Further Information on Rubidium Std. FE-5680A
Option ????
Vk4xv

On Receiving my unit and powering it up according to the label stuck to the unit the device produced the required 10Mhz output, but for some reason I was a little uneasy about these connections. When one of the tantalum caps caught fire as they do, I decided to “bell out” some of the connections.

The sticker on the unit as it arrived detailed the connections on the DB9 connector as follows:-

Pin 1 - Input +15V - +18V
Pin 2 - Chassis Ground
Pin 3 - +5v Input
Pin 7 - RF Out

These above connections I believe are incorrect for my option.

I checked the continuity of pin 3 of the DB9 connector and found it went to pin 11 of the 74ACT240. This is a ttl input pin of this i.c. Which is a ti-state inverting octal buffer. By putting +5V into this pin the Vcc rail for this chip is supplied via the input protection diodes of this input. This resulted of a Vcc on the 74ACT240 of some 3.7 volts. These input protection diodes have a max forward current of some 20ma. This chip normally required a Vcc of 5Volts.

I then found that there was continuity between pin 4 of the DB9 connector and pin 20 of the 74ACT240. This pin on this i.c. Is the Vcc supply pin and should be +5v.

I then checked continuity between pin 6 of the DB9 connector and found it connected to pin 5 of the 74ACT240. This is a ttl output pin.

There was continuity between pin 7 of the DB9 connector and the center pin of the small co-axial connector on the PCB. This is obviously the 10Mkz RF output.

On the PCB there is a chip MAX3232 which is a RS-232 to ttl converter. There is continuity between pin 14 of this chip and DB9 pin 9. This is the RS232 output from the unit. Pin 13 of this chip connects to DB9 pin 8 and is RS232 input to the device.

As a result we arrive at a set of connections for the DB9 connector as follows:-

Pin 1 - 15v – 18v supply voltage
Pin 2 - Chassis Ground. 0V.
Pin 3 - Ttl input. (Control of ttl output)
Pin 4 - +5v Supply voltage.
Pin 5 - Ground.
Pin 6 - Ttl output (1 second output pulse)
Pin 7 - 10Mhz RF output.
Pin 8 - RS232 Input to unit.
Pin 9 - RS232 Output from unit.

On powering up under these connections and making the ttl input on pin 3 low at 0v the 1 second pulse appeared at pin 6 of the DB9 connector. This pulse was of 1ms duration. When commands were sent into the RS232 pin 8 connector a corresponding reply was received from pin 9 of this connector indication the current offset value was returned. These commands were issued at 9600 baud 1 stop and no parity.

Initially I tried applying 15v between pins 1&2 of the DB9 only, and then measuring the Vcc pins on the 74ACT240. There was no voltage present indicating that there is no internal 5v regulator.

Below is a photo of the bottom of the PCB showing the various components discussed above.

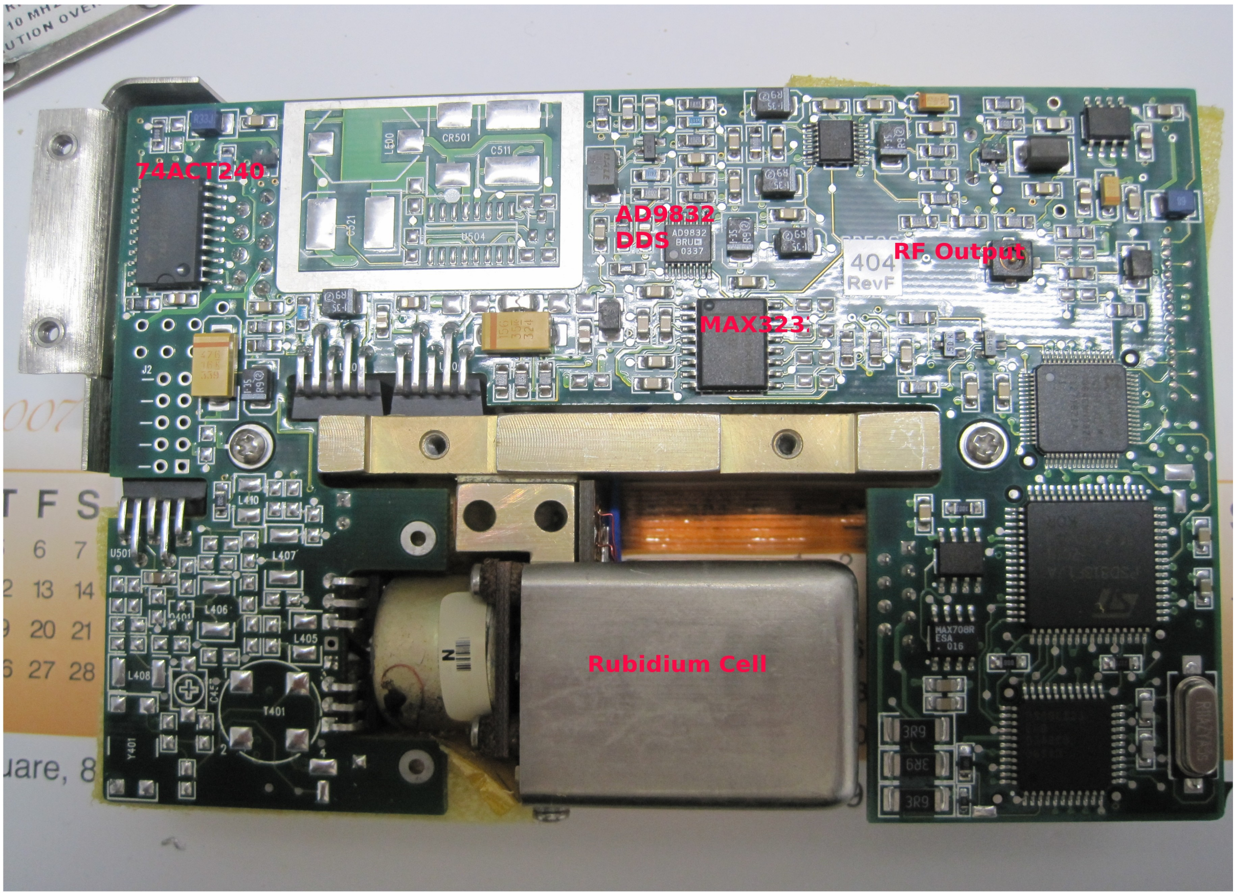


Illustration 1: Rbd Std Bottom plate removed

There seems to be some difficulty in determining what options are implemented on the variations of this device. So I would advise that you determine the exact device you have before rushing into using these connections.

In service these devices were apparently mounted on a piece of circuit board. I am not going to apply any heat sinking to my installation as these devices need to be at a certain temperature during operation, so by taking away heat you are causing the electronics to produce more heat to maintain this temperature. The components installed should be rated to cope with the set temperature.

Now to the software to handle this device.

My initial tests included sending commands as outlined in the manual's section on protocols. By sending the Hex command [2D 04 00 29] to the device, mine returned [2D 09 00 24 00 00 00 00 00] which tells us the off set in this unit is 0. The baud rate is 9600 1 stop bit no parity. This indicates that the RS232 circuits are operating.

The manual I referred to is obtainable from:-
http://www.wa6vhs.com/Test%20equipment/FREQUENCY%20STANDARDS/FE-5680A/5680%20TECH%20MANUAL.pdf

From this manual we see that we can load a temporary offset, load a permanent offset and of course as outlined above read what that offset is currently. The software does not echo any input, and does not offer any response to the load offset commands. These have to be checked with the read offset command. From the manual we can see that the output frequency can only be moved plus/minus 383Hz. This is fine adjusting the output frequency to achieve the desired accuracy at 10Mhz that you require, but not enough to achieve 10.0666Mhz required for tripling to lock some of our transceivers. By my calculations each bit moves the output frequency $.178^{-6}$ Hz. Ideal for the time/frequency nuts.

The DDS chip in the unit I have is a AD9832 while the DDS chip referred to in many of the units that are programmable is a AD9830. The PCB boards are quite different. The 9832 requires a I2C interface while the 9830 is of the TTL parallel type interface. The 9830 is capable of a 50Mhz clock while the 9832 is 25Mhz. Other than that the chips are similar in function. See the following link to a paper produced by Matthius Bopp DD1US who I thank very much for some great information.
http://www.vk3um.com/Reference%20Data/precise%20reference%20frequency%20rev%200_5.pdf

I could not get my unit to respond to any of the commands issued by the http://www.redrok.com/main.htm software by by Duane C. Johnson, so I am assuming the software that I am talking to via the DB9 pins 8&9 is not the same as the above software wants to talk to. However the confusing part is that the software I am talking to is as per the user manual.

I have found information in postings to the time nuts list by Jose Camara http://article.gmane.org/gmane.comp.time.nuts/9473/match=fe+5680+pin+outs and Dan Rae http://www.ko4bb.com/dokuwiki/doku.php?id=precision_timing:fe5860a_pin-out to be very helpful and I thank them for posting this information. Murray ZL1BPU also published some helpful posts. http://www.qsl.net/zl1bpu/PROJ/Ruby4.htm

The next step is to build a suitable power supply and write a bit of software to make adjusting this offset easier. As I need only 10Mhz I will compare the output from this unit with a GPS locked unit, and compare its accuracy and stability over a suitable period of time, using Lissajous pattern on a storage CRO. By observing and measuring the phase angle over a period of time you should be able to adjust this device to an acceptable level of accuracy.

I conclusion this device is quite useful for those who want a 10Mhz frequency reference, however it seems not suitable as a programmable device for generating the various reference frequencies required by a lot of amateur transceivers.

13th June 2011..............
Further investigations to the hardware have revealed that some devices that looked very

similar to the one we were playing with produced different results with different configurations of pin 3 of the db9 connector. On these units, if pin3 was left floating or pulled up to +5 with 10k, pin 3 would be 4.9xxx volts on power up and after the device warmed up this pin 3 would be pulled low, < .09 volts. This would indicate it produced a LOCK indication from this pin. This was confirmed by observing to output frequency and sure enough the frequency varied somewhat while pin 3 was high but became stable when this pin went low.

My unit would produce about 2.8 volts after warm up, and this to me indicated that the 74act240 was probably faulty, caused by using the original connection information. I replaced this chip and now my unit behaves as above.

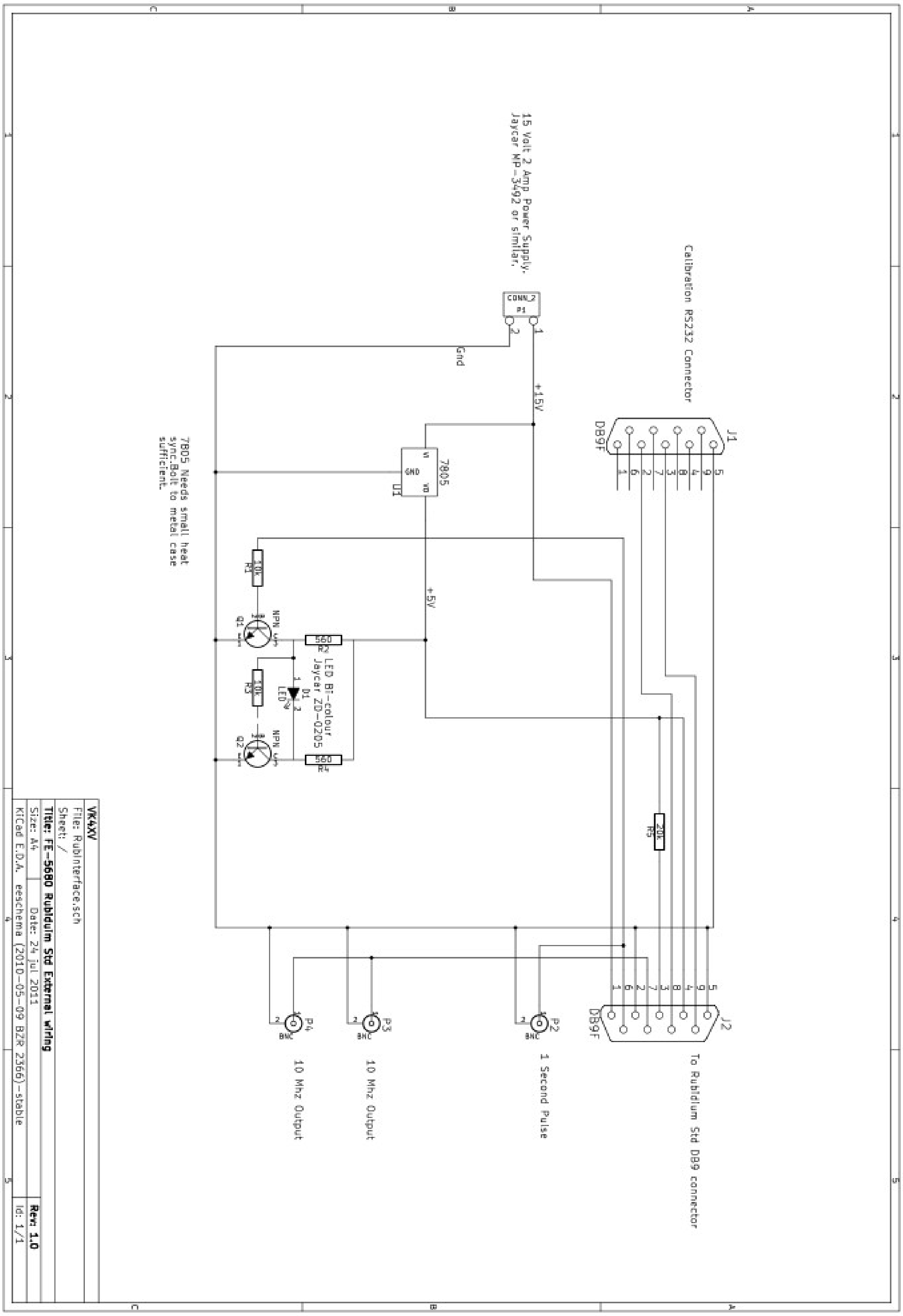
As a result I now believe the connections for the DB9 connector as follows:-

Pin 1 - 15v – 18v supply voltage
Pin 2 - Chassis Ground. 0V.
Pin 3 - Ttl input pull HI with 20k will go LOW on LOCK.
Pin 4 - +5v Supply voltage.
Pin 5 - Ground.
Pin 6 - Ttl output (1 second output pulse 1 uSec wide) / LOCK
Pin 7 - 10Mhz RF output.
Pin 8 - RS232 Input to unit.
Pin 9 - RS232 Output from unit.

Currently we are developing some software that allows us to communicate with the FE-5680 and adjust the offset. We have been able to measure the phase relationship between a GPS locked 10Mhz signal and the output from the FE-5680, using a vector voltmeter. We can adjust the rate of phase change between the two, and make this change of offset permanent and thus surviving a power down of the device. This software will be freely available as soon as we get it out of the alpha version and is hopefully bug free. It is a Windows app. And has been developed via the .NET framework.

Appended is the circuit I eventually used. I was not convinced that pin 3 had sufficient out drive so I just pulled it up with 20K to +5V.

73's Bob Campbell Vk4xv...


15 Volt 2 Amp Power Supply,
Jaycar MP-3492 or similar.
Calibration RS232 Connector
7805 Needs small heat
sync.Bolt to metal case
sufficient.
LED Bi-colour
Jaycar ZD-0205
To Rubidium Std DB9 connector
1 Second Pulse
10 Mhz Output
10 Mhz Output
VK4XV
File: RubInterface.sch
Sheet: /
Title: FE-5680 Rubidium Std External wiring
Size: A4 Date: 24 jul 2011
KiCad E.D.A. eeschema (2010-05-09 BZR 2366)-stable
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