Fox Delta antenna analyser and RF power meter kits

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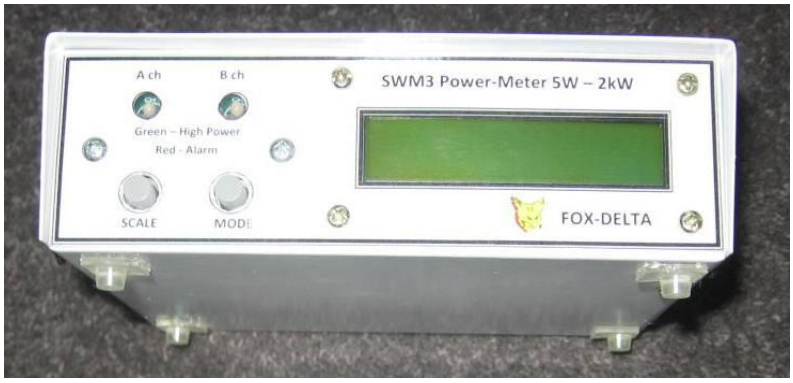
I like building kit sets because all of the hard design work and prototyping has been done for me and also in most cases the difficult and expensive process of producing a printed circuit board and collecting all of the required components. Due to the high cost of electronic components in New Zealand, especially if you are buying in small quantities, many kits cost less than the local value of the components. Fox Delta has a wide selection of kits for electronics enthusiasts and hams. So far I have built three of them; a simple sound card interface, a USB powered 200W / 2kW HF power meter and the USB powered antenna analyser. Fox Delta is a collaboration between Dinesh Gajjar VU2FD, Antonio Alfinito I2TZK, and Frank Dziurda K7SFN. I ordered all three kits at the same time to save postage costs but the power meter arrived in a separate parcel anyway. The service and emails from Dinesh and Nina Gajjar were excellent. They shipped the kits two days after my order and supplied the India Post tracking numbers which successfully tracked my parcels right through to delivery at home 12 days later. I did have an issue with my credit card not being accepted by the '2CO' agency that they use for payments. A quick email resolved the problem; apparently the issue has been reported by other NZ buyers as well. There is an alternate Paypal shop at: http://www.foxdelta.net/shopping/.

The 1MHz – 35MHz antenna analyser



The SWM-3 USB power meter

The dual 200W / 2kW measurement bridge

The kits seem to be very good value for money and I am pleased with the results. However you do need good soldering skills and you may have to do minor fault finding. Two of the three kits had faults that I had to locate. You do not have to solder any surface mount devices. The antenna analyser has several surface mount integrated circuits and some chip capacitors, but all of the surface mount devices are already soldered on to the circuit board when you get the kit and the DDS chip and associated components are on a small daughter board which just plugs in. The Fox Delta kits do not come with step by step instructions, but the pc boards are good quality with plated through holes and silk screen markings. Online documentation includes high quality photos, schematics, parts list and setup instructions for the more complex kits. Each kit comes with lots and lots of plastic bags each containing a labelled value of component, for example four 100 Ohm resistors in one bag, one 1k Ohm resistor in another. All of the components were supplied correctly. When constructing, I start with mounting and soldering the small components like diodes, RFCs and resistors that lie flat to the board, then I proceed to capacitors, active devices and connectors. I open a bag and install all of that value of component, tick it off the parts list, then move onto the next bag. The kits come complete with powder coated steel cases, standoffs and mounting screws. The case quality is fairly poor and purists might prefer to house their kit in a better box. There are no labels provided, but I made my own by laminating paper labels and sticking them on the boxes with double sided tape. I also replaced some of the mounting screws and standoffs. Two or three of the longer mounting screws seemed to be stripped, they have a very fine thread, so I replaced them with M3 screws which are a similar size.

Each kit comes with the components in individually marked bags

Teething troubles: The sound card interface is very simple with transformers to isolate the audio lines and an opto-coupler to isolate the PTT. I had no problems with the assembly at all. The cables I had to buy ended up costing more than the $US35 kit, but the overall cost is still much less than similar commercial interfaces. The power meter is really two kits, one containing the power meter; display and computer, and the other a remote switched 200W / 2kW forward and reverse power measurement, bridge. It can display SWR, forward and reverse power, for up to two measurement heads at the same time. The unit is powered from a computer USB port or a USB style power adaptor, but a PC is not required for operation. Optional free PC software gives you the ability to change the configuration settings from your PC and displays the power meter readings on a variety of different meter styles. It also includes a very useful peak hold indication on the forward power measurement. There was no meter scale for 0-200W so I modified two of the images and sent them to Tony I2TZK and they are now distributed with the software. During initial testing, I had an unusual

fault on the power meter section. A pre-made cable that runs between the display and the main pc board had one open circuit wire resulting in no back light on the LCD display. On removing the wire from the connectors, I found that the wire was crimped both ends and looked fine but was not conducting. A quick soldering job and all was fine. I had another problem with the power measurement bridge, this time of my own making. I was not getting any forward power reading and was initially worried that I had somehow damaged the forward power metering diode. But it turned out to be an open circuit RFC on the metering line from the bridge to the power meter. I had bent the leads too tight because the holes on the pcb were a little too close for the size of the RFC that was supplied.

The antenna analyser was the first kit I built but the last completed. After assembly it seemed to work... but not very well. A good 50 Ohm load measured as a flat line but with only around 15dB return loss and my antenna seemed to have negative return loss! The trace disappeared off the top of the display. I could not see anything obviously wrong and all of the voltage test points were OK so I shelved the project and built the other two kits. Finally I dragged my oscilloscope out and tried to work out the problem. It turned out that the 125MHz clock output to the DDS synthesiser, had not been soldered to the board. This was "not my fault" as it is one of the surface mount devices that had supposedly been pre-soldered. Now that the fault has been fixed the kit works well with my 'good' load measuring a return loss between 50dB at 1MHz and 42dB at 35MHz. My 100W load measures flat at around 22dB which is still very good. It turns out that the match to my home made 3 element Yagi is not as good as I thought, with in band SWR readings between 1.2 and 1.5 so I now have a project to improve that.

Antenna Analyser: The antenna analyser kit is $US54 for the full kit which is great value for money and the software is a free download. Like the AIM antenna analyser from Array Solutions, there is no display on the kitset, the analyser is powered and controlled from the PC via USB connection. Frequency range is 1MHz to 35MHz and the software displays Return Loss to 60dB and the equivalent SWR. Markers can be added to the display and the mouse position shows as horizontal and vertical marker lines along with the relevant frequency, SWR and return loss. The unit is calibrated in the usual way for this type of instrument, first leaving the termination open and then using a short. I made a shorting BNC calibration plug by soldering the centre pin to the outside of the connector. Sweep can be the full band from 1MHz to 35MHz, set to individual ham bands, or any range you want. The number of frequency steps and the sweep time is set automatically as you change the sweep range but is also fully adjustable. The kit can also function as a signal generator although the output level is not adjustable. The software needs to restart every time a configuration setting is saved and this is a bit annoying, but not the end of the world. You can compare up to three sweep results and also save a table of results for future reference. The analyser uses a simple resistive bridge and lacks the ability to show the reactance of the antenna load or do distance to fault measurement, but is very handy for checking or adjusting your HF antennas and it is very cheap compared to similar instruments.

The PCB is good quality with marking both sides and plated through holes. Surface mount components are already mounted. Note the separate earth plane for the RF section of the analyser board.

References: Fox Delta: http://foxdelta.com