

CONCEPT

Time to build



Last time

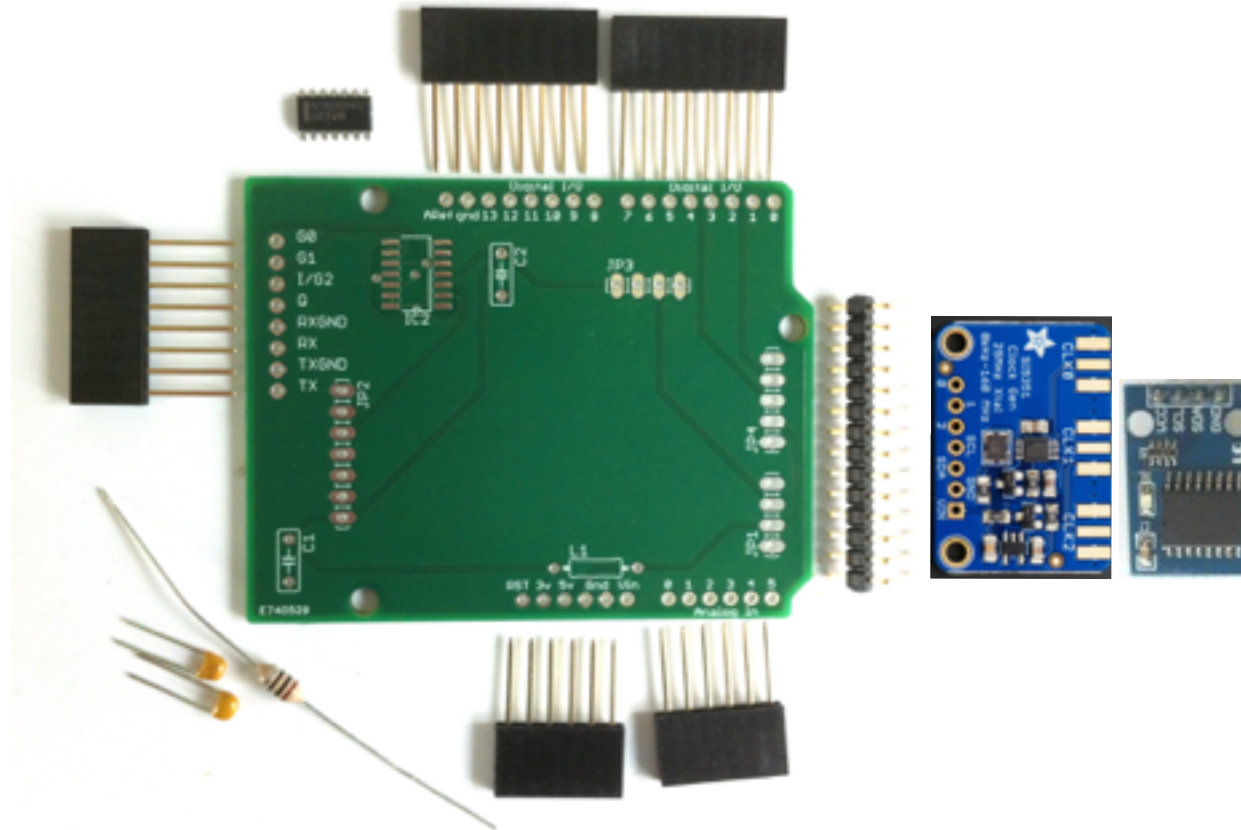
- We prototyped the VFO
 - With Rotary Encoder tuning & LCD display
- Tested a number of sketches
- We did our homework to understand the code (Didn't we???)
- We have already seen and operated the RTC, it could be added
- We saw that VFO, RTC & LCD are controlled by I2C bus



Encoders & LCDs

- Hobby Components have acknowledged the Encoders were not correct, and have shipped replacements.
- They want us to return the units, so please give them to me and I will ship them back to them.
- If we want 10 LCD 20 x 4 line I2C types, HobbyComponents are offering a 10% discount, making the price for 10 £8.09





Let's build the VFO_RTC_IQ

Digital VFO, Real Time Clock
with Quadrature IQ outputs

Tools needed

- Check you have a suitable soldering iron. Wire cutters. A small set of tweezers, a magnifier would be useful
- Hobby components has a very good soldering iron (40W temp controlled). Amazon has Cutters, Tweezers, Solder Flux Pen + 0.3mm Solder and Magnifiers.



Warning

- The Si5351 module, the SN74AC74 and the RTC module are CMOS devices
- You **MUST** take care to handle these and protect against static electricity
- Earth your soldering iron
- Work on an earthed conductive surface



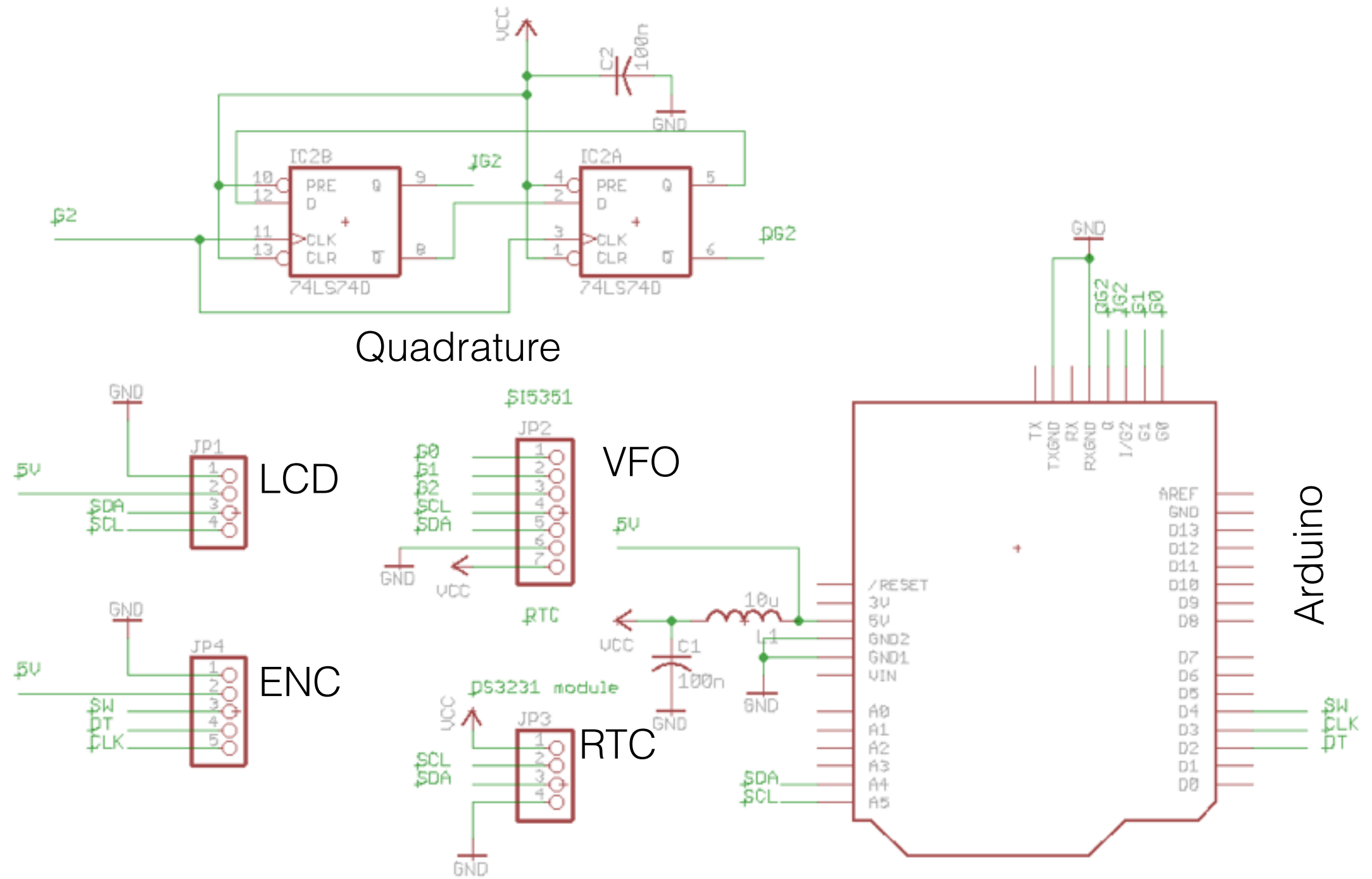
Kit 3

	Starter	Learner	VFO & RTC	VFO+ROT	VFO+ROT+LCD	VFO_RTC_IQ	SDR_40M
Arduino UNO	x						
400 point BB	x						
Jumper wires	x						
LED		x					
220R		x					
Piezo buzzer		x					
Si5351 module			x	o	o		
Rotary Encoder				x	o		
I2C LCD			x		o		
RTC module			x				
CR1220 battery			x				
F - M wires			x		o		
PCB SDRX_40M1						x	
Si5351 module						o	
SN74AC74N						x	
2 x 100nF						x	
1 x 10uH						x	
2x6 & 3x8 pin headers						x	
4 & 5 pin headers right angle						x	
Rotary Encoder						o	
RTC module						o	
I2C LCD						o	
F-F wires						x	

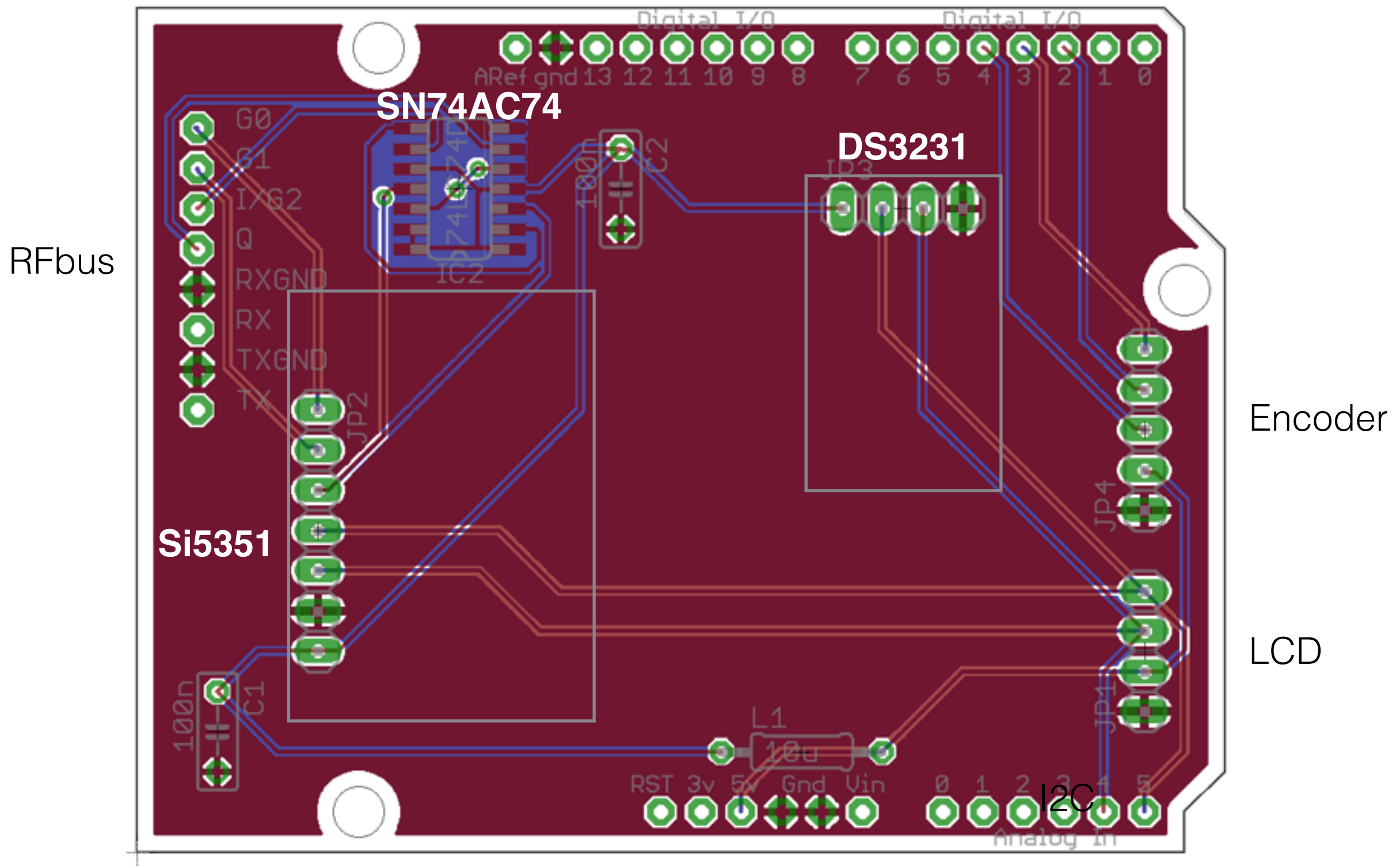
Check your kit, some parts "o" are from kit 2



Schematic

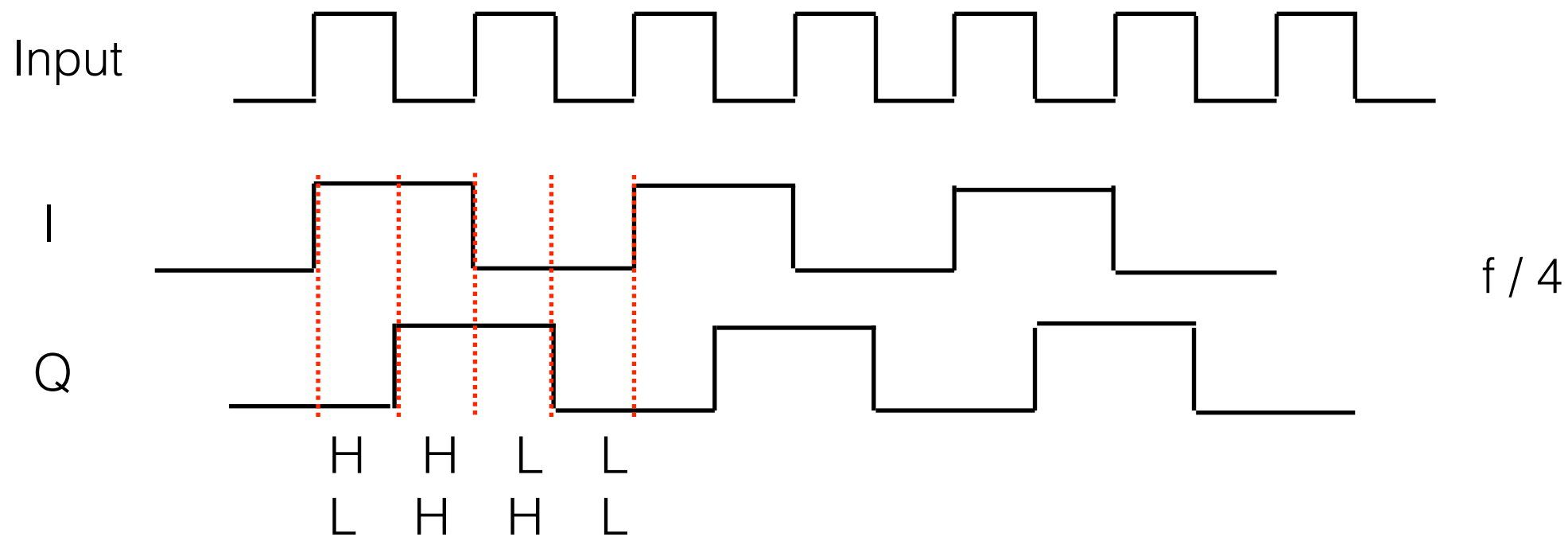
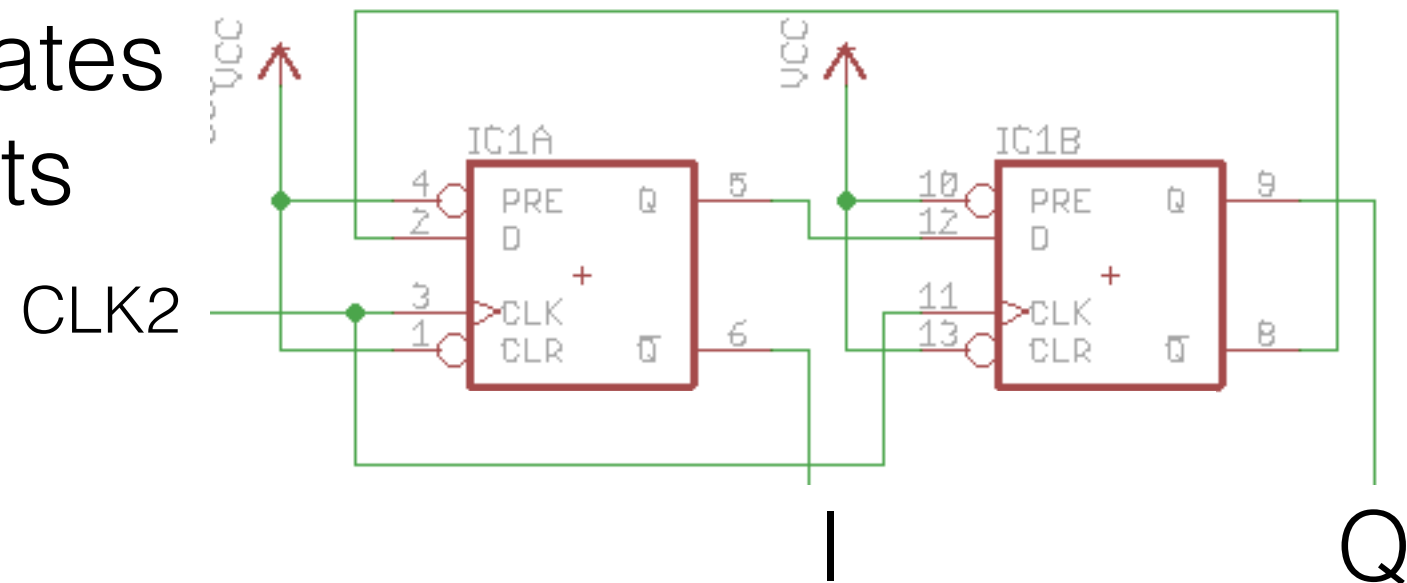


The PCB



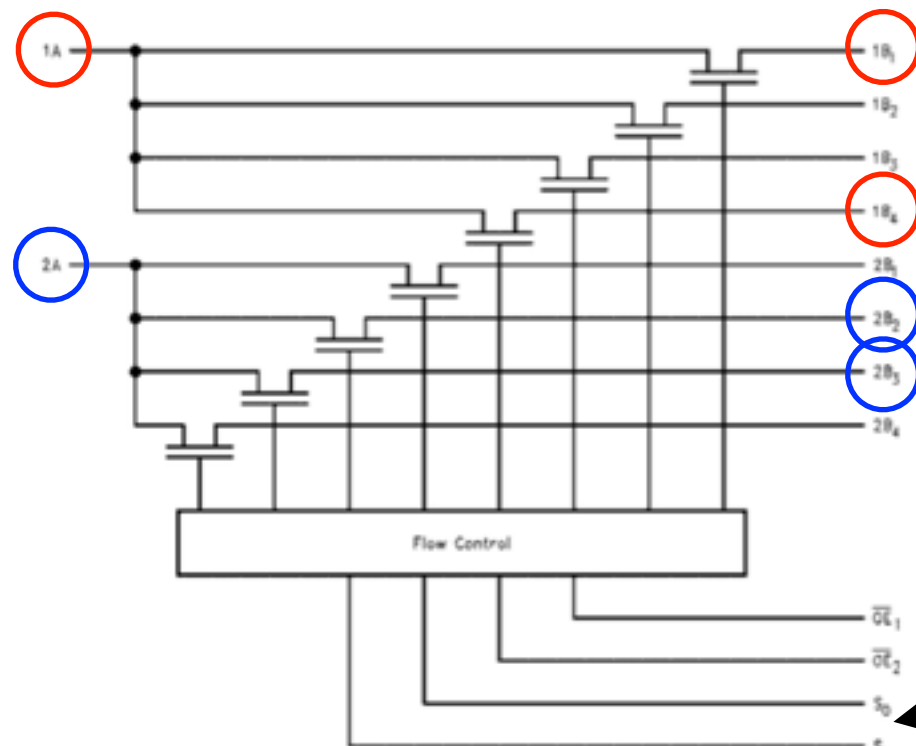
IQ - Johnson counter

SN74AC74D generates quadrature outputs

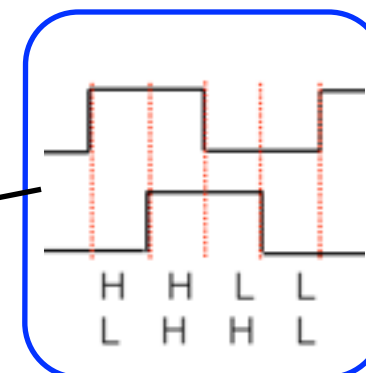


Baseband filter FST3253

Quadrature outputs drive the CMOS switches



S ₁	S ₀	\overline{OE}_1	\overline{OE}_2	Function
X	X	H	X	Disconnect 1A
X	X	X	H	Disconnect 2A
L	L	L	L	A = B ₁
L	H	L	L	A = B ₂
H	L	L	L	A = B ₃
H	H	L	L	A = B ₄



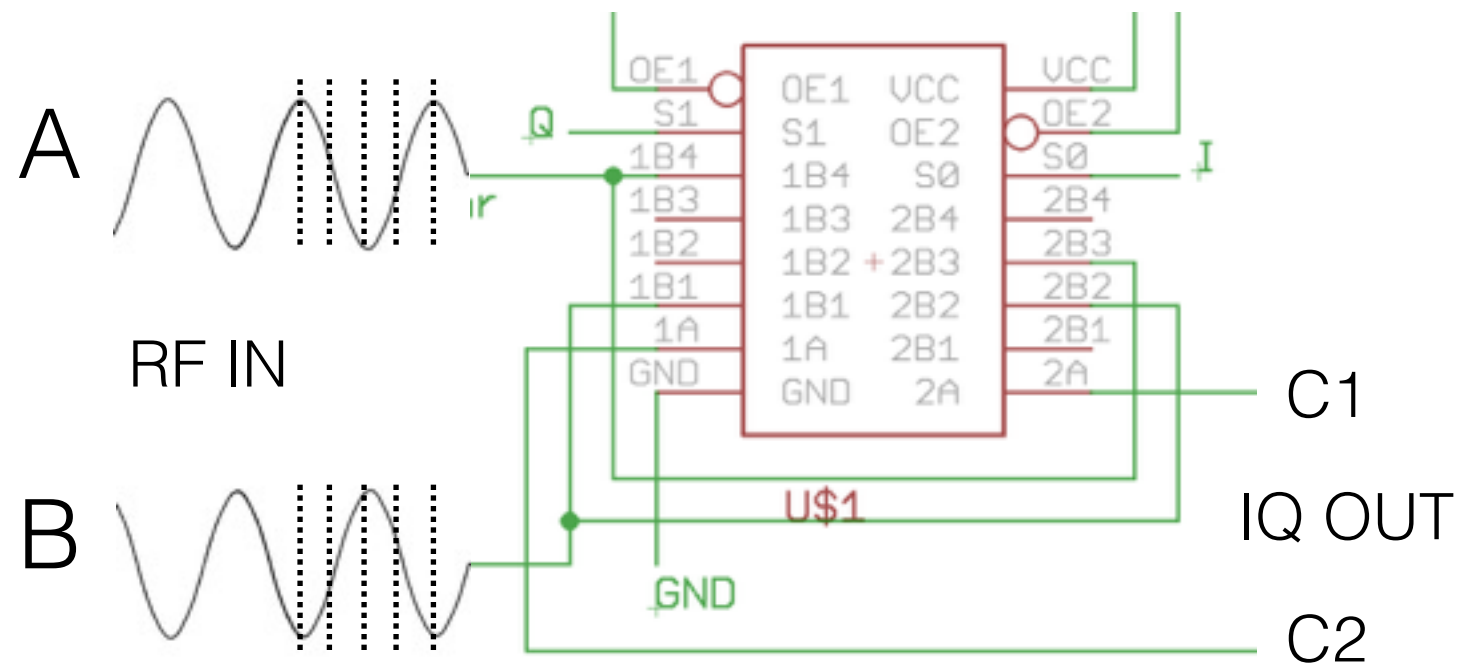
Quadrature inputs

Quadrature

HL	2B3 = 2A
HH	1B4 = 1A
LH	2B2 = 2A
LL	1B1 = 1A



Baseband filter



A & B switched
onto C1 & C2



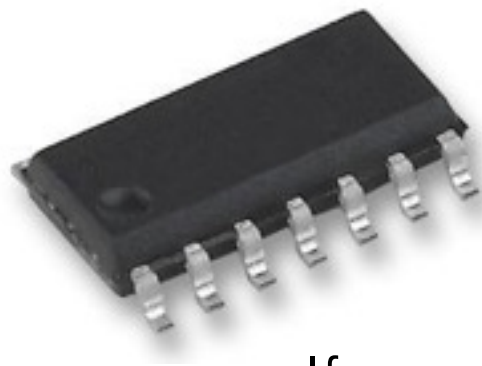
You have to solder an
SMD part.

Video on soldering SMDs

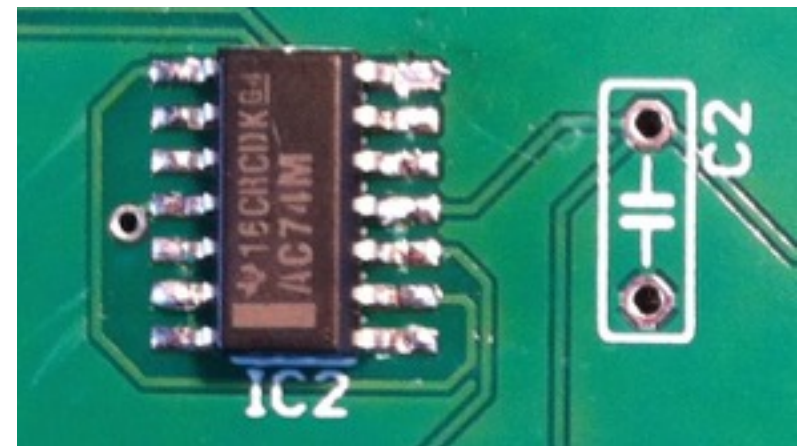
This movie is in your Arduino > Help folder

Mount the SMD

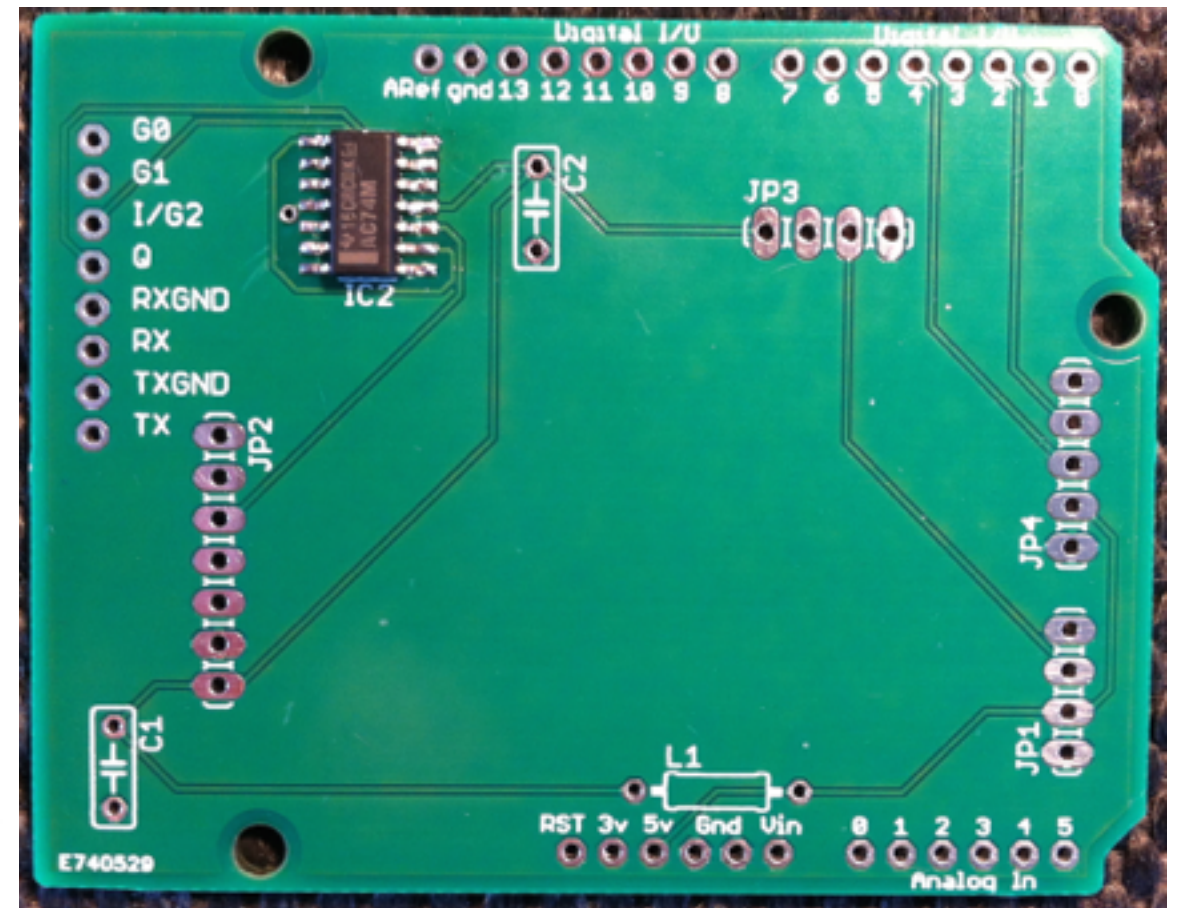
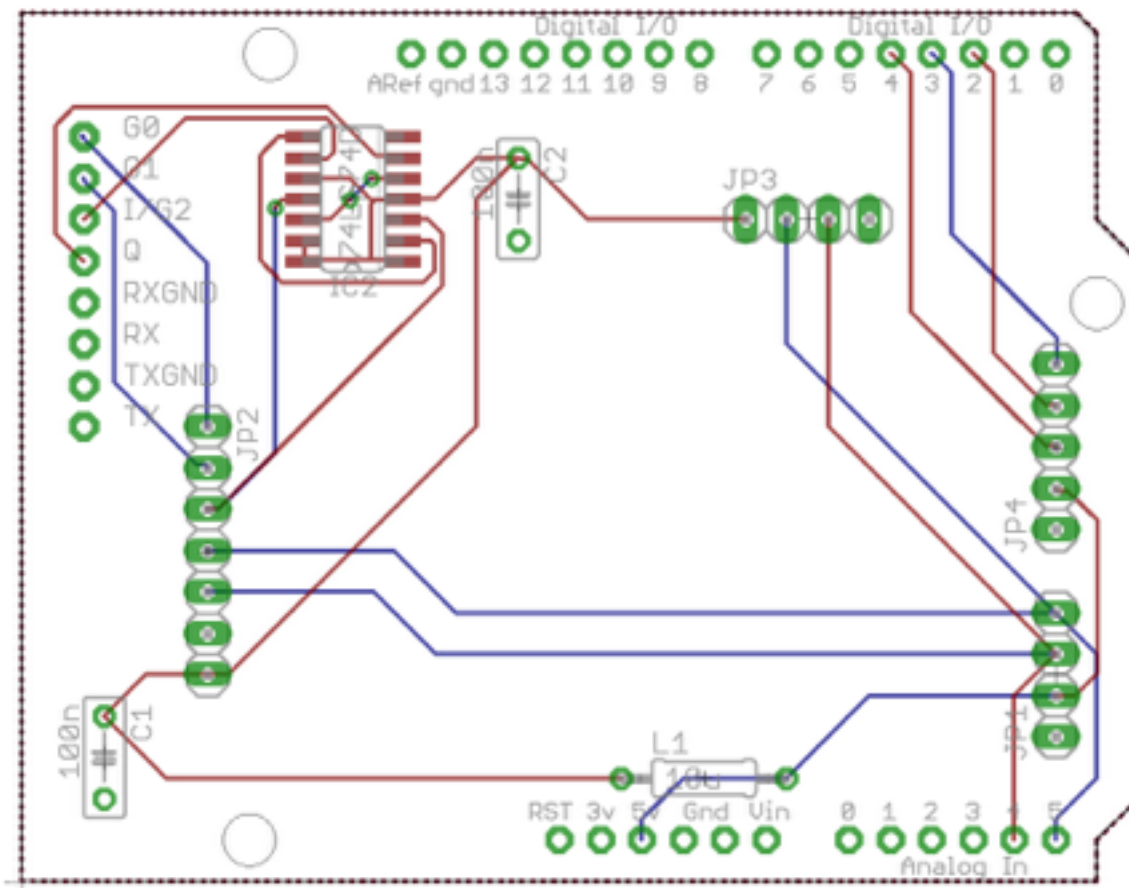
- SN74AC74D
- Wipe the PCB contacts with flux pen
- Position the part, very carefully
Pins 1 & 14 at the bottom, white line across package
- Tack one lead, to hold in position
- Tack the opposite corner
- Solder the other leads
- Comeback and re-solder the tacked lead



If you are unsure of this,
ask and I will do it for you

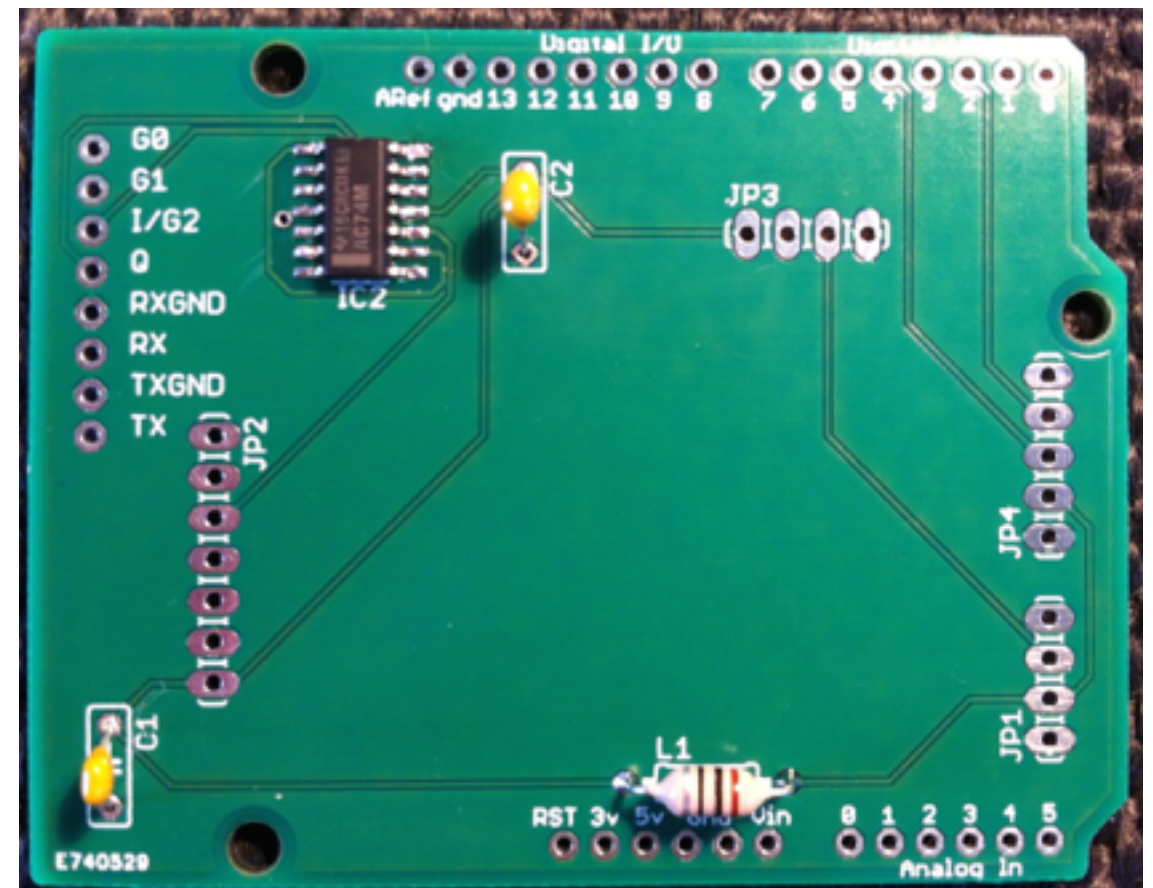
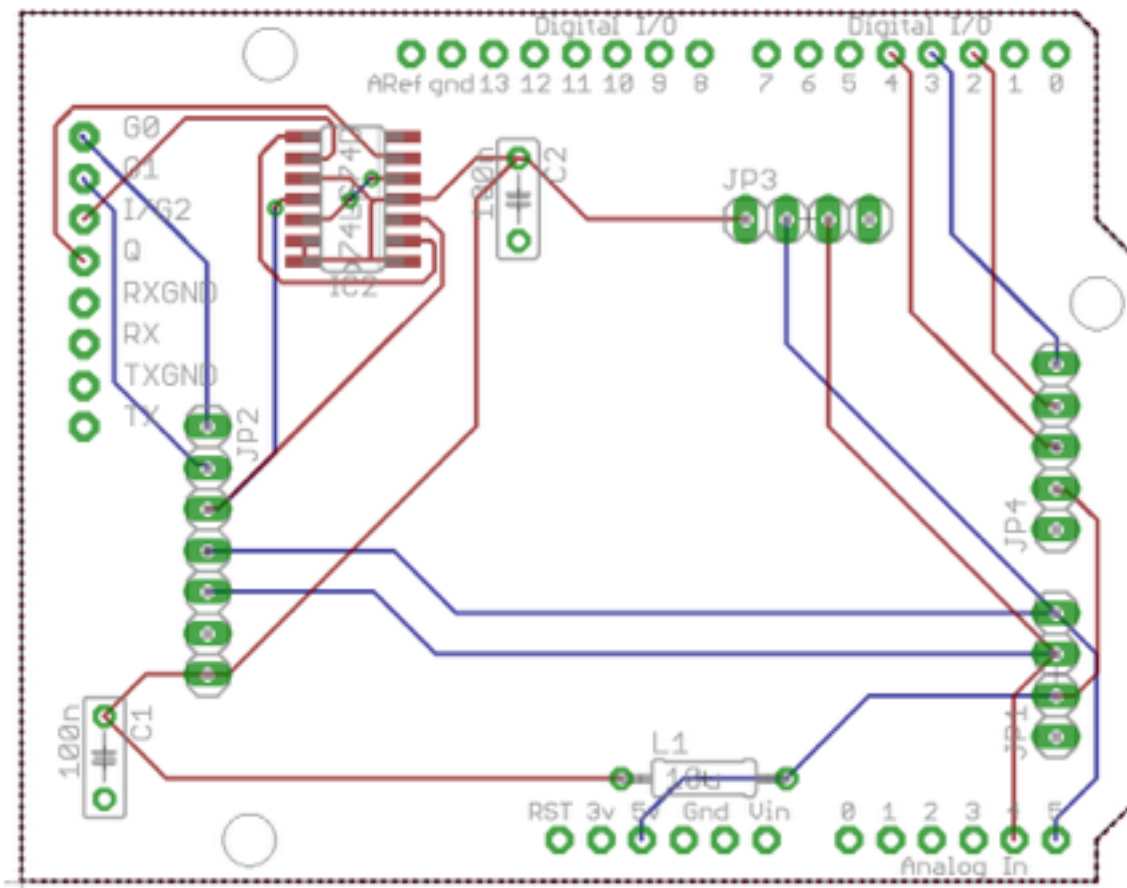


SMD mounted



Other components

Take care to correctly identify each component

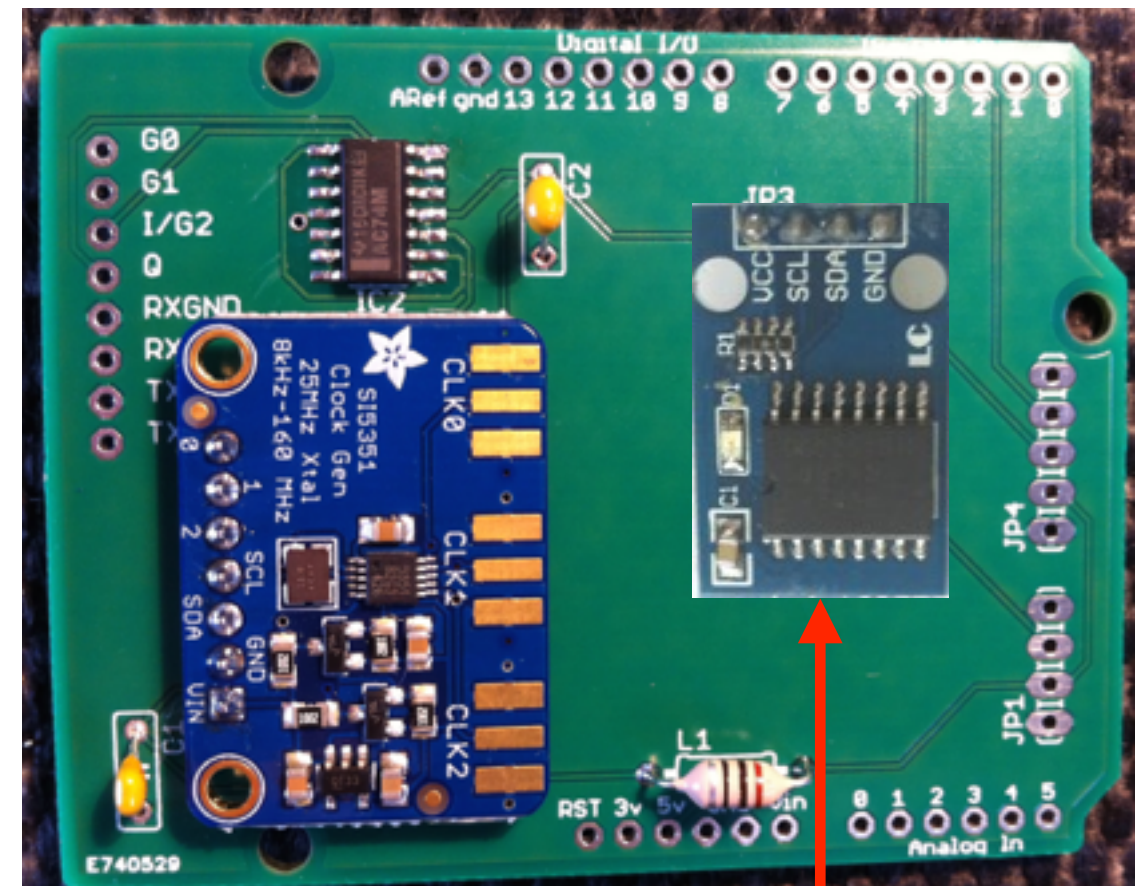
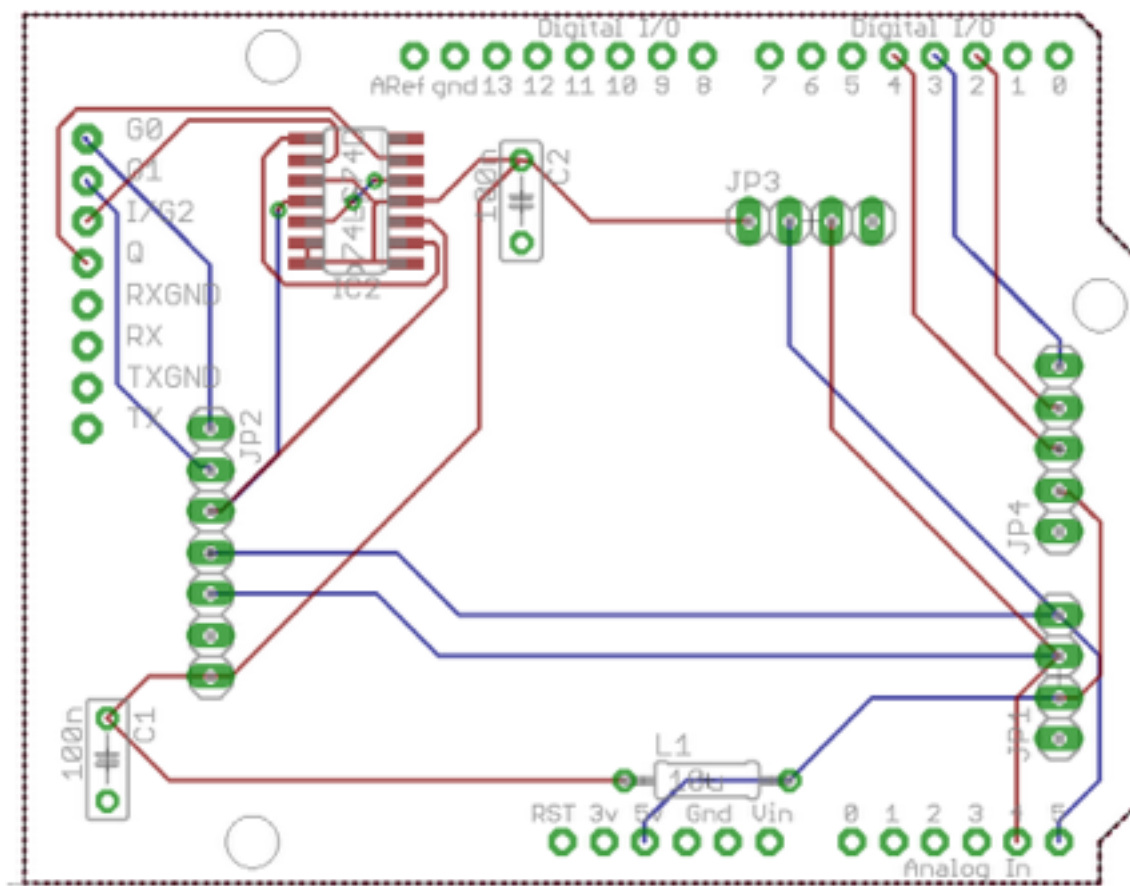


C1 100nF 104
C2 100nF 104
L1 10uH



Modules

IMPORTANT!!! Put in the CR1220 battery before you mount the RTC module, +ve side UP

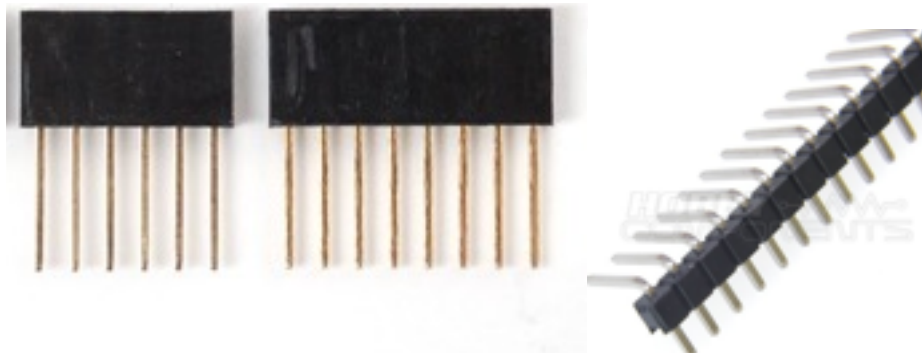
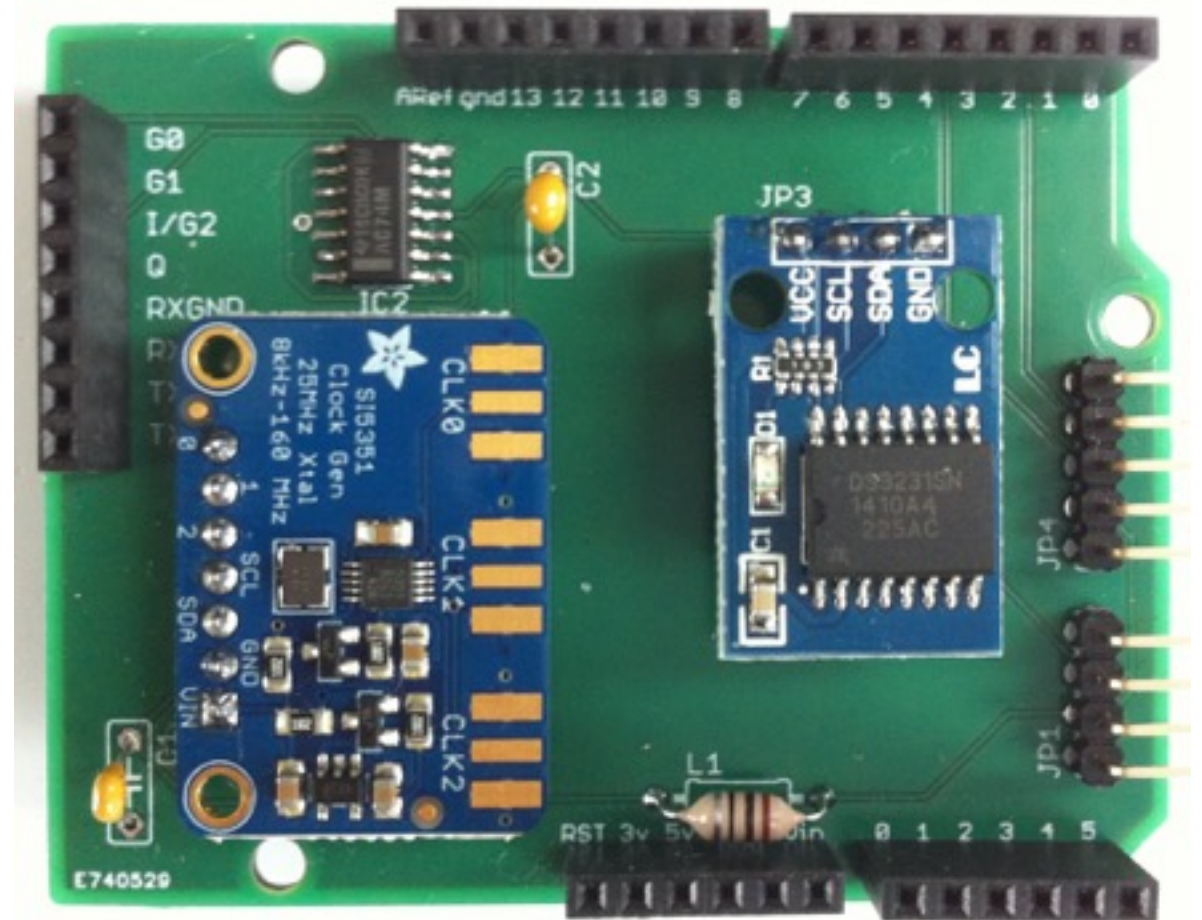
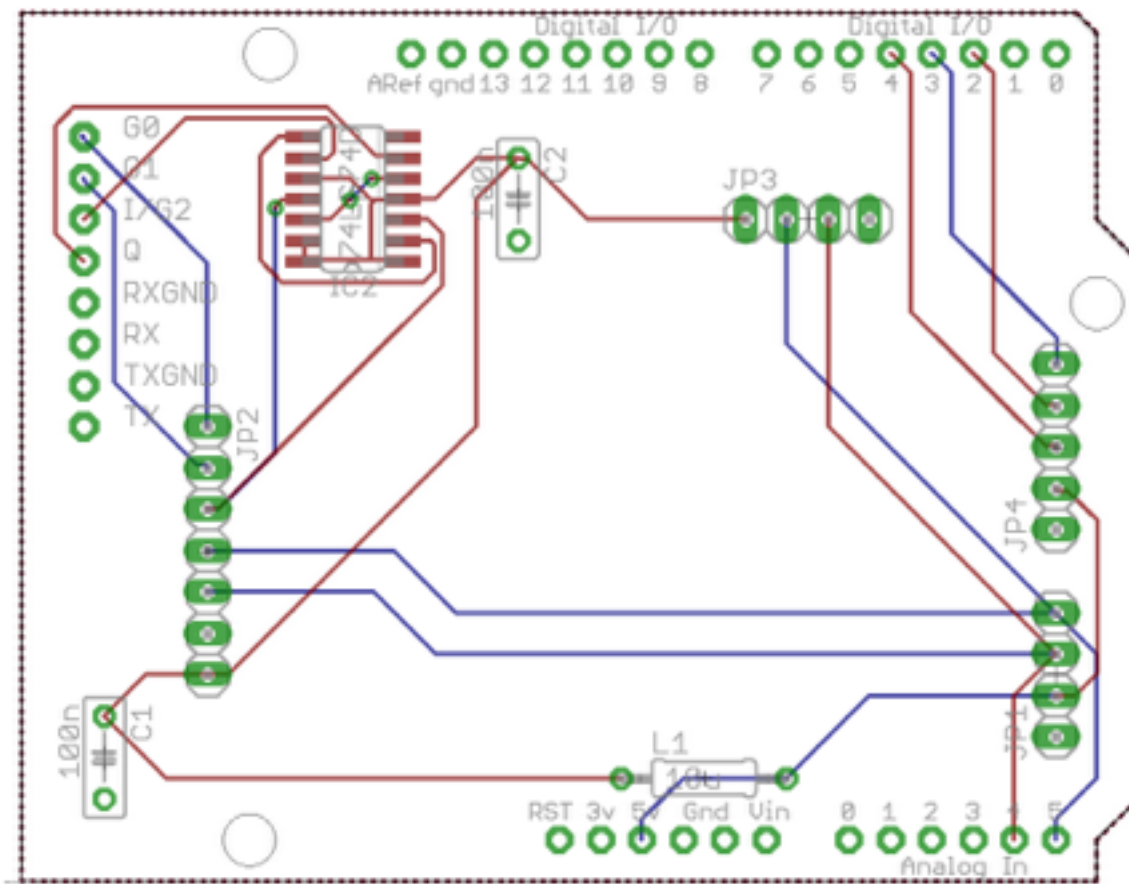


Note: RTC not available when this photo taken, goes here



Headers

Plug another Arduino board on top to make sure they are vertical



Or

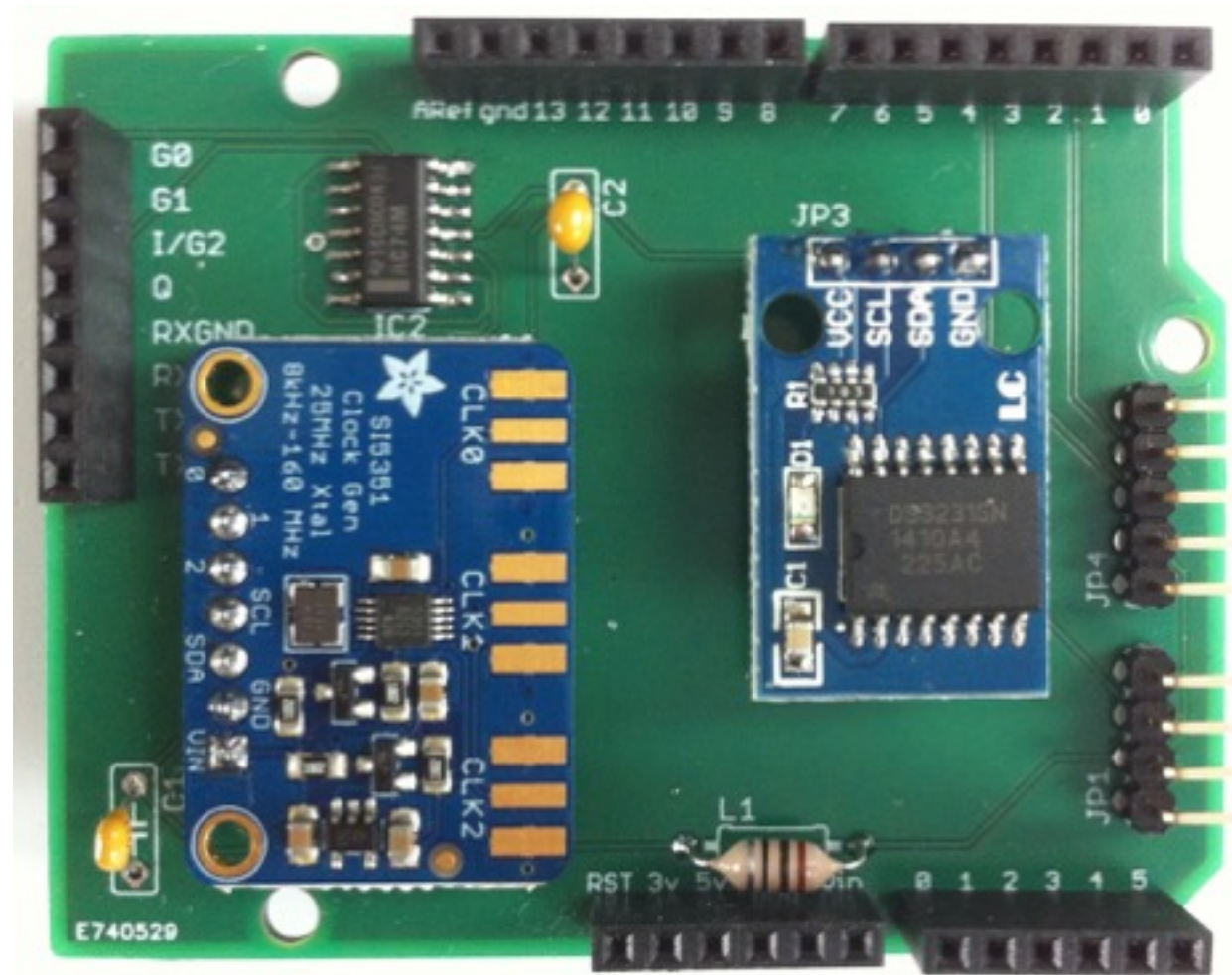


Wire up & test

File > Sketchbook > My_VFO_40M

If your LCD does not have
address 0x27 change sketch to 0x3F, save it





Well done!

Next we look at the SDR design