80 Meter Micro Fox Transmitter

Jerry Boyd WB8WFK

Why Micro Fox

- Cheep to build (cost per unit)
- Easy to use
  - One person setup
  - Existing transmitters required several persons to carry heavy equipment into the field
- Was intended as a temporary solution until our ARDF club (ammo can) transmitters is replaced with the SDR
  - Experience indicates that even with the upcoming SDR transmitter, there is still a need for Micro Fox

Processor used

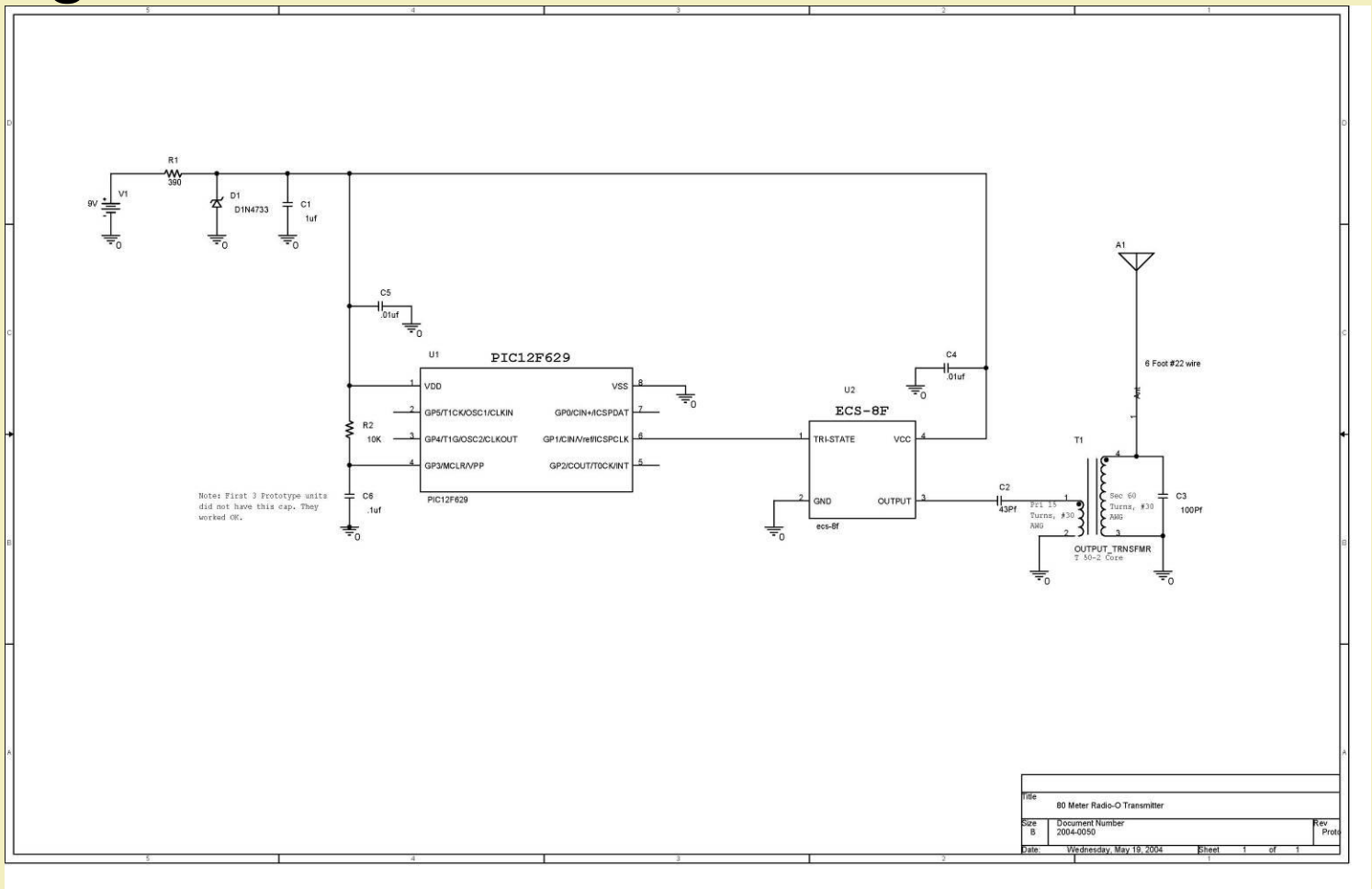
- **PIC 12F629**
  - 8 pin low cost part
    - Program memory (KB) 1.75
      program memory type Flash
    - CPU speed (MIPS) 5
    - RAM (Bytes) 64
    - Data EEPROM (Bytes) 128
    - Timers 1X8 Bit, 1X 16bit
    - Analog Comparators 1
    - 4 Oscillator selections including 4 MHz internal RC
    - Operating Voltage 2.5 – 5.5 Volts
  - Less then $2 (Digikey)
  - Original Micro Fox first used internal PIC RC oscillator as CPU clock to reduce parts count
    - Differences in parts resulted in Sync issue over short time
      - 1HR resulted in noticeable drift in cycle between transmitters
    - Testing indicated several KHz differences in clock frequency existed between 5 different PIC's
    - Internal PIC RC clocks drifted with temperature changes
  - Current Micro Fox uses external 4.194304 MHz crystal
    - No issues exist with transmitters drifting out of sync after a day of operation
    - Timing is rock solid

History

- First Micro fox prototype schematic is dated may 19,1994
  - This version did not have an RF amp
  - Control Program for this version was in PIC assembly code
  - Has been used on ARDF practice sessions to provide additional sniff opportunities and at some car T-Hunts for additional end point sniffing. I also used it on camping trips to practice
  - 3 units (V1) were built (no circuit board point to point wiring used)
  - V1 Used a 6 foot wire antenna
  - No sync connector
  - Original design was housed in an medical sample container
  - Had a considerable shorter range then the current micro fox design
    - ~ 200 meters vs Almost 2 miles for new design
  - Ran from a 9V battery
  - Had CW call sign ID for transmitter control operator to prevent FCC issues

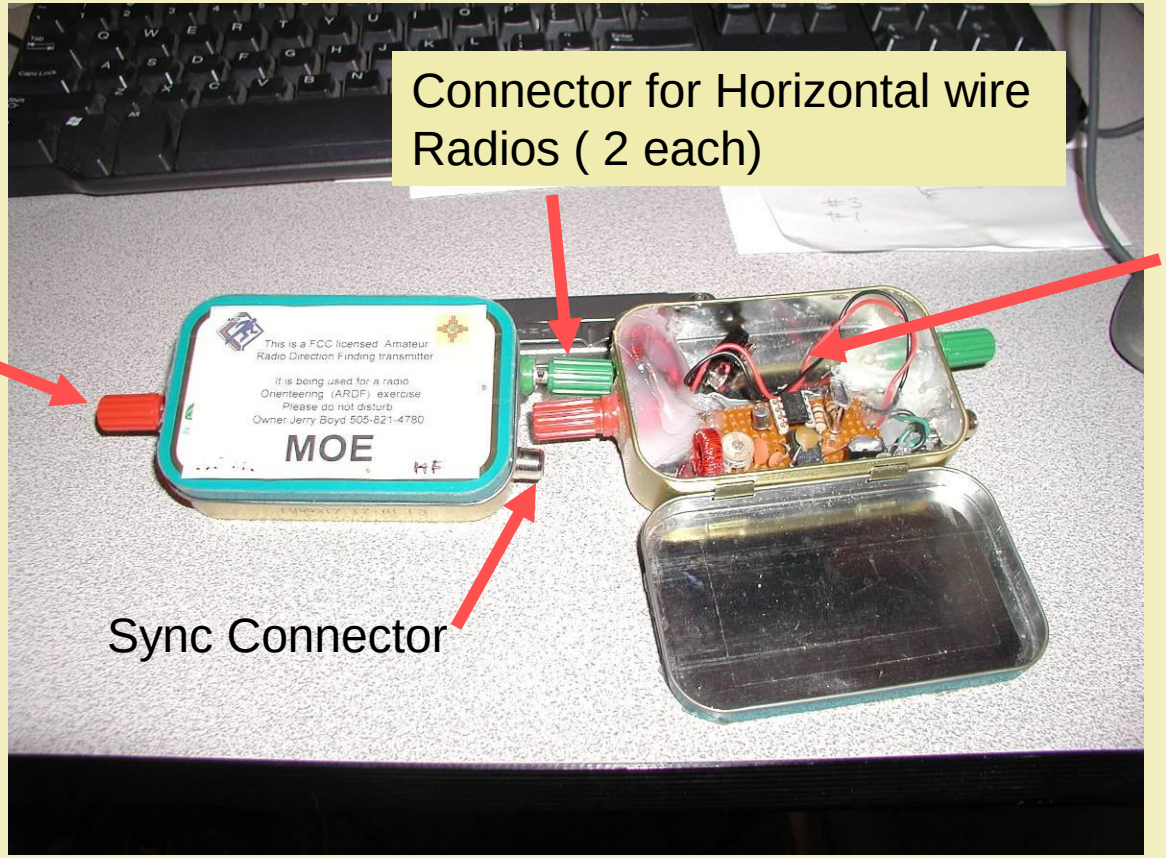
History

- Original Version of the Micro Fox



Current Micro Fox

- Small low power 80 meter ARDF training transmitter



Current Micro Fox Version

- Features
  - Control program revised and written in PIC C
  - Has Sync connector
  - This version follows formats used at the 2006 and 2004 ARDF world championships
    - Warning tone for end of cycle (2004 and 2006 WC)
    - Slow CW for first half of cycle (2006 WC)
  - Simple RF amp and antenna matching network for 22 foot wire antenna
    - Unlike version 1 the V2 oscillator is isolated from the antenna
  - Depending on surrounding conditions a range of almost 2 miles was achieved
    - Range at Doc long is shorter. One transmitter was placed in a very deep re-entrant and only got out to about 1 KM
  - A full length ARDF course was set at the old east mountain ARDF site; 2N2222A PA used
    - KC5VVB had no problem using his Altai-3,5 European receiver
    - All transmitters had usable signal at start point
    - This site is much flatter then the Doc Long Site
    - Has been used at 3 ARDF events at Doc Long in conjunction with New Mexico Orienteers meets (Course distance shortened to accommodate rugged terrain to allow all transmitters to be copied at start point)
    - Original units used 2N2222A. New version will use BFS17LT1 NPN RF transistor. Hope to get more RF output
  - Added filter on Sync input to prevent ESD events from re-setting the microcontroller (PCB version)
  - Runs all day on a 9 volt battery
  - Current set of 5 transmitters are built on point to point wired boards. Have draft PCB layout for additional builds
- **Bottom line Easy to set up and good for ARDF practice**
- **Could this be used by ARRL to promote ARDF in Schools or with Scouts?**
  - **It would be cheep to re-produce as could be provided as part of a jump start kit**

Easy To Setup for Practice

- Every thing that needs to be placed in the field to run a practice meet fits in a single Daypack
  - This system has been used on 3 NMO meets @ Doc Long and one session at the old ARDF site **(note SI first used on one NMO meet in October 2008)**

Daypack to carry Everything into the field

5 each Micro Fox and antennas

5 each Control markers and Backup “O” punch

5 each Sport Ident System for score keeping

Not shown: Ball of string to hang antennas, pocket knife to cut string and rope to attach SI stations to a tree

All Units Are Marked

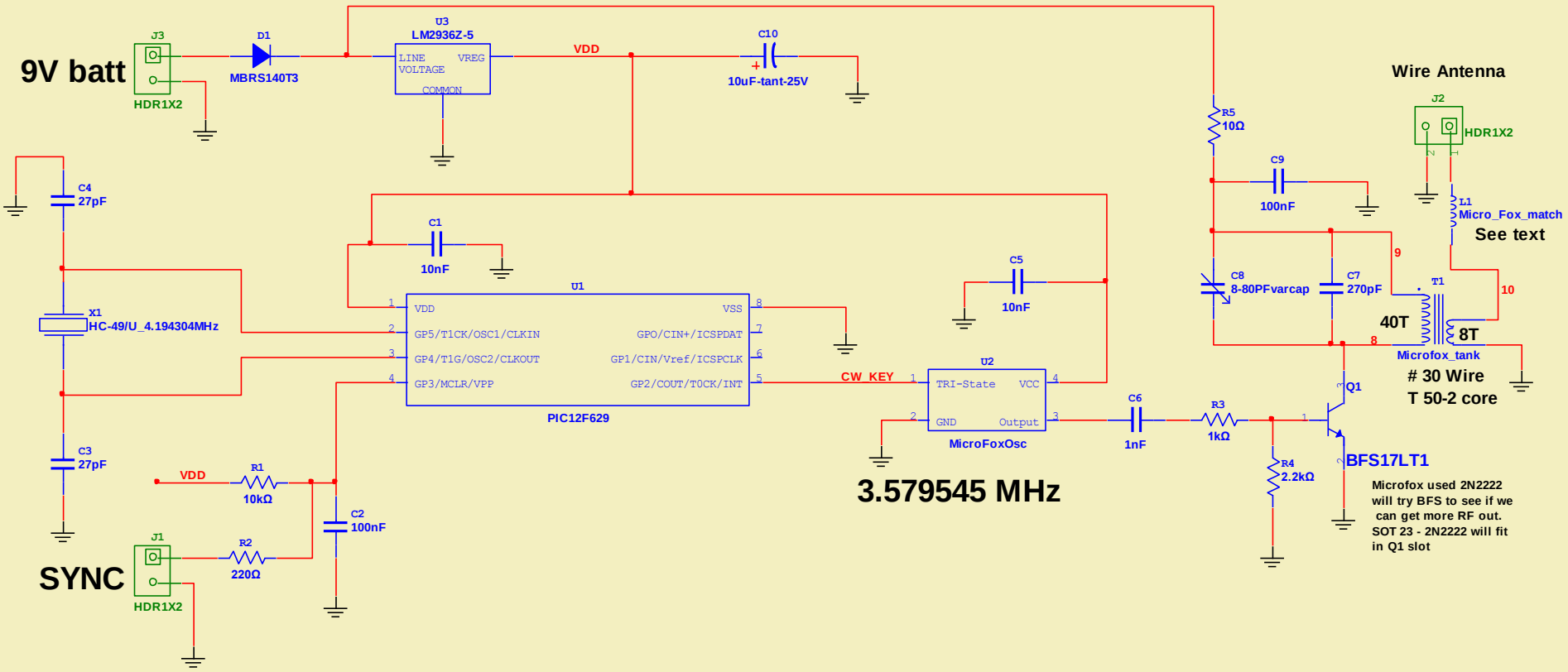
This is a FCC licensed Amateur
Radio Direction Finding transmitter

It is being used for a radio
Orienteering (ARDF) exercise
Please do not disturb.
Owner Jerry Boyd 505-821-4780

MO5

Hope to prevent a re-occurrence of the K5QQ encounter with APD

Current Version Schematic

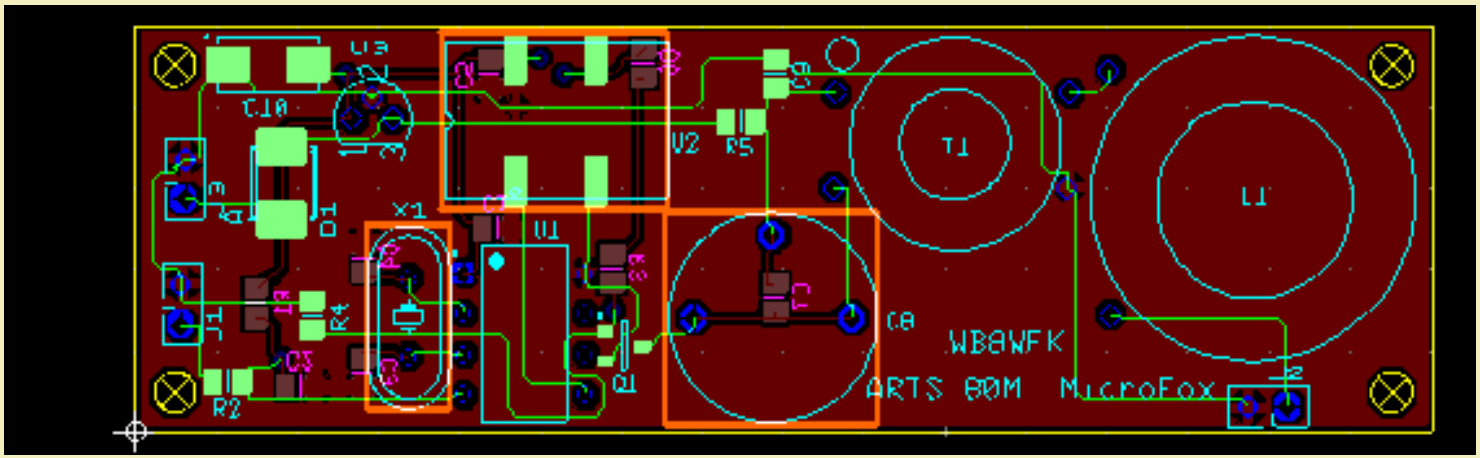


Note: First Microfox was built in 2004

Jerry Boyd WB8WFK 9128 Surrey NE Albuquerque NM (505) 821-4780	**80 meter ARDF MicroFox**	
Title: 80M-Microfox	Desc.: 80M-Microfox	
Designed by:	Document No: 0001	Revision: 1.0
Checked by:	Date: 2009-01-30	Size: LE
Approved by:	Sheet 1 of 1	

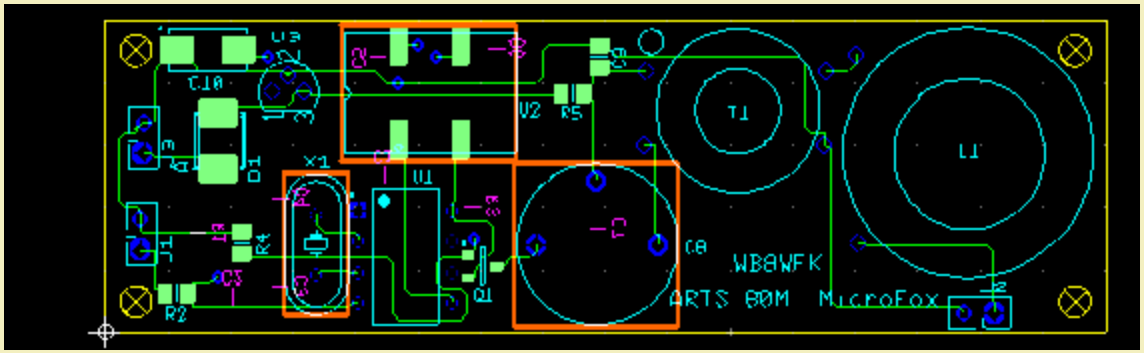
A Board layout was done

- Is there any interest in building any additional MicroFox units?
  - 3.2 inch by 1 inch board draft layout
  - 2 sided

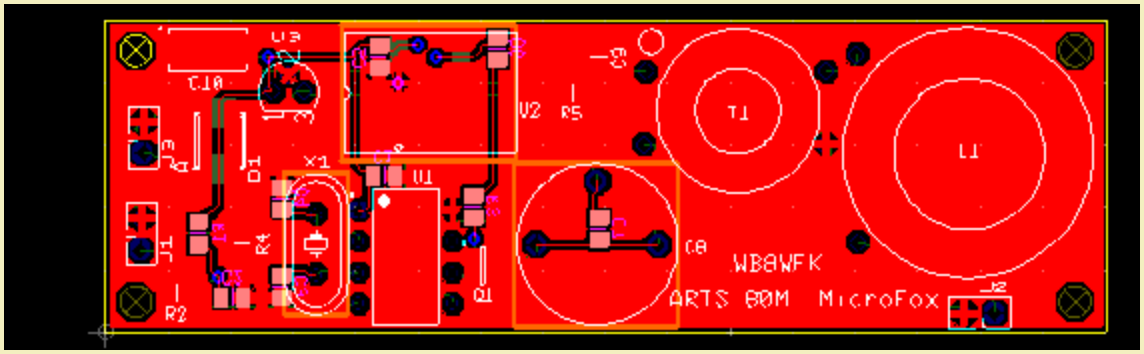


Board Views

- Copper Top and Bottom views



Copper Top with
Top Silkscreen visible

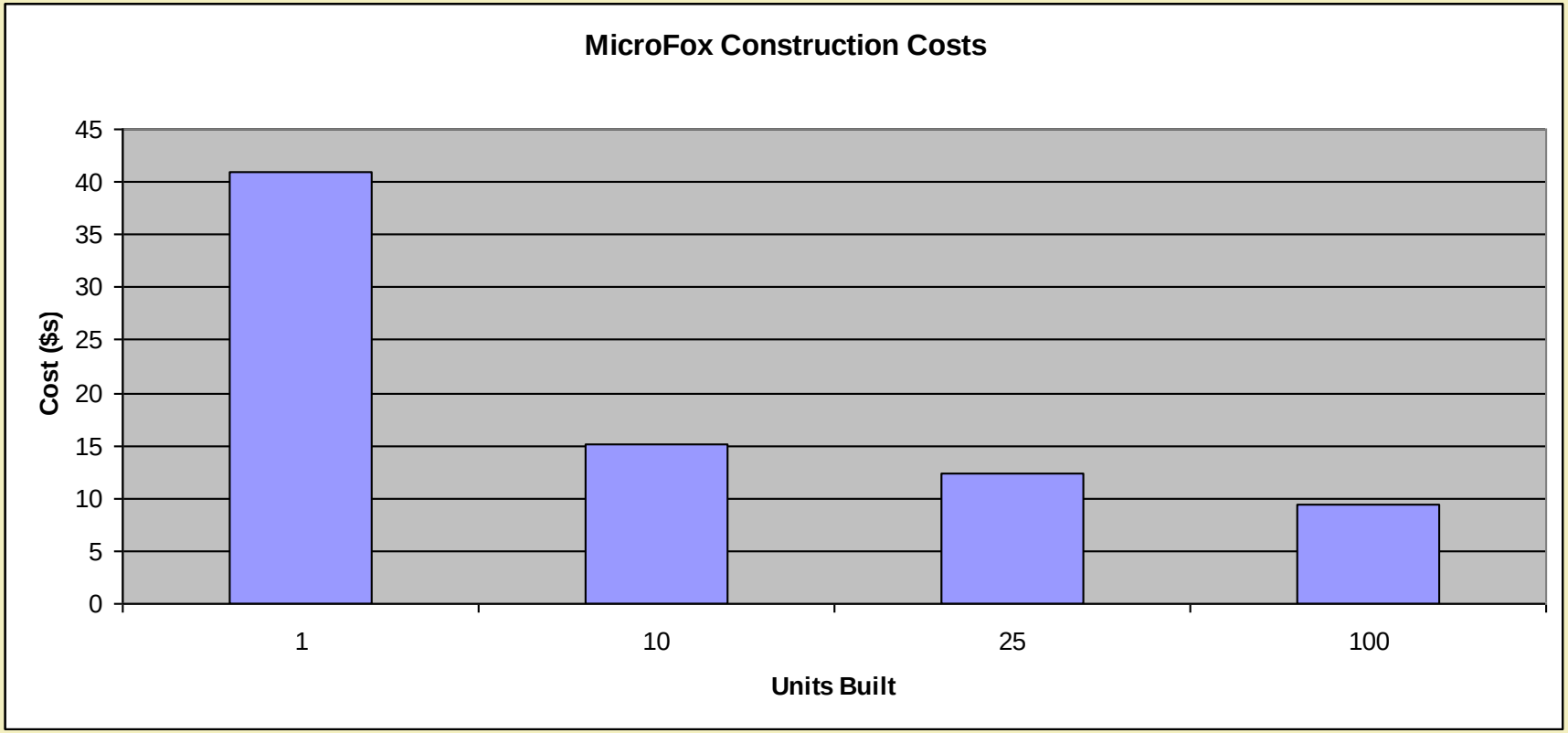


Copper Bottom with
Top silk screen
visible

Issues

- Need to find an in production core for L1
  - Current core used for L1 are ones that were purchased at a surplus store on central
  - Its not a show stopper
    - Just requires a little more work to get same inductance with an in production (Amidon) core if the project is to continue into a production phase
  - The box or “RED” cores are still at the surplus store
- All other parts are in current production and can be purchased on line

Construction Costs



Software

- The program is divided into two main parts
  - A .5 second interrupt routine for time keeping
  - The MAIN C code that provides the FOX function and ARDF sequence
    - Its basically a C code case statement that calls a Morris code send function

Software

- Show software listing (text File)

Demo

- Demonstrate system
  - Use FT817 as receiver and let all 5 transmitters go through the ARDF cycle
    - Point our how the European CYCLE format can help non-hams enjoy ARDF
      - Slow CW for first half of cycle , Fast CW for balance of cycle then letter “C” sent followed by key down before TX switches off cycle

Software Defined Radio Project Update

- Boards have arrived (show a board)
- Mike (K5ATM) has placed an order for the parts
- Boards will be assembled and tested