

Microcomputers for Ham Radio

SLVARC

3 May 2018

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Abstract

- Lots of useful HR projects can be made
- Lots of different microcomputers are available
 - Most can be programmed with c, assembly, forth
 - Many with the “Arduino” programming language
 - A subset/enhancement of C
- The Raspberry Pi is very common and well documented

Some microcomputers

- Arduino Atmel 8 bit
 - Easy to program
 - Very common
 - Poor bang-for-the-buck HW/price
- Use it if already familiar
 - Better options available...

More micros

- TI MSP430 parts and “Launchpad” systems
 - My favorite
 - Easy to program in assembly language
 - Esp. the MSP430FR2311
 - Cheap
 - Excellent if it has enuf memory for your project
 - Some have wireless (not FR2311)

Others...

- Micro:Bit about \$15 has wireless and lots of stuff
 - Somewhat difficult to program
- ESP32 or ESP8266
 - About \$3, amazing bang for the buck
 - Very difficult to program
 - ESP8266 has Forth interpreter

More suitable micros

- STM “Nucleo”
 - Development boards \$10 to \$15
 - Most parts hard to solder, but not all.
- Blue Pill development board – about \$2 including shipping
 - Based on STM32F103, 64K/20K Flash/Ram
 - Outstanding HW/price, fairly easy to program

ARM Cortex processors

- Over 100 Billion (!) sold
- Over 3B Cortex model, Prob. what you will use.
- Many vendors help keep them cheap.
- Easy to breadboard if pitch ≥ 0.65 mm
 - Some have pitch of 0.5 mm or less
 - Need microscope
 - Need fine tipped soldering iron
 - See example of iron, available on Apr. 1

Raspberry Pi

- Over 20 Million sold
- Outstanding support
- Large enuf that a resident linux operating system is normally used
- Can even use as a home pc (a bit slow for that)

Rpi is for kids (and adults)

- Original purpose
- Lots of kids using it
- Lots of documentation at kid's level
- Get one for your grandchild
 - (I suggest age 4 and up)

Stuff for kids (or your 2nd childhood)

See raspberry pi for kids

Sponsored 



Raspberry Pi For
Kids Magazine

\$7.43

DiscountMags.c..



Raspberry Pi
RASPBerry ...

\$15.03

Digi-Key



Kano Computer
Kit – A ...

\$93.99

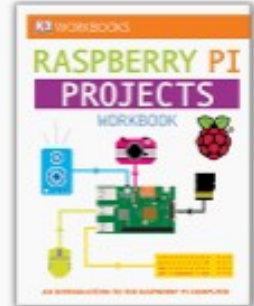
Amazon.com



PiGRRL 2.0 Kit
Pack - Build ...

\$59.95

Adafruit Industri..



Raspberry Pi
Projects ...

\$5.49

EAI Education

RPI common Models

- RPI 3B+, \$35+, 1GB ram, wireless, ethernet
- RPI 3A+, \$25+, 512MB ram, wireless
- RPI Zero W, \$10+, 512MB ram, wireless
- RPI Zero, \$5+, 512MB ram, no wireless or internet

RPI Price does not include:

- SD card, 4G or more, \$5 or more
- Power supply, 5.1 volts, \$5 or more
 - 5.1 volts because of poor design, not a problem if 5.1 is used instead of 5.0

RPI Zero



RPI 3B+



RPI Zero W

-



RPI 3A+



RPI Clones

- Lots available
 - Omega2
 - Orange Pi
 - Banana Pi
 - Odriod
 - C.H.I.P (vaporware, they will take your money and deliver nothing)
 - Pine 64

Why not use clones?

- Marginal documentation
- Slightly different hardware
- Programming not as well supported
- RPI is by far the easiest to learn and use

RPI documentation

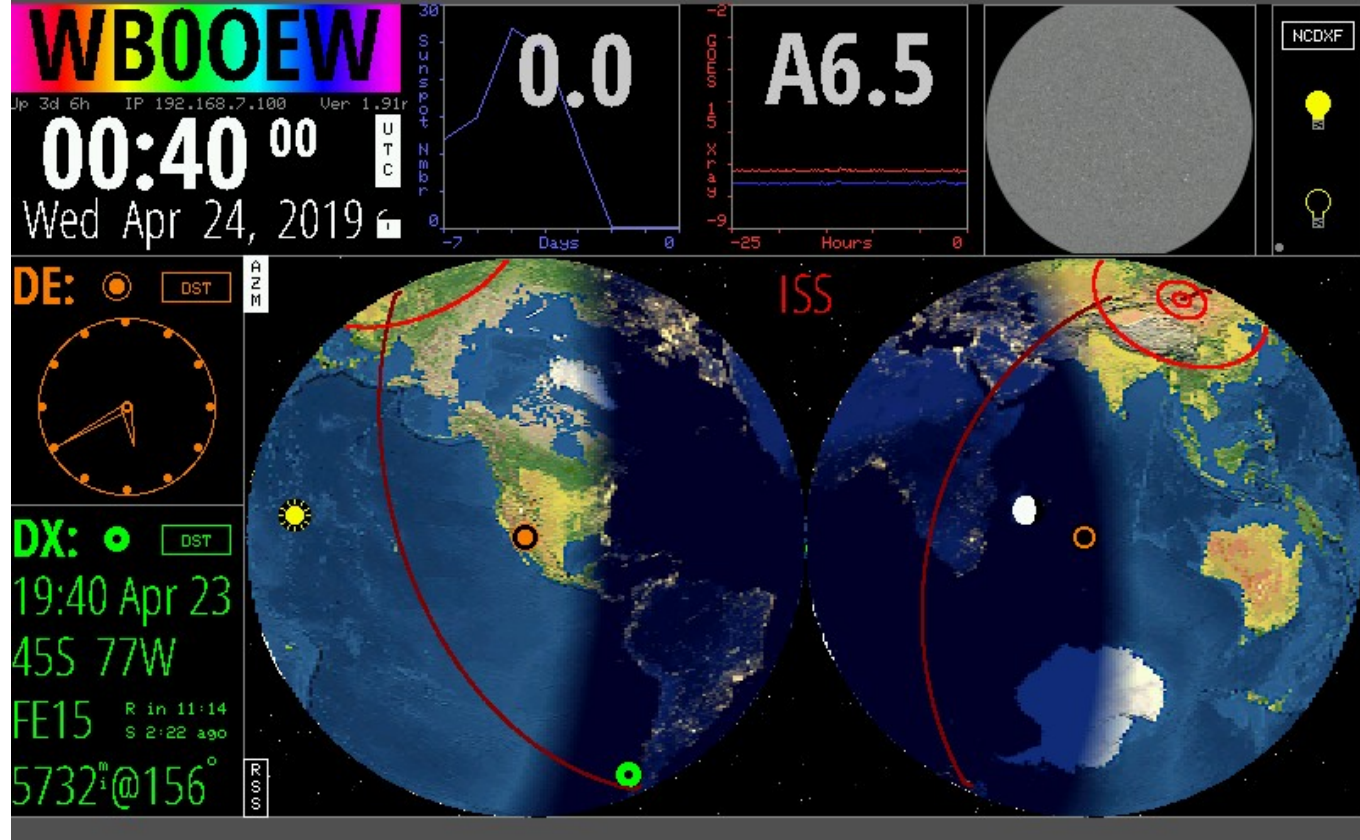
- Outstanding support
- MagPI magazine
 - Monthly
 - \$120/year or free download
 - 81 Issues available now
 - Many Other pubs available
 - Google

How to program

- Download OS (Raspbian) (Google on RPI software)
 - A version of linux
- Store the download on the SD card
- Make minor mods to a couple of files
- Use keyboard, mouse, video display
- Or, use wifi – no hardwired connection to PC. Easy, cheap.
- RPI linux programming: C, Python, assembly, Forth, LUA, Julia, Pascal, etc. etc. etc.

An RPI application

This live screen grab is from one of my HamClocks. It updates automatically every minute after making a random tap. Click for an hour history.



Home automation

- Use wifi or wired connection (cat-5)
- Remote or automatic control of sprinklers
- Ditto for night lights
- Burglar alarms with cameras

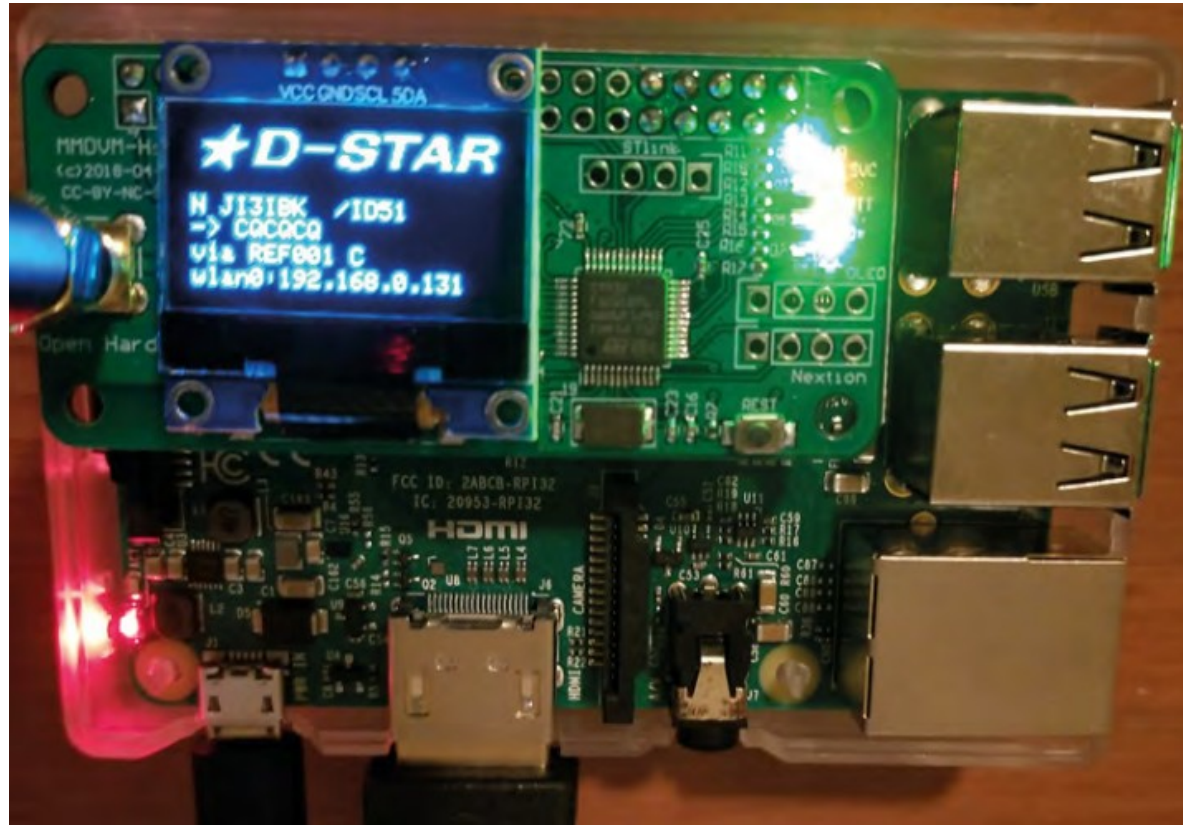
Backup server

- Your own dropbox
- Automatic backups to a large disk on the Rpi
- Low power draw
- Need not be in same building as PC
- Faster with CAT-5 but can use wireless

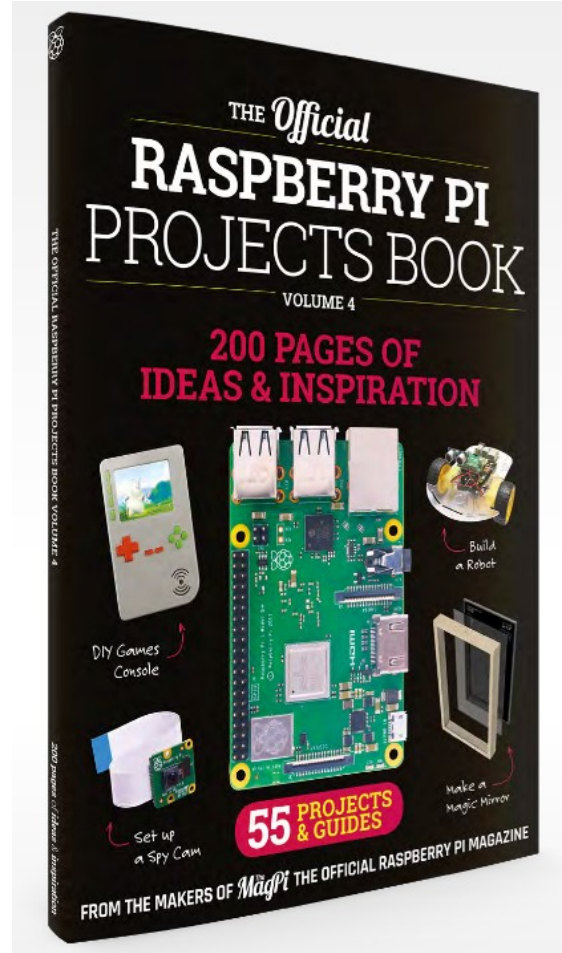
Run your Apache-Labs ANAN SDR




MagPi issue 80 – ham radio apps



Example Pub



Another of Many Pubs



THE OFFICIAL
Raspberry Pi
Beginner's Guide
How to use your new computer

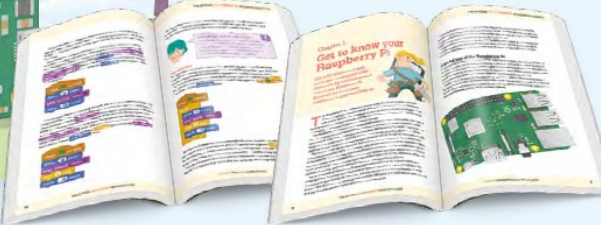
The only guide you need to get started with Raspberry Pi

Inside:

- Learn how to set up the Raspberry Pi, install an operating system, and start using it
- Follow step-by-step guides to code your own animations and games, using both the Scratch and Python languages
- Create amazing projects by connecting electronic components to the Pi's GPIO pins

Plus much, much more!

£10 with FREE worldwide delivery



Possible HR projects

- Keyer for old radios that don't have one (Tom)
- Morse decode for Lid's that never learned it
- Remote antenna switch
- Keyboard generate PSK31, Morse, RTTY, etc.
- Auto set tuner when radio freq changes
- Auto change amplifier band when freq changes
- Repeater Locator (very nice for mobile)
- 10 minute timer reminder for required ID
 - Demo shown here a year or two ago

Display, L to R, Top to Bottom

- NXP LPC804. Interesting part I am learning.
- MSP430FR2311. One of my favorites.
- MSP430G2553, DIP-20 on top, TSSOP below.
- Bluepill – an amazing board for the price (< \$2)
- ESP32 Development board; parts cost < \$4
- Micro:Bit
- VWB designed by Kerry, not shown, somewhere in junkbox)

RPi boards (loose)

- RPi Zero
- RPi Zero W
- RPi 3B
 - I don't have RPi3b+ or RPi3A+
- STM32 Nucleo (not Rpi), many available
- LPC845-BRK development board

Loose programmer and micro:

- TI MSP430 Launchpad, used to program/debug
 - There are lots of different launchpads
- MSP430FR2311 on breadboard, my home automation micros (maybe)
- I use naken-asm to program MSP430 in assy.
- I use mspdebug to load and debug code.

Loose LPC804 board and usb to serial dongle

- Breadboard for LPC804
- Learning is slow but I now have blinky and display working
- Very easy to load programs with lpc21isp
- Difficult to program in c or to debug, easy in assembly
- Easy to get output on serial terminal using usb to serial
- Hope to publish “Mastering the LPC804” when/if I do master it.

Fred's use of RPI

- Thanks for listening
- Micro samples on counter
- Questions after Fred's talk.
- Cheers, Glen KG0T