are going to change and hopefully efforts will get people to venture into other areas of amateur radio so that they can learn new things and make things more interesting. And hopefully, this will allow LETARC to draw in new and experienced members.

During the January 2018 LETARC Board Meeting this topic was at the forefront of board members minds, as well as other club members who showed up for the meeting to provide their input on the direction the club needs to take for 2018 and beyond. There were many different and great ideas expressed during the board meeting. All of those ideas had one central theme; we need to do something to make amateur radio more attractive and interesting along with attracting new members.

Potential Members

In doing a query on QRZ.com by county, there are many amateur radio operators in the area; many of these folks who could potentially have a very positive impact on amateur radio in the area. The following are the number of amateur radio licensees in 12 counties of East Texas. These numbers would most likely include some silent keys:

- 120 – Cherokee County
- 52 – Titus County
- 182- Upshur County
- 330 – Gregg County
- 620 – Smith County
- 120- Rusk County
- 161 – Wood County
- 47 – Morris County
- 171 – Harrison County
- 150 Cass County
- 65- Panola County
- 171 – Van Zandt

There are 2,190 amateur radio operators in the East Texas area and a very small number are members of clubs in these counties.

Just think of the potential many of these folks could offer the ham radio community through their expertise and knowledge. This is also not to mention there are tons of folks out there who are friends we have not met yet. Isn't friendship what ham radio is really all about?

As a club, we need to do more outreach to those within a few miles of Longview by making a few telephone calls to invite them to a LETARC meeting. A list will be developed for distribution to LETARC members who are willing to make a few quick phone calls to invite prospective members to a meeting, a special event like Field Day or a get together like the monthly dinner. A simple phone call can go a very long way to attracting new membership. Ya never know how a simple phone call can be a positive experience for all involved.

Activities

As mentioned earlier, 2 meter radio seems to be our primary activity. This mindset must change if we are to grow as a club and attract new members. During the Janury 2018 LETARC Board Meeting, different ideas were presented by those in attendance. Two ideas have already been presented in more depth in this news letter (the Arduino Antenna Analyzer group build project and learning Morse Code). This is just the beginning.

We talked about doing club projects and activities like:

- Antenna building
- Elmering

- Learning Morse Code
- DX contests
- Building an antenna analyzer
- Guest speakers
- Fox Hunting
- Field Day
- Emergency drills
- Help a fellow Ham
- Social nights
- Radio troublse shooting / repair events
- Autions for equipment
- Home brew radio event
- Equipment reviews
- Learning about digital radio
- Show at tell
- Field trips
- 10, 20,40 and 80 Meter Nets
- Tail gate sales
- ARES
- CERT
- Sponsor a hamfest
- QSL info – Stories how contacts were made
- Involvement with other clubs – (important).
  - Get togethers - Social
  - DX Contests
  - Projects
- Picnics

These are just a few of the ideas discussed and the club needs to act on some of these ideas to remain vibrant. If we do nothing as a club, we will certainly end up not knowing when we are finished.

LETARC MEETINGS

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

LETARC's monthly meeting held the third Saturday of each month at 0900 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!

During the January 2018 LETARC meeting, the topic of having club meetings on a different day was touched upon, but nothing was settled on a a particular day of the month. Your input to changing days of the monthly meeting is very important and the topic will be brought up again for discussion during the February 2018 meeting. Please make it a point to attend the February 2018 meeting.

LETARC OFFICERS FOR 2018

The LETARC Officers / Board Members for 2018 are:

President
Jim Quinn AA5CX

Vice President
John Zenter AE5OY

Secretary/Treasure
Carolyn Morton KF5GLT

Media Director
John Armstrong KG5LWD

Communications Director
Jim Rogers N5VGQ

EVENTS AND CONTESTS

February 2018

12-16 School Club Roundup

17-18 International DX – CW

http://www.arrl.org/contest-calendar

Hamfest/Convention

02/24/2018 | Orange (Texas) Hamfest 2018

Location: Orange, TX
Type: ARRL Hamfest
Sponsor: Orange ARC & Jefferson County ARC
Website: http://www.qsl.net/w5nd/index_files/HAMFEST%20INFO/hamfest%20info.htm

REGIONAL CLUBS

Click on underscored name to visit site.

Tyler http://www.tylerarc.org/
Nacogdoches http://w5nac.com/
Athens http://www.athensarc.org/
Cedar Creek https://k5ccl.wordpress.com/
Marshall http://marclub.net/
Minden http://www.n5rd.org/
Shreveport (ARCOS) http://www.qsl.net/nwlarn/arcos.htm
Shreveport (SARA) http://www.k5sar.com/
Rusk County (Henderson) http://www.ruskcountyarc.com/
Four States (Texarkana) http://www.4444sarc.org/
Palestine-Anderson County http://www.pacarc.org/
Navarro, Freestone, Limestone and Leon County
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/

ARES – RESCHEDULED TIME

Upshur County ARES net authorized by LETARC to begin on 30 Nov 2017 and on each Thursday thereafter at 8 PM on 147.34 repeater.

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.

Where: LeTourneau University Glaske Engineering Center - Classroom C103.

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.

LeTourneau University is located on 2100 S. Mobberly Avenue in Longview, TX.

LETARC Radio Room Update

Progress on the LETARC Radio Room at the Mims, TX Volunteer Fire Department seems to be still on schedule. According to Jim Perry (KA5BCM), once the floor to the facility has been painted and has had adequate time to cure, construction on the radio room will begin.

The radio room will be approximately 12' x 14' in size and allow for at least three to four radio setups during contests such as Field Day that will take place on June 23-24, 2018.

Having the LETARC setup at the Mims Volunteer Fire Department will provide LETARC an advantage over other clubs in the region who are notlocated in emergency facilities because all the points the club earns during the contest will be doubled.

LETARC CALENDAR

February 2018

Sunday	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
				1	2	3
4 DINNER	5	6	7	8	9	10
11	12	13	14	15	16	17 LETARC MEETING VE TESTING
18	19	20	21	22	23	24
25	26	27	28			

Calendar Detail

Sunday , February 4, 2018, 6:00 PM–David Beards, 2005 Toler Rd, Longview, TX 75605

Saturday, February 17, 2018, 9:00 AM – LETARC Monthly Meeting - City of Longview Fire Training Facility, 411 American Legion Blvd, Longview, TX.

Saturday, February 17, 2018, 2:00 PM – VE Testing LeTourneau University , Glaske Science and Engineering Building, Rm 103, 2100 S. Mobberly Avenue in Longview, TX.

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

Membership: * New * Renew **Calendar Year: 2017**

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:_____

==========

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