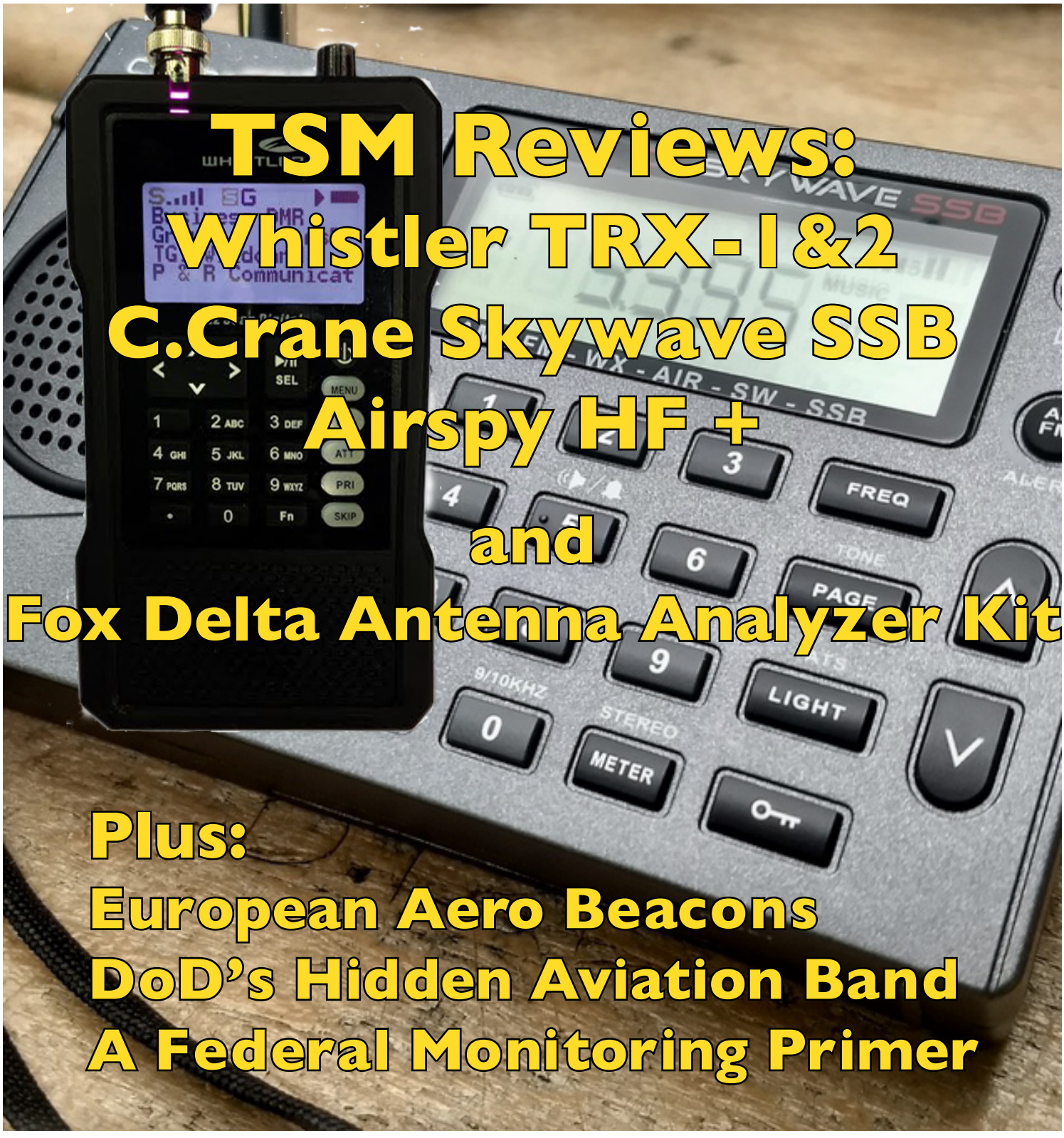
The Spectrum Monitor®

Amateur, Shortwave, AM/FM/TV, WiFi, Scanning, Satellites, Vintage Radio and More

Volume 5 Number 1 January 2018



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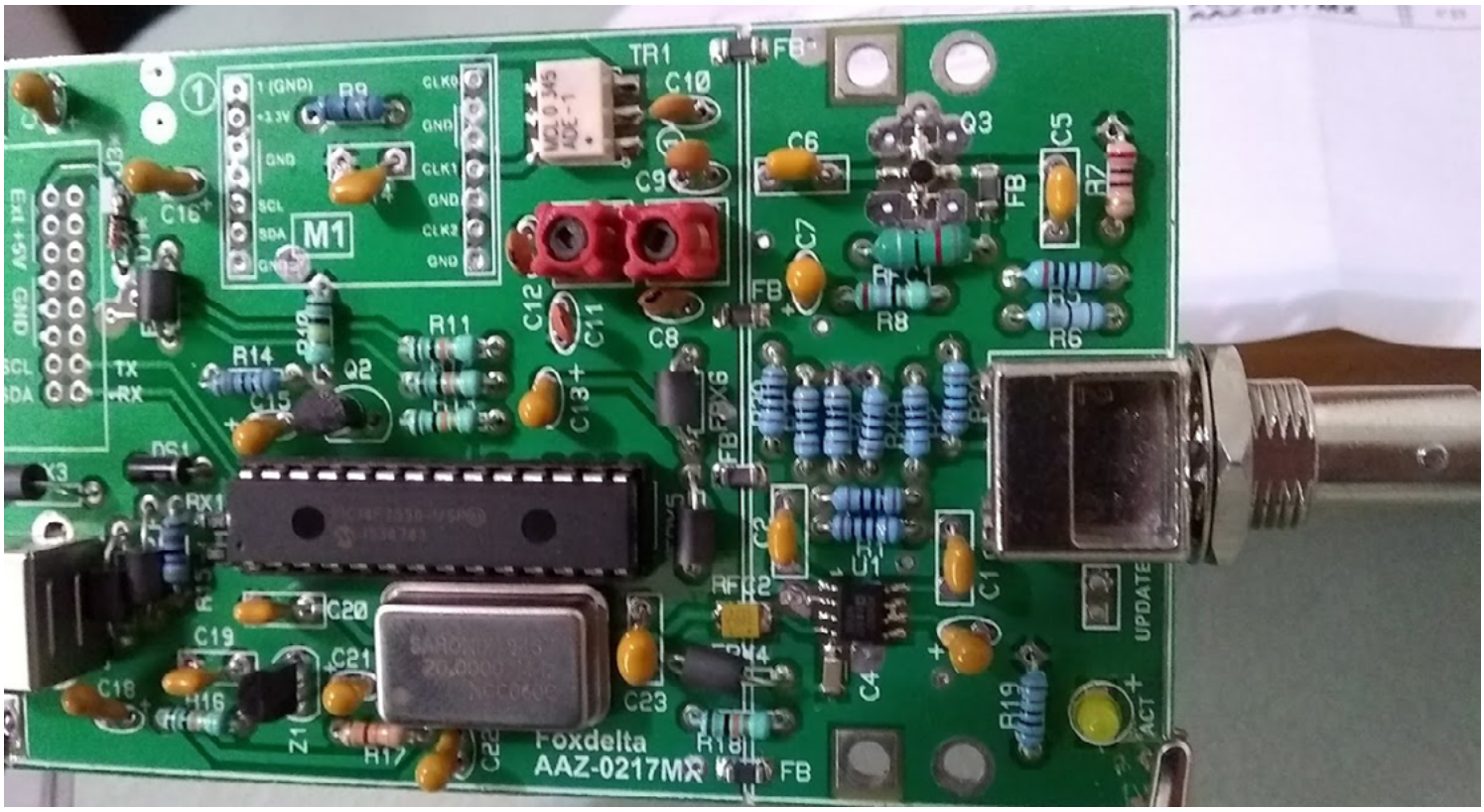


Board after installation of chip holder and processor chip – tight fit for soldering! (Courtesy of the author)

TSM Reviews:

Fox Delta 1 to 60 MHz Antenna Analyzer Kit

Robert Gulley AK3Q

The Fox Delta AAZ-0217MX antenna analyzer is an intermediate level ability kit with robust, mature software which is capable of scanning frequencies from 1 to 55 MHz. It has a signal generator from 1-169 MHz.

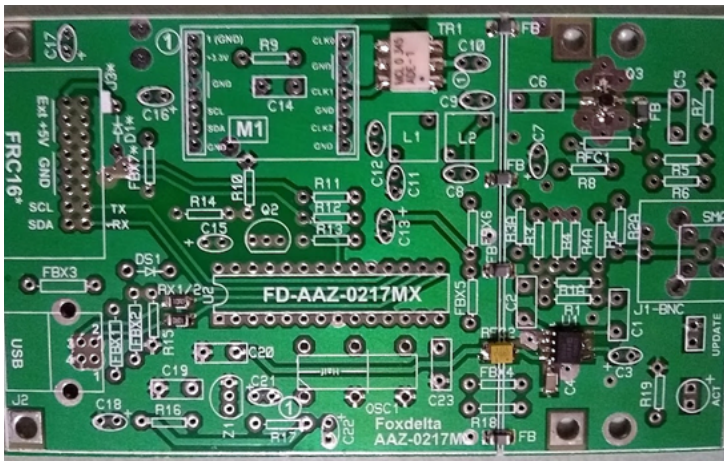
The analyzer uses an Si5351 signal source generator chip and a return loss bridge, for measurement by a Log Amplifier AD8307 and a reference. There are no surface mount parts to be soldered as those are pre-assembled on the board, and the silkscreen information is clean and easily readable.

Here are the specs as described on the Fox Delta website:

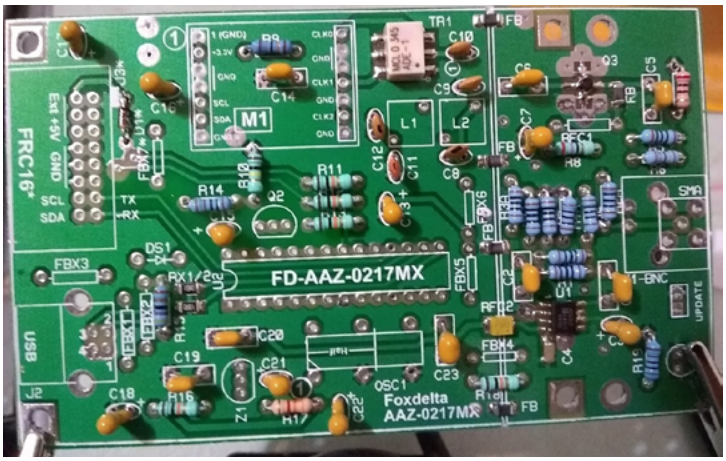
- Uses Si5351 as a signal Generator. Generates Frequency as low as 1MHZ and with upper limit of 60MHZ.
- Dual, auto power select option: PC use or Portable use
- Optional Bluetooth module (HC05): BT Function auto activated when BT module inserted into FRC16 Socket.
- Project uses Si5351 chip on a plug in module and is supplied fully assembled and tested.
- Spec technically restricted to upper limit of 60MHZ due to VHF Mixer technique used. However, AAZ-0217MX may be used to as high as 90MHZ with small mod on LPF.
- Expansion socket (FRC16) is for future use of a Bluetooth or a WiFi Module, with necessary implementations in FW. Supports RX/TX and I2C + External 5V Power input.
- A PC Software V6.08 is available for free download AAZ-0217MX and works well with most WIN OS. Latest dotnet update is essential for your WIN OS.
- Firmware V1.05 and Software V 6.08 for AAZ-0217MX is developed by Tony/I2TZK.

Kits are offered with option of RF connector: BNC or SMA and a free metal case. This kit first came to my attention while perusing the swap meet forum on QRZ.com. Someone had built the kit as a project and then decided to sell it as it was surplus to his needs. The specs were impressive, and the builder claimed good performance for the build, so I looked up the company online. I was intrigued by the kit as a project not only for myself, but also as a possible club build for my local amateur radio group.

Right about the time I was ready to order, the folks at FoxDelta made a switch to the Si5351 chip, which necessitated changing some other parts out. I had good communications with them, and they kept me abreast as to when the



Stock board before placing components. (Author's photo)



Board with capacitors, diodes and resistors in place. (Author's photo)

newly revised kits would be ready for sale.

When the kit arrived, I was impressed both with how quickly the kit reached me from India and how well things were packaged and labeled. Each part was labeled corresponding to the parts list, and in cases where identical parts were used, the number of components in the bag matched the number listed on the parts inventory. Everything was present with no missing or surplus parts. While a small thing, I was glad to see check marks beside each component on the inventory list, indicating someone at Fox Delta had checked the kit before sending it out.

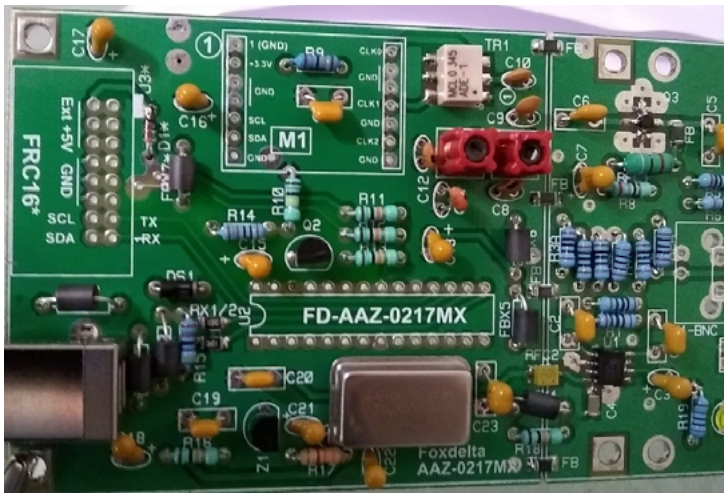
The assumption of the company is that this is not your first kit building experience. There are no instructions on soldering, identifying parts on the silk-screening of the circuit board, or any step-by-step instructions. There is a brief suggested order of assembly, and an available troubleshooting guide for testing part of the build if the unit does not work as intended.

Since this was not my first build I did not run into any real issues except one small point I will mention. The LED diode, which was labeled as such on its bag was silk-screened as ACT on the board. Since I was looking for LED it took a few moments to figure things out! Fortunately, there are both schematics and several photographs of the completed board, so I found out where the part should go.

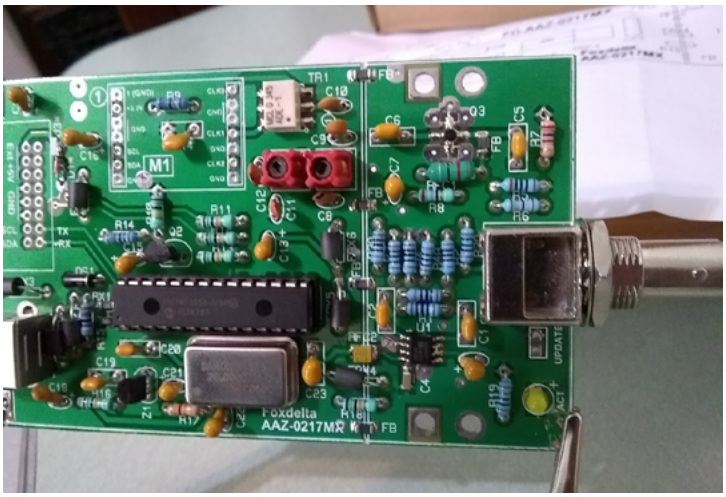
What I Needed for the Build

- Soldering Iron – 25-35 watts should do fine. I would recommend a fairly small tip because spacing is often tight.
- Solder – I use a very thin solder for this type of work, such as .031-inch resin core 63/37 mix. The solder melts easily, is small enough for tight spaces, and adheres well because of the internal flux.
- Solder tip cleaning wire and holder – this wire mesh allows cleaning of the tip without removing the tinning effect of the solder tip.
- Holder for the soldering iron – many of the soldering irons sold have a coiled holder as part of the package, but if not, get one for safety and convenience.
- Solder Wick – I found this invaluable after I learned how properly to use this tool. Because the solder points of various components are close to one another, it is easy to have your solder trail over to another pad. This helps remove the unwanted solder more effectively that other methods I have tried.
- Flux – often used for surface mount work, it can also be used with the solder wick to clean up solder trails. I dip the solder wick in the flux before cleaning a pad as I have found the wick is much more effective with the flux on it.
- Solder holder – I have found a solder holder/dispenser reel to be invaluable. It is hard to juggle everything at once as you are trying to solder as it is, having a dispenser to keep the solder stable and manageable is very useful.
- Circuit board holder – sometimes referred to as a "third hand," there are various designs available. I used one with clips and a series of adjustable points to allow rotation and angling of the board as needed. Unfortunately, mine was too lightweight and too finicky, so I will likely be getting a base from a company such as Bessy or Panavise. They are a little pricey, but after fiddling with the third hand on this build, a vise seems a much better choice to me.
- Small Diagonal cutters – for cutting off excess leads, solder wick, etc.
- Magnifying Lamp – Okay, I'm getting old and my eyesight isn't what it used to be. I had reading glasses on, supplemented by a headlight magnifier but that was rather awkward, at least for me. I have since obtained a 5-inch glass magnifier with a ring light of LEDs.

As a general tip I would recommend a space that can be closed off when finished for the night without having to "clean up" parts and tools. This might not be possible in one's circumstances, but there are many advantages if so. For my situation I have a cat for whom every shiny object is a toy. For others there will be kids, other household members, and just life happening. A secluded place allows one to



Board with USB port installed. (Author's photo)



Board with processor installed. (Author's photo)

start and stop as needed and as time allows for working on the project.

The Build

Like any new build, the parts inventory is the place to start—ensuring all parts are present and identified as to type. This is not as straightforward as it might seem at first, particularly if one is not familiar with typical components and if there are a number of parts involved.

Depending on how things are labeled some parts look quite similar to others and therefore need to be determined by their indicated measurements. If the label indicates picofarads, for example, you are dealing with a capacitor. If Ohms are indicated, often a resistor is indicated, but inductors are also measured in Ohms. Other parts are identified by their shape, the length of leads, or +/- indicators.

In this case the kit was clear and inventoried well. I started by putting in all the resistors. Since there were quite a few, I soldered them in batches. With space on small circuit boards at a premium, it is often more expedient to solder in 4-5 resistors at a time and afterwards clip the excess leads to keep the soldering area accessible.

Another tip to mention is that, when putting the component through the lead holes and ensuring the part as either flat against the surface of the circuit board (or as far down as possible (insert snug-to-suface.jpg here), slightly bend each lead of the component on the soldering side outward to help hold the piece in place for soldering. Parts are almost impossible to hold in place while soldering, so this tip will free up a hand or some contrivance for keeping pressure on a component while soldering with the board upside down!

Some parts require a specific orientation on the board such as transistors and some capacitors, diodes, etc. The silk-screen on this board had clear indicators for the transistors and positive (+) value indicators where needed. You do need to know about those diodes, which have a black band around them (which often look like glass resistors!) and how they are oriented on the board (the band indicates the flow of current).

Holding was a bit of challenge because the circuit board holder I was using simply was not strong enough or heavy enough to counter the weight of the soldering iron pressure. There were times when I had to brace something up against the base in order to hold the unit in place, which at the least was an aggravation. Additionally, while the arms were flexible and would rotate, they never seemed to move the way I wanted them to move.

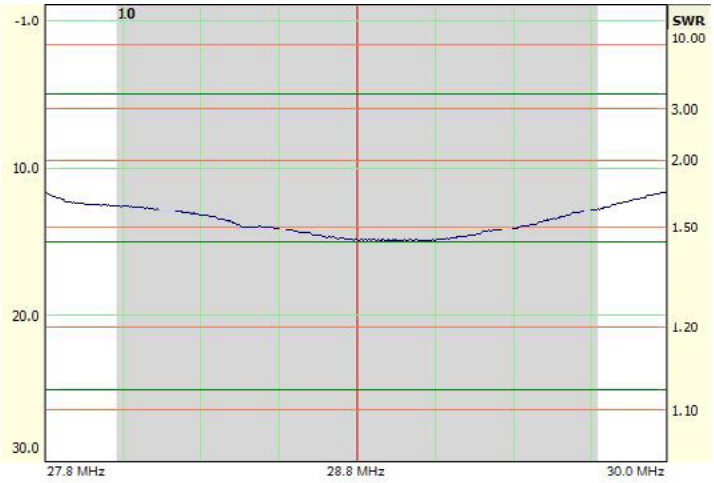
I considered stopping the build until I found something better, but finally decided to just push on and complete the project. I have since purchased a heavy, weighted vise which I am confident will work better for future builds. The main point here is any tool one uses should enhance workflow, not hinder it. Frustration at any level can cause one to make mistakes.

Impressions

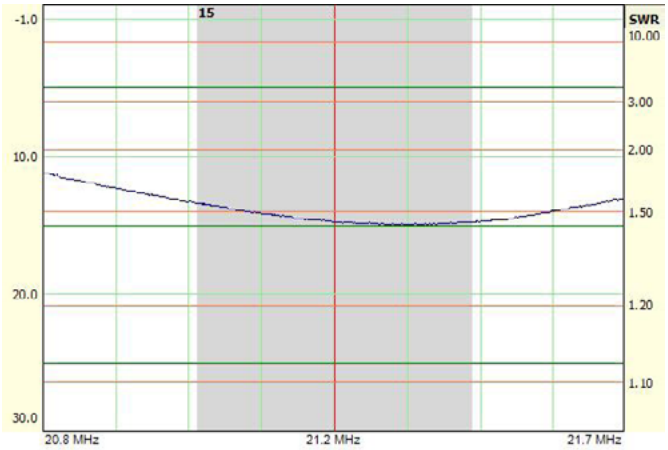
Overall I was very impressed with the quality of the kit and the relative ease of assembly. With such a small circuit board there were some tight spots for soldering, most of which I navigated well, but a few, well, that's where the solder wick came in. But as any old-timer in the homebrew, DIY part of the hobby says, you learn more from your mistakes than from your successes. In fact, successes usually are a result of failures because one learns what not to do, which is at least as important as what one should do!

As a result of having several solder points bleed over to other contact points, I had to learn how to get rid of the unwanted solder, something I really had not faced before. I tried several other de-soldering techniques that work well for some folks, but not for me. After trying the solder wick without instruction, I watched a YouTube video or two and saw how to properly use the wick and to add flux. Bingo! Worked like a charm.

The case provided is, in essence, a generic one. The holes fit the board properly and all hardware is provided, but the sides are open on both ends. On the antenna connector end this makes sense because one can choose between an SMA and the larger BNC connector, thus requiring different



10-meter Hexbeam plot. (Graphic courtesy of the author)



15-meter Hexbeam plot. (Graphic courtesy of the author)

hole sizes. The other end allows for the USB and auxiliary connectors, which are standard. It would have been nice if this end would have been enclosed, but that is a minor thing overall.

With the build done and everything looking good, it is time to see if it works! On to the software!

Software

The software is provided free of charge and it consists of only one file. No drivers are needed to be installed in my Win10 computer, and the download file is the program executable.

The software requires an initial calibration: first with the antenna port open, and then with the port terminated at 0 Ohms (this can be achieved by using a paper clip to short the antenna port).

The software will sweep 1 through 55 MHz in both conditions, and then store the calibration results.

The setup screen is very straightforward and values should likely be left in their default settings initially, unless there is a port communication problem. The default startup screen is for sweep generation, but the unit may also be used as a signal generator and RL Bridge, so adjustments may be made in setup for these modes.

There are several speed settings from which to choose, as well as a note pad for user notes, a curser marker setting. There is also a Scan Table feature, which allows you to see very precise frequency readings down to 10-Hertz increments.

There is a start and stop frequency setting, as well as a "one shot" option for taking a single sweep. There is also a noise filter option that can be adjusted in the settings menu to allow for blocking local interference. Additionally, there is an analysis feature, which shows SWR and return loss, as well as a setting for using the analyzer with passband filters.

For such unassuming software at first glance, there are some powerful features inside. I was quite impressed with the compactness of the software as well as with the performance. Readings are clear, and the user has the ability to print a graphical representation of the results as well as a table version of the numerical results.

At each point along the graph the user can place the mouse curser over a frequency and immediately see the SWR, dB strength, power loss and ERP%.

Above are some results of testing my Hex Beam. These readings were taken in my shack with a fair amount of electrical noise present, but still managed to line up well with my MFJ-269c analyzer. The kit is not expected to be as accurate as professional analyzers, but I would say it is doing a good job, and is certainly capable of telling you when there is a problem.

In addition to being an interesting kit to build, for around $60 U.S. shipped, it is also a useful piece of test equipment for the shack and I highly recommend it!

It's hard to get good help. The author's helper takes a break. (Photo courtesy of the author)

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