Yana --- Programming

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I. The Beginning

There are versions of the Arduino IDE for Linux (which I use), Windows (which I have used and am using to write these notes), and Mac. Download and install your correct version from:

https://www.arduino.cc/en/main/software

Adafruit has a good introduction to the Arduino:

https://learn.adafruit.com/ladyadas-learn-arduino-lesson-number-0/intro

Don't worry that it's about the UNO, pin for pin the UNO and Nano are compatible. Go to the right section of this tutorial and install the Arduino IDE on your computer. You will need a usb cable to connect your Nano to your computer. If it has not been created, you will need to create a "sketchbook" folder for all your Arduino programming. An Arduino program is called a "sketch." Inside the sketchbook is a folder called "libraries." There should also be a folder called YANA_AD9851 and the sketch YANA_AD9851.ino should be copied into this folder.

Make sure your sketchbook is known to the Arduino IDE: File > Preferences > Browse.

The tutorial contains a bootloader reset test. Perform this test. If it fails, you probably have a Nano without a bootloader. If your Nano passes the test, install and run Blink.

https://learn.adafruit.com/ladyadas-learn-arduino-lesson-number-1/upload-your-first-sketch

In the IDE program, the Nano is selected as: Tools > Board > Nano. The processor should be: Tools > Processor > Atmega328. The programmer should be Tools > Programmer > AVRISP. Select the right COM port. The tutorial gives some guidance. If your upload works, the on-board LED should blink. The program will tell you if uploading fails. If the upload fails, you may need a bootloader. If you blink, skip the next section.

II. The Boot Loader

I recommend buying a Nano with a preloaded bootloader. eBay sellers will tell you if a clone comes with a preloaded bootloader.

If you are very confident or have a guru then you can install a bootloader. There are many methods to install the bootloader. I recommend using another Arduino (probably an UNO) that already has a bootloader. There are good instructions on the installation at:

http://www.instructables.com/id/How-To-Burn-a-Bootloader-to-Clone-Arduino-Nano-30/?ALLSTEPS

These instructions tell how to use a bootloader enabled Nano (or UNO) to load a bootloader onto a second Nano. Respect pin numbers on the enabled Nano and use an UNO instead, if that's

what you have. I used an UNO. You will need push-on jumper cables which are covered in the **Useful Tools and Parts** section of **Yana --- Parts**.

III. Install the Libraries

At the beginning of the Yana_AD9851.ino program you will find some #include libraries. Three are already installed in the Arduino IDE: SPI, TFT, and EEPROM. You will need to install Rotary and DDS. Installation instructions are at:

https://learn.adafruit.com/adafruit-all-about-arduino-libraries-install-use/how-to-install-a-library

The DDS library is at:

https://github.com/m0xpd/DDS

The "Clone or Download" button will get this library for you. It must be installed as described in the above tutorial. If it is installed correctly, it will show in Tools > Include Library.

The m0xpd library supports the AD9850 so needs a change for the AD9851. Go to the libraries directory of Arduino and open the file DDS.cpp. Change _TrimFreq from 125000000 to 180000000. This change makes no difference since _TrimFreq is corrected in the Yana code. Change the constant 4294967295 to 4294967296. (Data sheet page 12.) This change will probably make no real difference. The **big change** is
shiftOut(_DATA, _W_CLK, LSBFIRST, 0x00);
to
shiftOut(_DATA, _W_CLK, LSBFIRST, 0x01);
This invokes the six times clock multiplier. Without this change your frequencies will be 1/6th the correct value: quite a shock.

The Rotary library is at:

https://github.com/brianlow/Rotary

IV. Load and compile YANA_AD9851.ino

The program YANA_AD9851.ino should be copied into the YANA_AD9851 folder in your sketchbook. Double click on the file. The Arduino IDE will start and load YANA_AD9851. Click the Checkmark in the upper left corner of the IDE. At the bottom of the Arduino IDE will show orange errors and white results. There should be no orange errors. If there are, you need to find out what is not installed and what is not properly set up in your Arduino IDE. You may need a guru.

V. Install the Yana firmware

With a usb cable, connect the Nano to your computer. Some lights on the Nano should flash. Click on the upper left corner right pointing arrow (->) in the Arduino IDE. The program should compile and install on your Nano. No orange means no errors. Your firmware is now loaded and Yana will run when power is applied.

In fact, if all parts of Yana are connected, Yana will run as soon as the firmware is uploaded. The usb supplies power to the Nano, screen, and AD9851 DDS, but not to the AD8307 detector. So, you can turn the knob, punch the button, and play around. Without calibration, Yana is kind of weird, so you need to see the **Yana --- Calibration** section.