



# The Kanga Whisper Mite

## Setup/User Guide.

The Kanga Whisper Mite (KWM) is a small low-cost method to get going with a WSPR beacon. Whisper mode is a great way to test antennas, propagation, or just for the fun of seeing where your low power signal can go. There is a clue in the name 'WSPR' mode (Weak Signal

Propagation Mode) even just a few mW can result in reports from many 100's of miles if not 1000's. We have been using the KWM for some time and we have results (Spots) from over 5000KM and we only run 200mW of power in to a simple end fed half wave wire at 20-25ft AGL. The first prototype didn't even have a PA transistor just straight from the Si5351 module into a LPF and that got reports from over a 1000miles (only running 5-10mW!)

Once built your KWM will need to be setup before you can use it. If not correctly configured the KWM will transmit but the remote stations will NOT decode your transmissions.

First we need to install the serial device drivers on your computer, you may well have this already installed. The driver is for the well known CH340 USB Serial driver. This is downloadable from the WSPR page on our web site. Install this **before** plugging in the KWM.

Once the driver is installed on the computer plug in the KWM via the front USB socket to the computer, the computer should see it as a Com port

Look at the device manager if you need to so you can see what comport it's been given.

Here my KWM has been allocated COM4, remember this number





To setup the KWM you need to a computer with Terminal emulator software. We recommend CoolTerm, it's a free program that is intended for use with serial ports rather than network communications like some others. If you have a favourite package feel free to use that. We have not tested the serial communications with ever program but have used CoolTerm since the first prototype of the KWM. Its great, simple to use best of all its free.

A link to this free program is on our web sites WSPR page too. Consider a small donation to the writer of this program if you like it and can afford to do so.

Lets look at this first as it's the only way we can talk to the KWM and get it ready to go on air.

Downloads are available for most operating systems, I am using Windows 11 and so screen shots are from my PC.

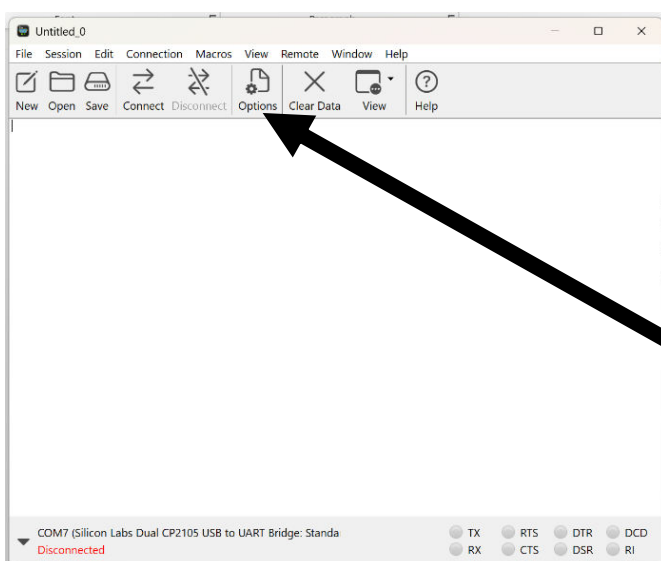
Download either the 32bit or 64 bit depending on your computer and install.

When you run Coolterm for the first time you will get an option to set preferences now or use defaults. I normally select use defaults .

Plug the KWM into any available USB port on the PC. BUT YOU MUST use the FRONT USB socket on the KWM, the back type 'C' socket is for powering the KWM only. **Do NOT plug power into the rear of the KWM while using it connected to the computer. You could damage either the KWM or the computer.**

As soon as you plug in the KWM the standby green LED will come on and for 5 seconds the two other tone LEDs will also come on. These two extra LEDS indicated the setup window that can be used to enter the update menu.

Start CoolTerm and look at the top for the Options Icon

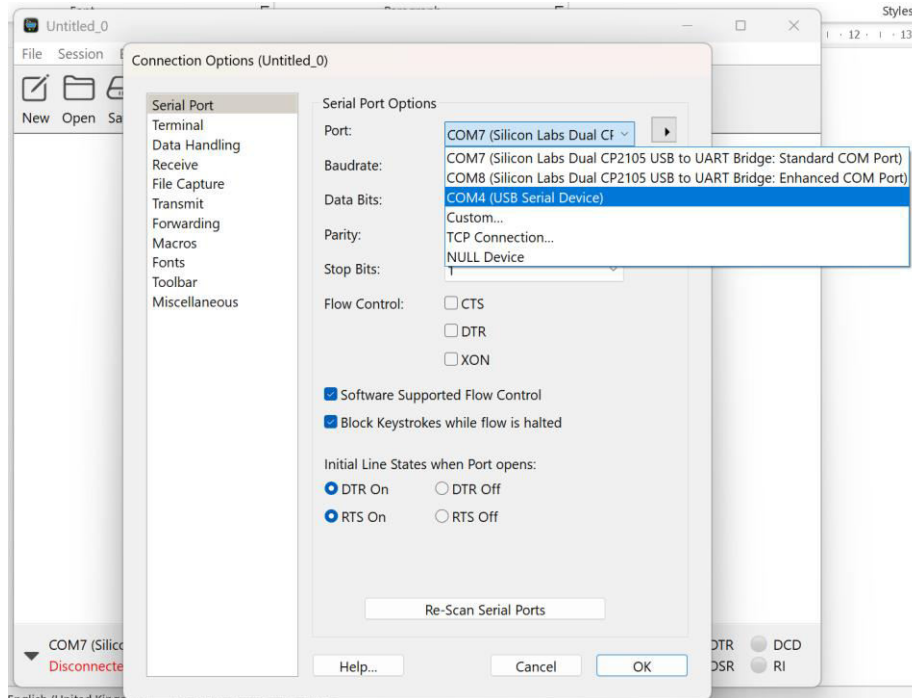


You need to have the KWM connected to the computer still now. Click on the Options icon.

This will give you a pop up.



***Please note, If you can not see the KWM as a comport the most common reason is that you are using a charge cable not a data cable , they look the same and many phone leads are just for charging and do not have the data wires inside. Get a data cable!***



From this pop up select the comport for the KWM, Your comport number will depend on your hardware. If you move your lead to a different USB port then the Comport number may also change. the settings should say.



Serial Port Options

Port: COM4 (USB Serial Device) ▶

Baudrate: 9600 ▼

Data Bits: 8 ▼

Parity: None ▼

Stop Bits: 1 ▼

Flow Control: ☐ CTS ☐ DTR ☐ XON

☒ Software Supported Flow Control

☒ Block Keystrokes while flow is halted

Initial Line States when Port opens:

☒ DTR On ☐ DTR Off

☒ RTS On ☐ RTS Off

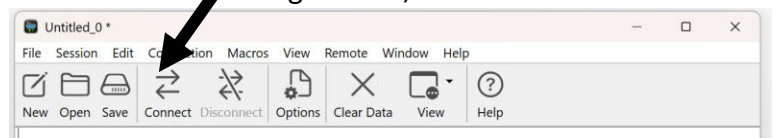
Re-Scan Serial Ports

Help... Cancel OK

Change any setting that differ from these shown here.  
(Except the Com port number you are using)

Then Click OK.

Next click the 'Connect' icon on the top icon bar  
You will see the message below, the first line will



appear right away, the second line 5 secs later if we  
do nothing (that's what I want you to do for now)

Press `BUTTON` within 5 seconds for menu.

`Normal operating mode`

The front of the KWM will have a few things happen,  
since we plugged the KWM in a few minutes ago there is a chance you will have noticed the LED's.

### What does these LED's mean?

The top right LED above the button is a Standby/TX indicator. It will normally be green in standby and Red when sending a WSPR transmission. Since we have been taking our time it possible it will have sent a WSPR message already, so if you have a receive nearby you may hear the output if tuned to the right WSPR frequency, if so that's all fine and nothing to worry about.

There are two other LED's to the left of the button these are the Tone indicators.  
these only normally light during a WSPR transmission, there are two LED so in binary that's 0-3 (WSPR sends 4 tones) so;

Tone 1= '0' '0'

Tone 2= '0' '1'

Tone 3= '1' '0'

Tone 4= '1' '1'

These tones are represented by the two LED's



These LED's are just for information and to let you see that the KWM is sending the 4 different tones that make a valid WSPR message.

Right back to it....

These instructions may seem complicated but once you understand them it takes only seconds to make a change. I have to explain all the options here so it seems much more work than it is in reality.

Unplug the KWM and then plug it back in. You should see a message appear in the terminals window. The two Tone LEDs will light solid. This time Press the button on the KWM. The screen should now show:

---

```
Press BUTTON (within 5s) to enter setup

Interactive menu.

      Kanga Whisper Mite Menu
Q: Set Call/Loc/dBm
D: Restore defaults
V: View corr
C <n>: Set corr
F: View stored freqs and runtime Tfreq

      Suggested WSPR Frequencies
Only Choose a band or bands supported by your build
80m Freq 3.5700-3.5702MHz   Suggested 3.5701 MHz
60m Freq 5.2886-5.2888MHz   Suggested 5.2887 Mhz
40m Freq 7.0400-7.0402MHz   Suggested 7.0401 MHz
30m Freq 10.1401-10.1403MHz Suggested 10.1402 MHz
20m Freq 14.0970-14.0972MHz Suggested 14.0971 MHz

F1 <freq>: Set Band1 freq
F2 <freq>: Set Band2 freq)
B <1|2|DUAL>: Select band
R: Toggle Random Freq on/off
Y: View/set Si5351 crystal frequency (Hz or MHz)
I <minutes>: Set interval in EVEN minutes used with OPTION1
P: Park on/off
X: Exit
Cmd: |
```

The KWM is now in update mode. If you do not interact with the menu for 60 secs it will time out and start normal operations again. If you take too long and it times out just unplug and plug in again and enter the setup menu again.

There are a few things you need to customise your KWM.

To start with a nice clean slate the first time the KWM is powered up we need to perform a default setup load, this uploads the EEPROM with clean default data so we have a fresh starting point, if at any time in the future you make a mess of the settings you can enter 'D' to get back to this Default point again. This just ensures no corrupt data is stored in the eeprom.



The default settings are; callsign A0AAA , locator AA00 and dBm set to 23 (that's the level we recommend for the KWM)

If you don't change these many decoding packages will ignore the transmission as these values are often used as default values by many WSPR kits.

Also we have a default Correction factor of -25000 (more on how to calibrate the si5351 later) and the frequency is set to middle of the 40m WSPR band (7.040100 MHz)

You need to enter your versions of these.

We can set the callsign, Locator, dBm in one go.

The First menu option is :-

```
10000 1000 1000000
Q: Set Call/Loc/dBm
```

Enter all this info in one line.

If I was doing so, my callsign is **M0BMN** and my Locator **IO82** running default power levels of **23dBm**

I would type...

```
Cmd: Q M0BMN IO82 23
Generated Tones for: M0BMN IO82 23
```

You can see you will get some feedback

Congrats you have set the data successfully

Now when you built the KWM you would have had a sticker with the correction factor of the si5351. Now we need that number on the sticker.

All si5351 modules are slightly off frequency as they come. Normally up to a couple of KHz, for some applications that may not be a big problem but for us radio hams this is too much.

I have already tested each si5351 we use and calculated the individual Calibration Factor for these modules. This is the number on the sticker. It may be positive or negative, if negative be sure to put the negative (-) sign with the number when you enter it.

If we look at the menu again we will see that we have two options related to this

'V : View Corr ' this allows you to view the stored calibration factor, the default value is '-2500'

We need to update this with our modules data. The module data for the prototype happens to be -25300. We will use this in our example.



You can check the current value at any time by entering the setup program and typing 'V'  
here's the display of the Default setup.

```
Cmd: V  
correctionFactor = -25000
```

Now we can enter the value for our module

So use the 'C' command and type

```
C -25300
```

This should result in the following display

```
Cmd: C -25300  
correction set: -25300
```

that's the si5351 setup now to be on an accurate frequency. There is an option to determine the calibration factor yourself but that's not needed to get you up and running, we will look at that in the advance options section later.

The next step is to set the operating frequency or frequencies if using as a dual band transmitter.

The choice of frequencies will depend on what LPF setup you have. The software will allow you free entry of any frequency you want but you need to be sure that the LPF is suitable for your choice, the standard kit is suitable for 40 and 60m frequencies, either single band or dual band.

Lets look at the options. Theres a lot here to think about.

```
F: View stored freqs and runtime Tfreq
```

```
      Suggested WSPR Frequencies  
Only Choose a band or bands supported by your build  
80m Freq 3.5700-3.5702MHz   Suggested 3.5701 MHz  
60m Freq 5.2886-5.2888MHz   Suggested 5.2887 Mhz  
40m Freq 7.0400-7.0402MHz   Suggested 7.0401 MHz  
30m Freq 10.1401-10.1403MHz Suggested 10.1402 MHz  
20m Freq 14.0970-14.0972MHz Suggested 14.0971 MHz
```

```
F1 <freq>: Set Band1 freq (free entry)  
F2 <freq>: Set Band2 freq (free entry)  
B <1|2|DUAL>: Select which band to use
```

Ok the first thing we need to do is to check that we have the correct oscillator value selected for the si5351 module (could in fact be a Mi5351 module but all the same really)

The default value for this is 25MHz, it's printed on the top of the little module you fitted but unless you have a special module, with maybe a TXCO fitted, 25MHz is the correct value.

Type and enter 'Y' (or 'y') at the cmd prompt to see current setting

```
Cmd: y  
Stored Si5351 crystal freq: 25000000 Hz  (25.000000 MHz)
```



If you want to change the value for some reason, lets say to a 26MHz module then you would type 'Y 26MHz'

You would get a feedback message

```
Cmd: y 26  
Si5351 crystal freq set to 26000000 Hz (26.000000 MHz)
```

**BUT unless you know some reason why not leave yours set to 25MHz**

Ok so lets set our operating frequency

The standard Whisper Mite when built will be suitable for 40 and/ or 60m

The LPF design will allow either band to be used.

Your choice now, do you want this to work dual band or single band.

Lets assume you want dual band 40 and 60m

WSPR only as a narrow band of frequencies on each band. You need to select a spot in these bands or you will not get and decoded spots on the network.

To keep it simple for now set the frequencies to the centre of each band. The menu shows the ranges for each band and a suggested frequency. We will set the suggest frequency for now

#### Suggested WSPR Frequencies

Only Choose a band or bands supported by your build

80m Freq 3.5700-3.5702MHz Suggested 3.5701 MHz

60m Freq 5.2886-5.2888MHz Suggested 5.2887 Mhz

40m Freq 7.0400-7.0402MHz Suggested 7.0401 MHz

30m Freq 10.1401-10.1403MHz Suggested 10.1402 MHz

20m Freq 14.0970-14.0972MHz Suggested 14.0971 MHz

We will use 5.2887MHz and 7.0401MHz

So use command F1 so type ' F1 5.2887' (this sets Band 1 Freq)

Then 'F2 7.0401' (This sets Band 2 freq)

Now to enable Dual band use we use the 'B' command

Type 'B DUAL'

If you had wanted one band only type 'B 1' for the 60m band freq or 'B 2' for 40m's

For now that's all we need to get us on air. (after we do a time sync!, read on....)



Now we have one feature left, 'R' : Toggle Random Freq

If we use this 'R' feature the transmission frequency will move by a random amount (+/- upto 80Hz)

This feature is a toggle so select it once and you get

```
Cmd: R
Random Freq feature is now ON
```

Select it a second time and you get

```
Cmd: R
Random Freq feature is now OFF
```

I can hear you now!

**Isn't that bad practice, someone else maybe on that new frequency?**

Well it would be better to transmit on a clear unused frequency for sure BUT...

On WSPR mode people transmit on the start of an even minute, that can be 0,2,4,6,8,12,14,16,18,20,22,24,26,28,30 and so on up to the 60<sup>th</sup> min of each hour, some people band hop and may not appear on your band for 30 mins or more, its is just about impossible to be sure of any clear frequency.

If you transmit on the same frequency for each transmission its possible you will be right on top of one person (or more) each time, you really would not know.

I suggest using the random shift option as this way you will not block the same person each transmission (or them you), also worthwhile not setting the transmission to be on a new 10min period that falls on the hour, 10mins, 20mins etc past the hour but maybe 2,4,6, or 8 mins past the hour as less people may be doing that transmission time.

Occasionally you may notice if you look at the WSPR database that on some transmissions you get less spotter than others, this can be the reason, if a higher power station is transmitting at the same interval and the same frequency they may be blocking that particular transmission. Since you only need to be a few Hz away from others this doesn't happen very often.

For now these setting will get us on air.

Now exit the menu (if it hasn't time out!) and we are ready to put the KWM into service.

We need to set the transmission start time first but that's just the push of the button on the front panel at the start of an even minute. But how do we know to the second when an even minute starts?



This very last stage, is a critical one. The way WSPR works is that there is a specific time window for your transmission to be sent in, all over the world this is the same rule and **MUST** be followed or you will not get any decodes.

The whisper transmission must start at the beginning of an **even** minute, be that 2 mins past the hour 4mins, 6mins, 8mins, 10mins etc etc. every transmission from the KWM will be 10 minutes apart (default) so if you start at 2 mins past the hour the next transmission will be 12 mins, the 22 mins and so on.

The time window for an acceptable transmission is a few seconds either side of the start of the even minute. And once started to maintain this accurate timing the KWM uses a very accurate version of a common RTC clock chip, the DS3231SN, this version (SN) has a TXCO built in and is much more accurate than the standard DS3231 chips you will find fitted to most RTC modules from suppliers on eBay and the like (often fake none TXCO chips marked as genuine TXCO versions). Our DS3231SN is genuine and is pre-fitted for you as it's a SMD part on the main PCB.

We need to make sure we set this start time as accurately as we can. Your computers clock can be a couple of seconds off and using that as a reliable time source isn't such a great idea, we need better. A quick way to do this if you have no internet connection is to listen to a BBC station (BBC Radio 4 is the best one for this), you need to be listening on the hour for the 'pips' these pips are very accurate and as the last pip sounds press the button! Don't listen on DAB for this, there is a small delay on DAB radio, listen live to their FM (or LW if still going) station.

One of the better ways is to use a source from the internet, one I use is a web site called 'Time.is', which is one of many such sites but this is a reliable one.



Here is a screen shot of this site

The screenshot shows the TIME.IS website. At the top left is a red bar with 'TIME.IS' in white. To the right are icons for search, user profile, and a menu. Below the bar, the text 'Your time is exact!' is followed by 'The difference from Time.is was -0.011 seconds (±0.033 seconds).' and 'Time in Reading, United Kingdom now:'. The main display shows a large digital clock '18:27:49'. Below the clock is the date 'Thursday, 27 November, 2025, week 48' and 'Thanksgiving (US)'. At the bottom, it says 'Sun: ↑ 07:40 ↓ 16:04 (8h 24m) - More info - Make Reading time default - Add to favorite locations'.

This is a very accurate clock and I use it with my KWM. Here in this screen shot you can see my PC clock is bang on!

I use the websites clock to set the KWM. To do this have the KWM powered up and ready to go, it must be in standby mode with just the green LED on.

Watch the time and as it gets to the start of the new even minute press the sync button on the KWM, the KWM will start flashing both tone LEDS at a fast rate for 3 seconds . this is an indication that it has set the clock module. After this the KWM own internal Clock will maintain the timing, the first transmission will start on the next fresh time slot . From time to time you may find some time drift but you should be able to go weeks before you need to reset the time sync. (unless you push the sync button by mistake)

The 'time.is' web site can be used from a mobile smartphone so you do not need to bring the KWM into the shack to re-sync it at any time. Once synced do not press the button again as it will assume it's the start of a new minute and will re-set the time clock. The internal clock is backed up by a small 3V button cell. These cells are just common CR1220 type and very easy to get should you ever find the time keeping is being lost.

#### Advanced setup options

We can just leave the KWM set like this and not change anything else again ever!

But what about the 2 position options switch? Lets take a look.



## Options

The KWM has a couple of other features, the KWM does not to be connected to the computer for these options but if it is **Do not have the USB power lead plugged in the rear socket.**

Inside the KWM you will see a two position DIP switch this for Option 1 and Option2

### Option 1

With the switch 1 down (OFF) the KWM transmits once ever 10mins, so if using single mode 40m or 60m you will see reports each 10 min slot, if using Dual Mode 40m & 60m although the transmission is ever 10 mins you will only see slots on each band 20 mins apart. If you wish you can slide OPTION 1 switch to the ON position and the time between slots will be reduced, the KWM will transmit on the intervals set by the user in the 'I' option of the menu

```
Cmd: I
Stored interval (when OPTION1 active): 4 minutes
```

Typing 'I' with out a number will just show the current option time interval if you want to change it say to 6 mins apart type 'I 6'

```
Cmd: I 6
Interval set to 6 minutes (used when OPTION1 is active)
```

An advantage that has been found with this is since the Si5351 is being used more frequently and so not going cold between transmissions the drift factor is also reduced, give it a try if you feel that the reports are showing higher drift values than you would like. This is an option I recommend and use myself. ( Use 'I 4', 4 minute slots)

### Option 2

This is for those of you that want to re-calibrate the Si5351, I use this feature to test the modules on a test rig I have setup for this kit. You can recheck and adjust the calibration factor yourself if you wish or if you changed the si5351 module for some reason as each module needs its own calibration factor.

With this set to 'ON' (switch up) the KWM will transmit (weakly) a 10MHz signal, the correction factor of the attached module will be zero at this point so you can see how far off the module is.

The two Tone LEDS will flash alternatively while in this mode.

You will need an accurate way to measure the frequency to do this or you can do it using your modern blackbox transceiver with maybe a very small error. Like many hams I have a few blackbox rigs here and for this test I use my Yaesu FTDX . Having tested the radio with an accurate calibrated 10MHz generator I have found it to be within a Hz or so of correct, more than enough for our needs, I would expect most modern radios will be as good.

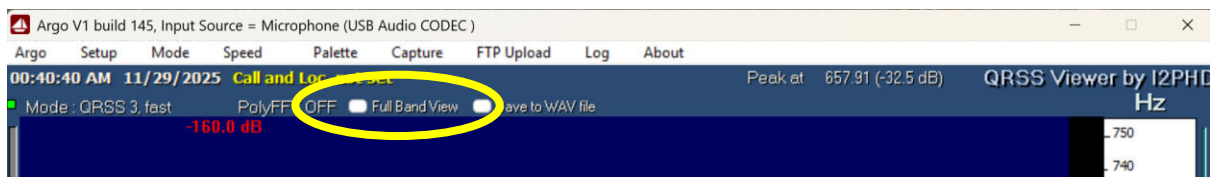


I use a free piece of software to help with this, Argo, it's normally used for looking at QRSS signals that only have shifts of 4-5hz typically so it's easy to see any frequency errors of a couple of Hz from our module.

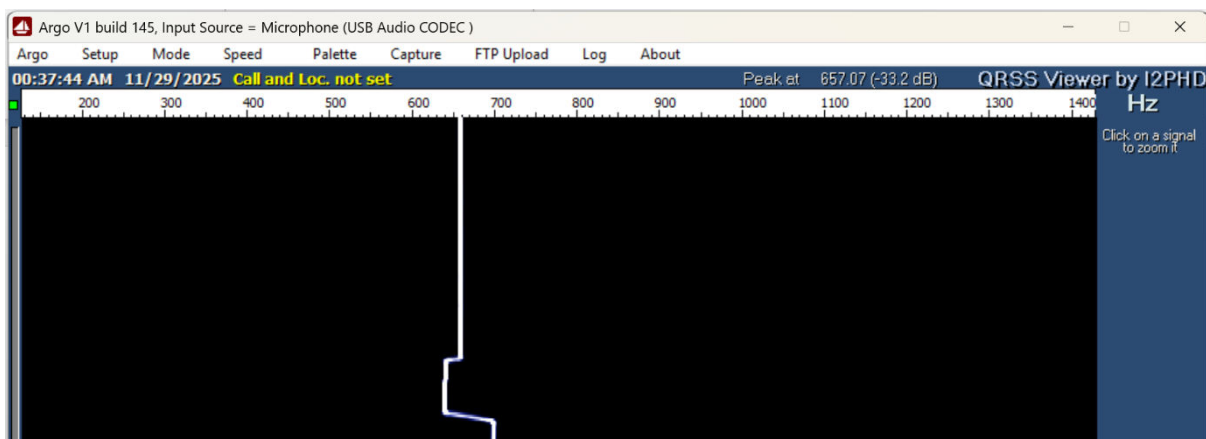
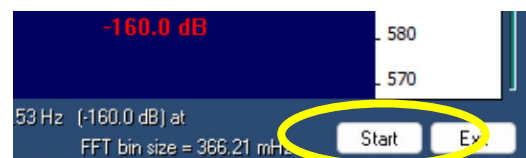
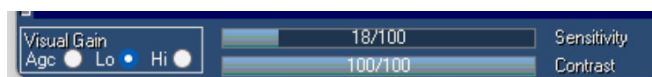
A download link for this software is on the KWM web page.

### **My easy way to calibrate a Si5351 module.**

Switch the OPTION 2 switch on (switch up) the two tone LED's will start to flash, place the top back on the KWM (no need to screw it back on yet) now on a nearby receive you should be able to hear the tone transmitted, put the radio into CW mode. Tune to 10mhz, it could be anything up to a couple of KHz either side before you find the tone (Often around +/- 500Hz). You need to be in CW mode for this and you need to know what offset you have on the radio. I have my radio set for a 700Hz offset for CW tone, tune the radio so that the pitch of the KWM signal is as close to 700Hz as you can, for quick calibration you will get away with this If you have a very good ear. It's not accurate but a quick and dirty way. Better way is to run the Argo software and if possible have the audio output of the radio connected to the computer, the way you would for any digimode you may run. (at a push you can use the microphone as an input source) Start Argo and select Band view. You need to press start on the bottom right of the Argo screen (caught me out a few times as that one)



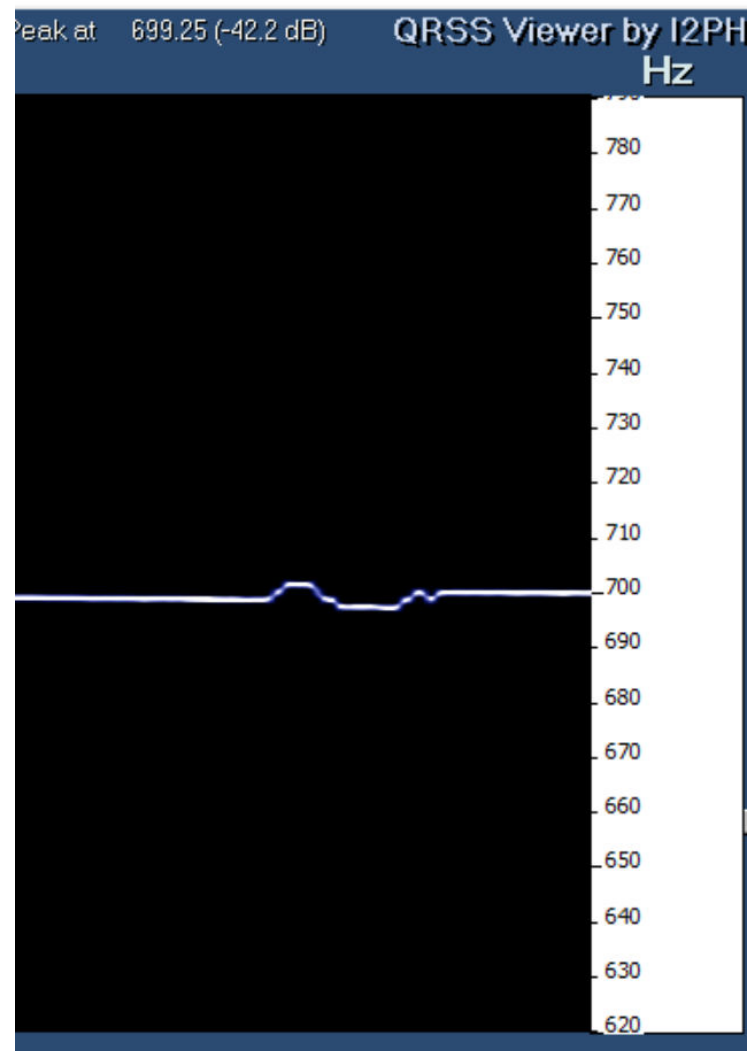
After selecting Full band view, click START.  
you may have to change the sensitivity slider to see the trace.





After a few seconds you will see the trace from the calibration signal on the screen click on it and it will change the screen to show the tone running from right to left on the Argo display, you will see the frequency scale on the right, adjust the radio tuning to get the signal aligned with the 700Hz mark (assuming your CW offset was 700Hz)

Leave the KWM running for about 5-10 mins to really warm up and then recheck the frequency of the signal, adjust the radios tuning again to get as close as you can to the 700Hz mark. You may be limited by the step size of you radio, read your radios manual and see If you can set it to 1Hz steps for CW mode.



Let's assume when you have got the signal aligned with 700Hz mark the actual radios frequency display says 9.999761MHz not the expected 10MHz. This is why we need to perform the calibration. Just for the info of anyone interested. When switched to calibrate mode the KWM temporary sets the calibration factor to zero so you can see the frequency error of your module correctly.

Now find the difference between 10MHZ and the display frequency in Hz and record that.

Eg wanted freq = 10.000000MHz display reads 9.999761MHz

Subtract the display frequency from 10MHz and we get 239Hz ,

We need to correct the module by this amount, since it below 10Mhz in our example it a negative correction so that's -239, the si5351 expects the correction fact to be accurate to 1/10<sup>th</sup> of a Hz so we need to add two extra '0's to this value, the correction factor we need to use then is **-23900**



If you have access to a high precision frequency counter you can use that to check the output in calibrate mode and compare that in the same way to the wanted 10Mhz frequency for its offset.

Use the setup menu again to enter this new value (option 'C' in the menu).

Enter C -23900 in the setup menu

```
Cmd: c -23900  
correction set: -23900
```

One last point for you to note is that all these settings can be cleared and the KWM set back to its shipping default at any time with the 'D' command from the setup menu.

That will set the frequencies back to defaults, callsign to A0AAA, locator to AA00, and power level to 23dBm, and the correction factor back to -2500.

That's a clean start position if you get in a mess!

Once you have setup the KWM you may find you never need to change anything in the Serial Interface.

If you have any problems I am only an email away.



## Quick Start Setting Guide

From the user Serial Interface screen

On a new Built Whisper Mite

Select 'D' to ensure all Default are set correctly.

Select 'Q' to enter your details, e.g. M0BMN IO82 23

Select 'C' to enter correction Factor from sticker on si5351 e.g. C -23900

Select 'F1' and then 'F2' to enter the frequencies you want to use.

Select 'B' to set band mode either 'B 1' or 'B 2' or 'B DUAL'

Leave 'R' for now

Select 'X' to exit menu

Now wait till start of even minute and press the front panel button.

Option Dips Switches , set '1' to ON, '2' to OFF (down) This is the default setting (4m intervals)

For full details of all settings refer to the instructions above.

You just need a suitable 5V supply and an antenna.