

Electronics Workshop Arduino and Raspberry Pi

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Workshop Session #1



- Arduino vs. Raspberry Pi
- Getting started with Arduino
 - Using ESP32 Microprocessor as representative for Arduino family
 - Blink an LED – always the first experiment
 - Serial Monitor – communicate between PC and Arduino

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What is Electronics Workshop?



- A series of class sessions focused on basic electronics and electronic projects for fun and amateur radio (and maybe GMRS) use
- A combination of demonstrations and hands-on experimentation.
- Sponsored by CARC – Chattanooga Amateur Radio Club
- Available to all

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We voted



- RF Measurements using homemade equipment
- Software defined radio
- Raspberry Pi basics
- ESP32 Clocks
- NanoVNA Network Analyzer – Antenna Analyzer
- Build-a-Pi: Raspberry Pi for Ham Radio
- TinySA Spectrum Analyzer

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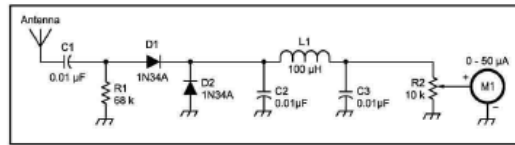
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Session 2 - RF Field Strength Meter



- Simple circuit to measure the strength of the RF field nearby
- First pass: all analog, use meter to display output

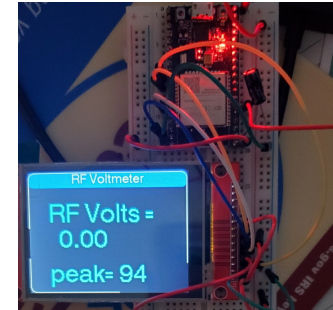


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First Display



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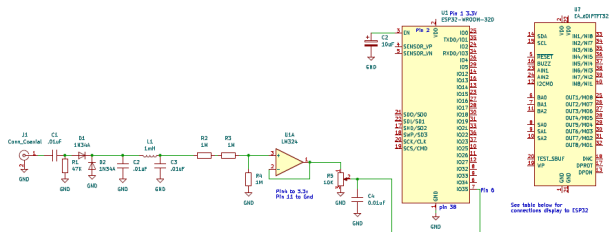
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Session 2 – Second Pass



- Second pass: Add digital ESP32 and display to increase the precision

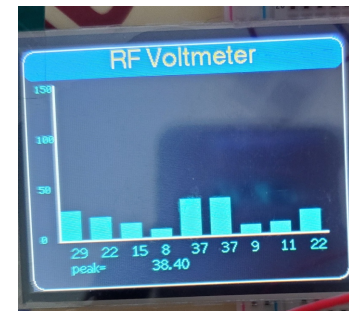


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“Improved” display



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Session 3 – Software Defined Radio



- What is it
- How can I use it
- How can I get started

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First Clock



- NTP time source
 - Requires an Internet connection
- Two time displays: local and UTC



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Session 5 - Clocks



- Based on work of W8BH Bruce Hall
- Three time sources
 - NTP – Network Time Protocol
 - GPS – Global Positioning System
 - WWV – National Institute of Standards and Technology
 - Broadcasts time and frequency information

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Second Clock



- GPS time source
 - Requires view of sky
 - Three displays: single clock with GPS, dual clock, GPS coordinates
 - Touch Control



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Third Clock

- WWV
- Not successful – component problems
- Waiting for better receiver



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Too Much??

- Based on class input
- Let's work through each step of the design and build process



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Combined clocks

- NTP when you have Internet
- GPS when you have sky view
- Touch screen to select which
- In development: combination of clocks and RF Field Strength meter
 - 3 minute for repeater timeout
 - 10 minute for FCC identification
 - When you PTT your transmitter, it will start a timer



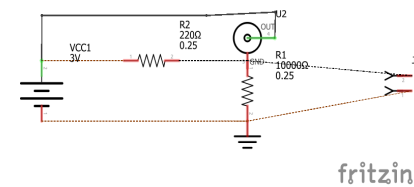
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Session 6 - Coax Tester

- Could use a multimeter or LED
- Because you may not be able to reach both ends of the coax
 - Shunt for far end of coax
- Very simple circuit



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How we built it

- We used ESP32 and 1.3" display to show
 - Short
 - Open
 - Something in between



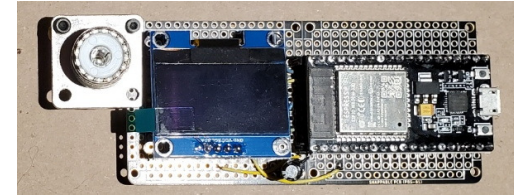
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Breadboard to Perf board

- Once it works, reproduce on a Perf Board
 - More permanent
 - Less likely for a wire to come loose
 - Requires soldering skill



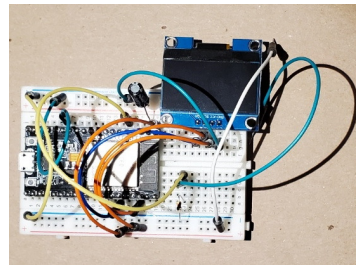
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Breadboard to Perf board

- Prototype the circuit on a breadboard
 - Fast to construct a circuit
 - Easy to change or rewire as needed
 - Wires can come loose, breaking the project



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Future workshops

- NanoVNA – vector network analyzer + antenna analyzer
- Raspberry Pi
 - Basics of use
 - Pi vs. Arduino
 - Microcomputer vs Microprocessor
 - Computer vs Dedicated device
 - Start with the Pi
 - Blink LED
 - Basic electronics
 - Sensors: temperature, light, motion

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Raspberry Pi Radio uses

- Build A Pi – Amateur radio “swiss army knife”
- Ham Clock
- APRS – Automatic Packet Reporting System
 - Position on a map
 - Information about weather, events, messaging
- Winlink – RF based email system
- WSPR – Weak Signal Propagation Reporter
- Digital Modes: FT8, JS8call, FLdigi



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When?

- Third Saturday of the month at 10 am

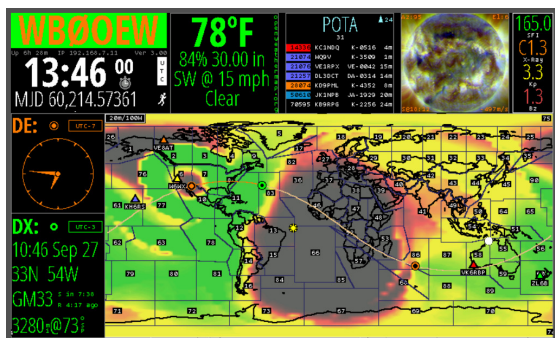


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Ham Clock



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Where?

- Berkshire Hathaway, 5475 Hixson Pike, Chattanooga, TN



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Past Sessions



- <https://github.com/hwdornbush> contains notes from most sessions

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Thanks for your interest



- Questions?
- Comments?

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Future sessions



- Sign up at <https://www.w4am.net/join-our-public-mailing-list/>
 - Select "Electronic Workshops"
- What are your ideas?

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