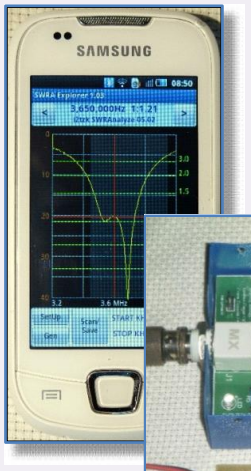
THE FOX DELTA ANTENNA ANALYZER FD-AAZ-0912

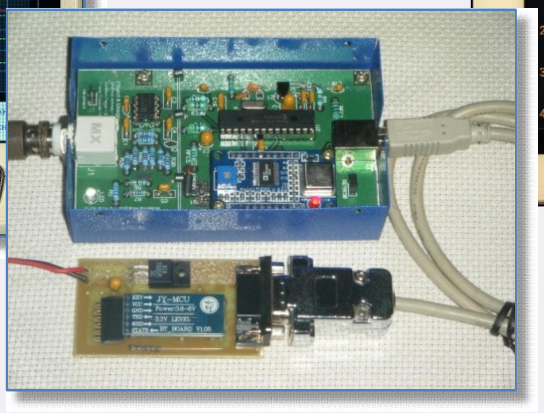
(HF 1-30 MHZ SWR-ANALYSER)

ANDROID OPERATION

Samsung Galaxy Mini i5800



GT-P3110 8GB, Wi-Fi, 7in



Fox Delta SWRA & BT adapter

1. Project Description -

Following the successful development of the Windows OS Based Fox-Delta SWR Analyzer (SWRA), a suggestion was made to see if it could be made to work with an ANDROID device like a smart phone or tablet by connecting it to a Bluetooth adapter with an auxiliary power supply. This proved to be relatively easily from a hardware point of view and Tony I2TZK quickly developed a new APP to do this.

" My special thanks go to Mario, G8ODE and Tom, WA4TA for the time they dedicated helping me to test and improve this piece of software, as well as to Dinesh, VU2FD for the kit's design allowing our fellow radio hams to easily assemble this analyzer.

Tony, I2TZK "

H/W Requirements

- Modified SWRA unit as per paragraph 2, with f/w v5.02.
- A Commercially made BlueTooth (BT) adapter.(see later text)
- A cable to connect SWRA to the Bluetooth adapter and 9-12V 250mA power supply.
- A portable terminal (smart phone or tablet) runningthe latest version of Android SWRA software.

S/W Requirement

- SWRA firmware for the SWRA 18F2550 pic v 5.02 or later
- SWRA Analyzer.exe Windows software v 5.03 or later
- SWRA.apk application for Android devices v1.03 or later.

N.B. A Windows OS XP -7 PC is required to Initially calibrate the SWRA before it can be used with Android devices

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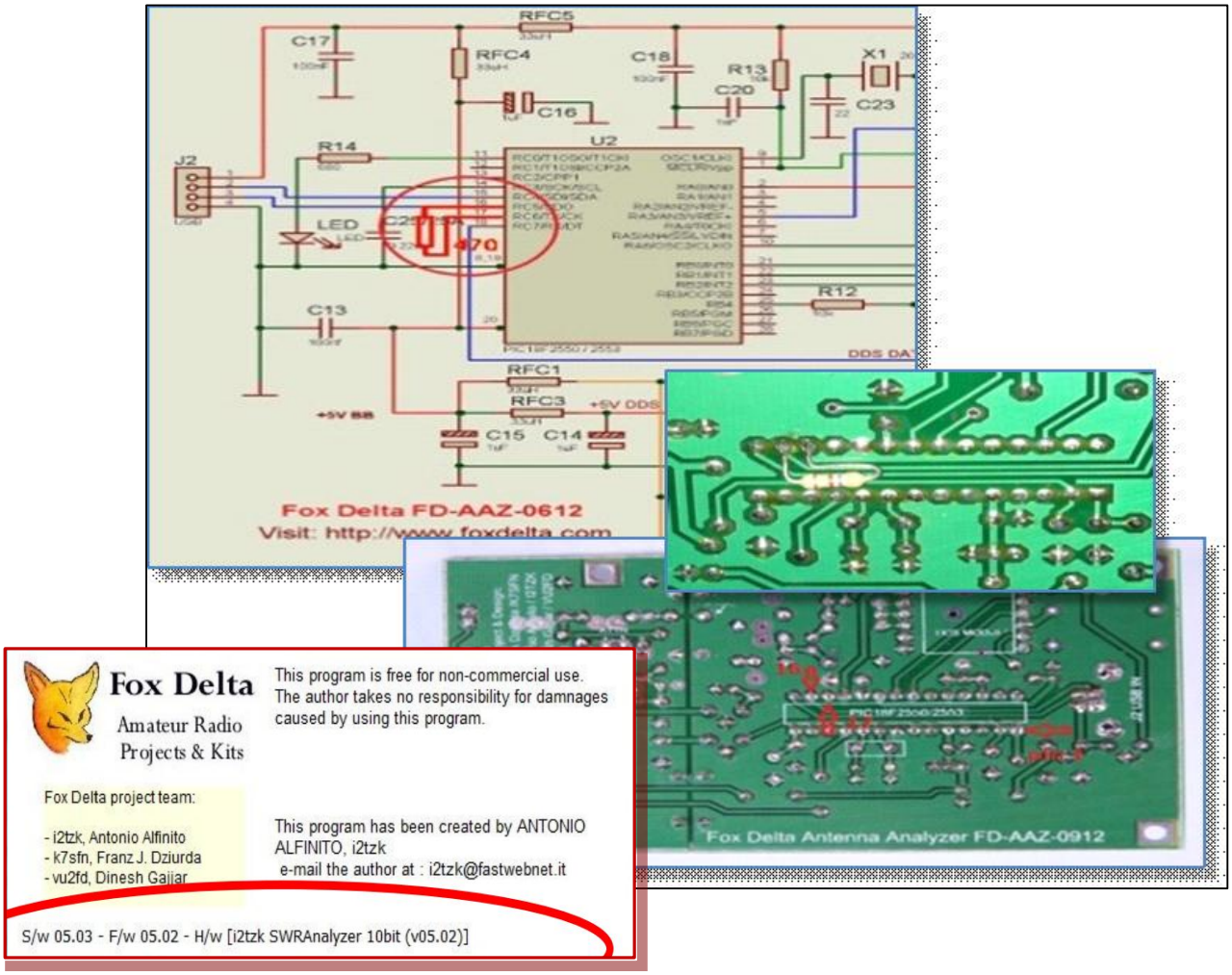
1.1 SWR Analyzer Board Modification.

- This mod is applies to all Fox Delta kits prior to re the latest version **labeled AAZ-0713** includes this modification resistor. Reinsert the Pic processor after soldering.
- **You should remove the Pic processor before carrying out this mod** to protect it from static. The modification to the SWRA board is to add a 470 ohm 0.25W resistor between pins 16 & 17 of the Pic 18F2550 .

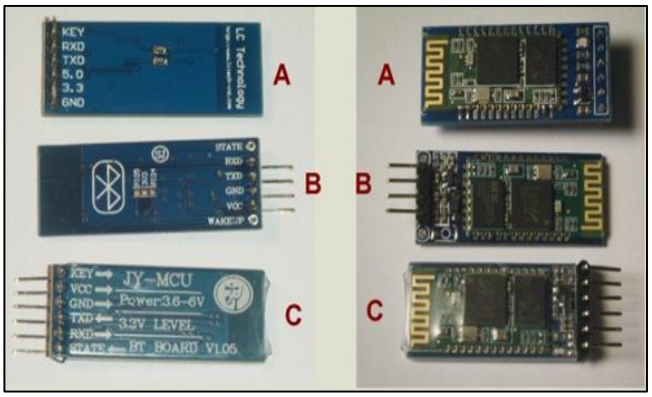
- Update the 18F2550 Pic f/w to v5.02 or later
- Update also the Windows program to v5.03 or later.
- Please refer to I2TZK website for "SWRA USB Update" documentation for detailed instructions.
- After updating the f/w, connect the SWRA board to the PC using a USB-Printer cable



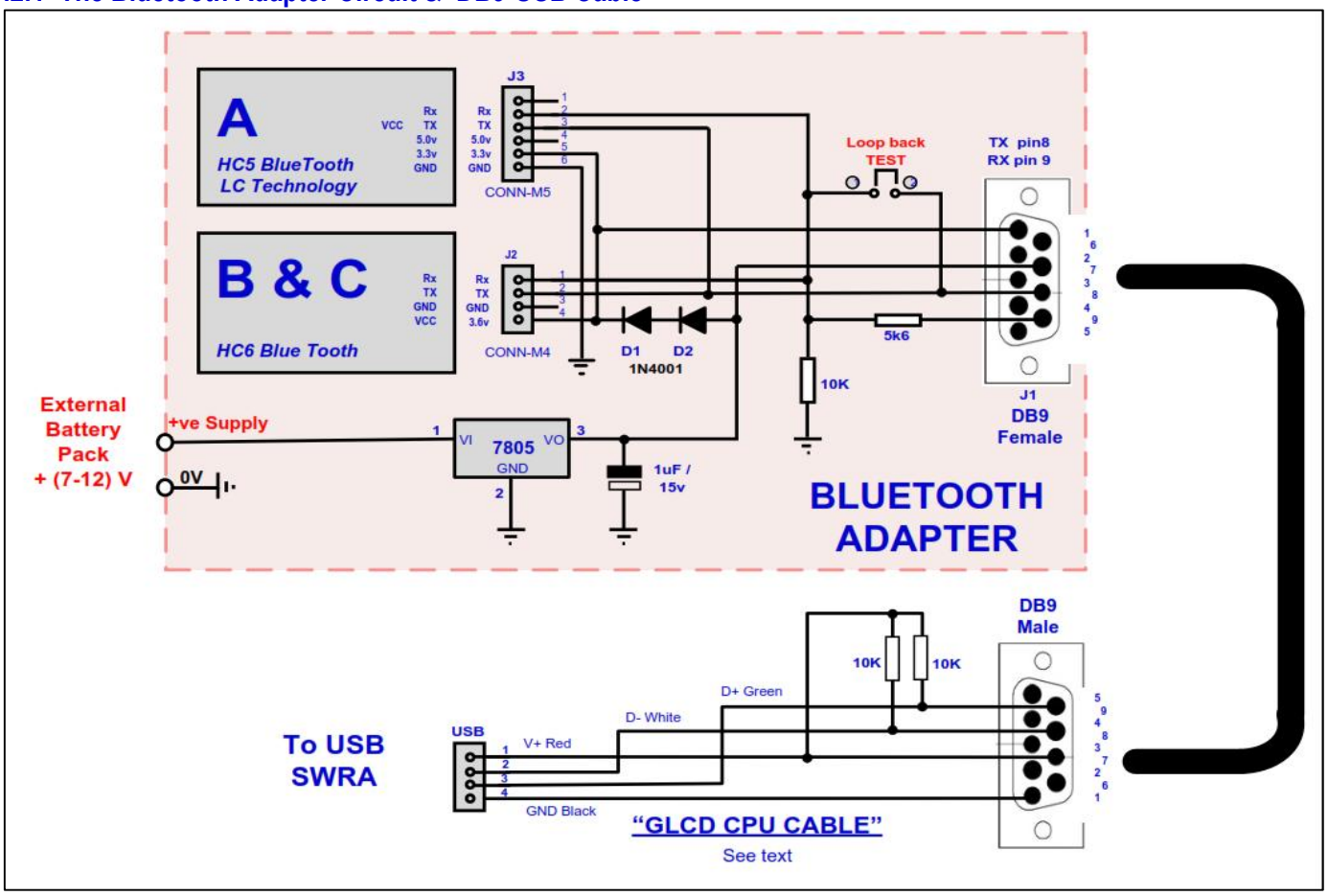
- Verify that the correct PC f/w version is installed
- **You must CALIBRATE** the SWRA board by following the on-screen prompts. *This must be done on the PC before the Android device can use the SWRA for scanning*

1.2 Bluetooth Adapter

- The Blue Tooth (BT) Adapter uses Ready madel modules available on **Amazon™ & EBay™** as shown below.



1.2.1 The Bluetooth Adapter Circuit & DB9-USB Cable



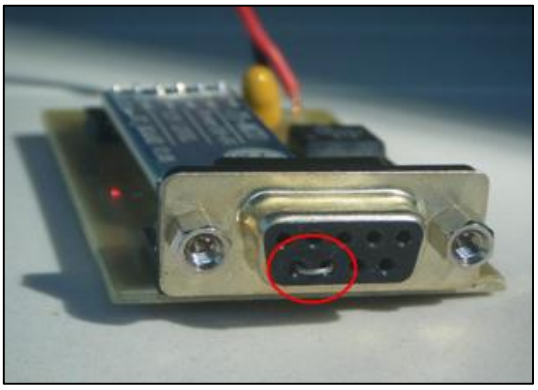
Schematic above caters for all three different manufacturer's versions of the BT module. The prototype unit has a DB9 connector so that the USB-DB9 cable for the Graphic CPU to a PC could be used (see Fox Delta web site). However any other 4 pin connectors can be used. A simpler version can be built using strip board with connections soldered directly onto the modules pins.

FOX DELTA's Dinesh - VU2FD , has produced an improved PCB KIT available from www.foxdelta.com website

1.3 Testing the BT Adapter

A “loop-back” test verifies that the Bluetooth module is working correctly. The test requires a laptop or a desktop with a BT or using a USB BT adapter, or Smart phone or tablet using terminal emulation software. The loop connects the BT Adapter **transmit** pin 8 to its **receive** pin 9, so that the terminal software sees an echo of every character that is sent.

The photo on the right shows the loop on the DB9 connector.



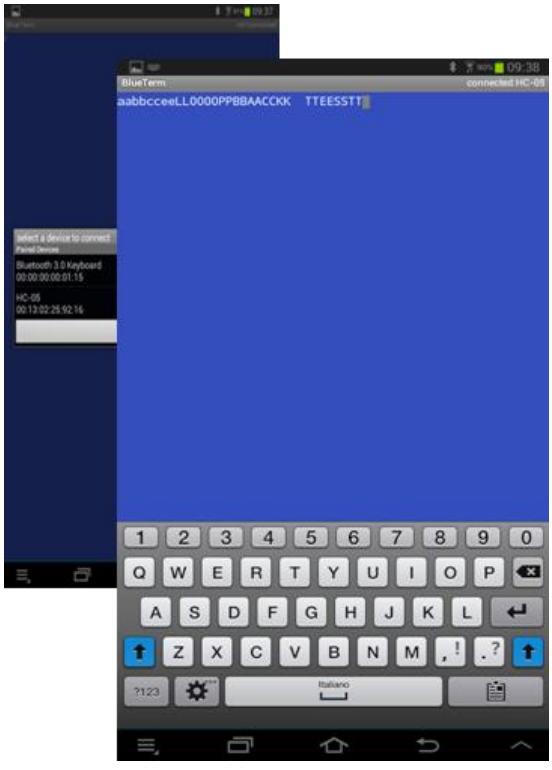
1.4 Pairing the BT Adapter

- Connect and ***pair*** the BT Adapter to your PC/Smartphone using the 4-digit code specific for the BT module version. The most common code is ***1234*** for pairing code and “HC-05 & 06 modules. However, refer to datasheet of the module that is used.

1.5 Testing with a Desktop / Laptop

- Run a terminal program and connect the “virtual port” created by the BT pairing process. WinXP users can run Hyper Terminal, Win7 users can choose any one of the many dumb terminal programs available from the web.
- Parameters to initialize the COM port are: **9.600 Baud, 8 bits, no parity, 1 Stop Bit (9600-8N1)**

- When the BT Device connects, ***verify that all the characters you key on the terminal program are echoed back by the BT Adapter*** .e.g. AABBCC DD etc each keyed letter appears twice



1.5.2 Testing with a Smartphone / Tablet

- Run any “Bluetooth terminal” application. Google Play, Amazon Store and similar websites offer several free “ Bluetooth Terminal Emulator” APP

- A good choice is “Bluetooth Terminal” it’s simple and easy to install and use.

- Connect the BT Adapter and verify that all the characters you enter from the terminal keyboard are transmitted and echoed back on the Android device’s screen.

- On the terminal screen all characters are shown twice i.e. echoed.

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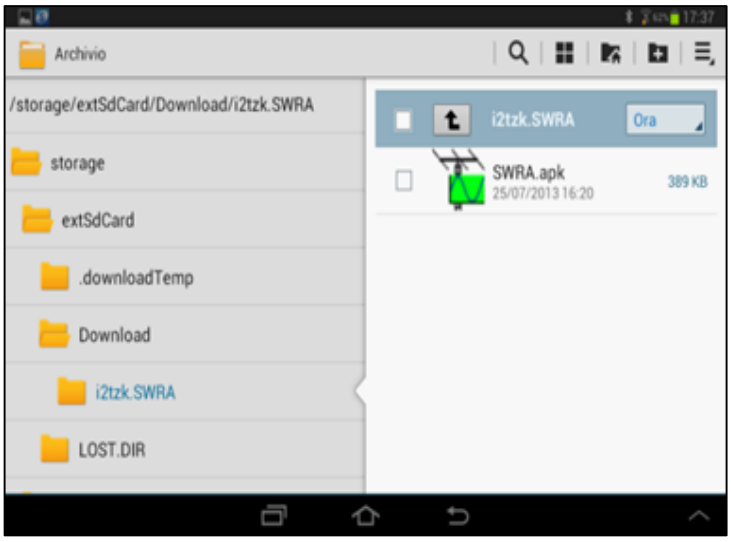
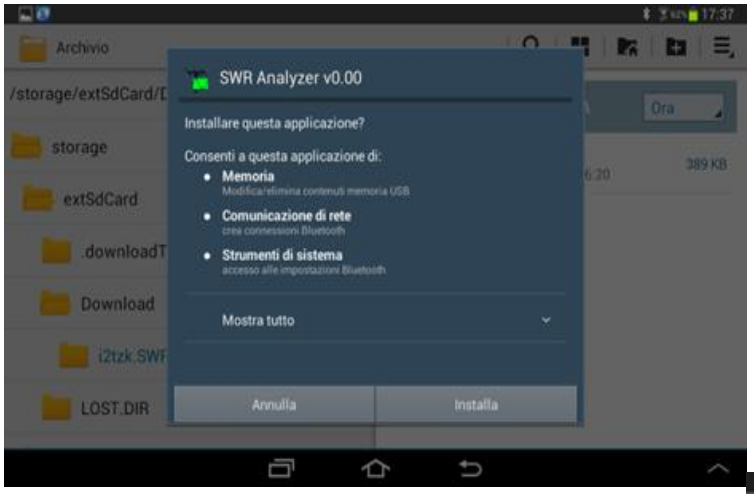


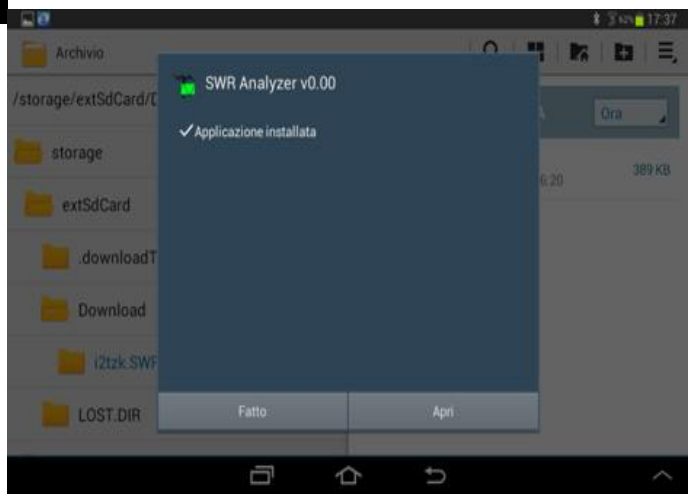
2. Installing the SWRA Android Application

- Copy the file “SWRA.apk” to the SD Memory card of your portable terminal
- Or download it from the Fox Delta server, or from www.I2TZK.com **….\Download\i2tzk.SWRA** and copy the application into the folder.

- Navigate to the folder where the application has been copied to and install it by clicking on the SWRA.apk icon. Android security settings may need changing to install the APP from an unknown source. However, for good security practice, remember to reset the permissions to block programs from unknown sources again



- “SWRA.apk” asks If the data can be stored in memory from unknown sources



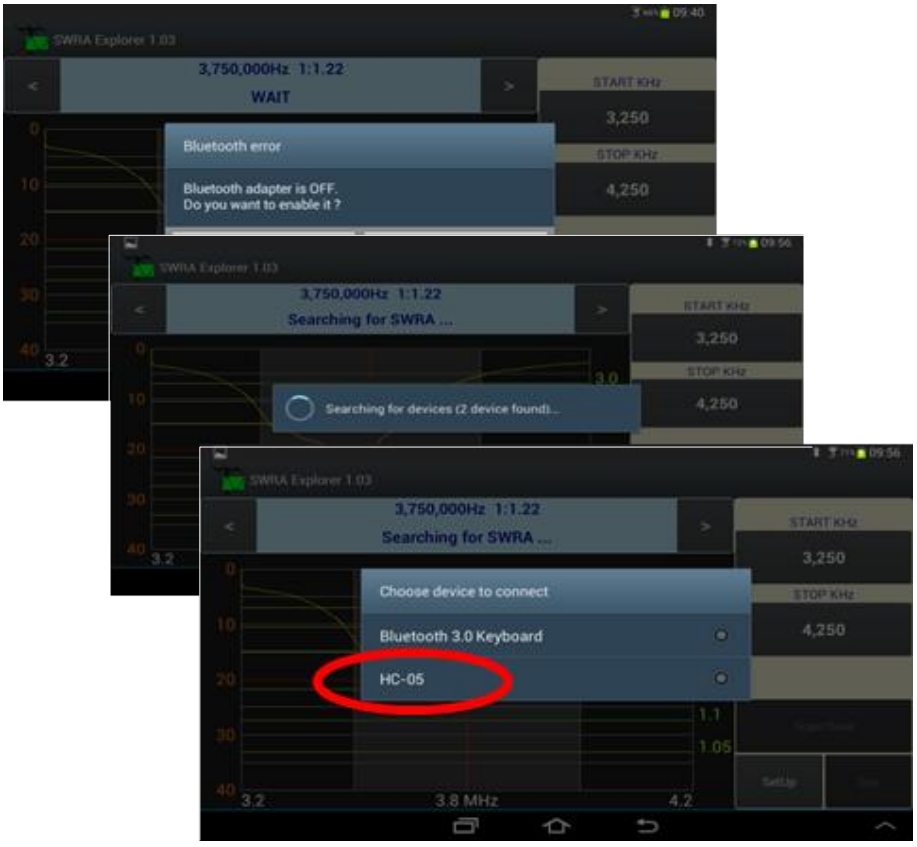
- Installation successfully executed.

2.1 SWRA for Android

- Before running "SWRA.apk" remember to pair the Smart Phone or tablet with the BT Adapter If this is the first time you're using SWRA, or it has been previously unpaired/removed, run the Bluetooth discovery service from the Setting/Configuration menu of your terminal, identify your BT Adapter and enter the pairing code (PIN).

- The most common pairing code is "**1234"** that's used by the "**HC-05 & HC-06**" modules.
- However, this may vary with different manufacturers. So pleased refer to their data sheet.

Touch the icon  to run SWR Analyzer. The first time the App runs you need to choose which device it has to connect to. In the screenshot below this is the HC-06 device.



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The following screenshots show the BlueTooth pairing sequence:

Graphics by G8ODE Sept 2013 iss 1.1A

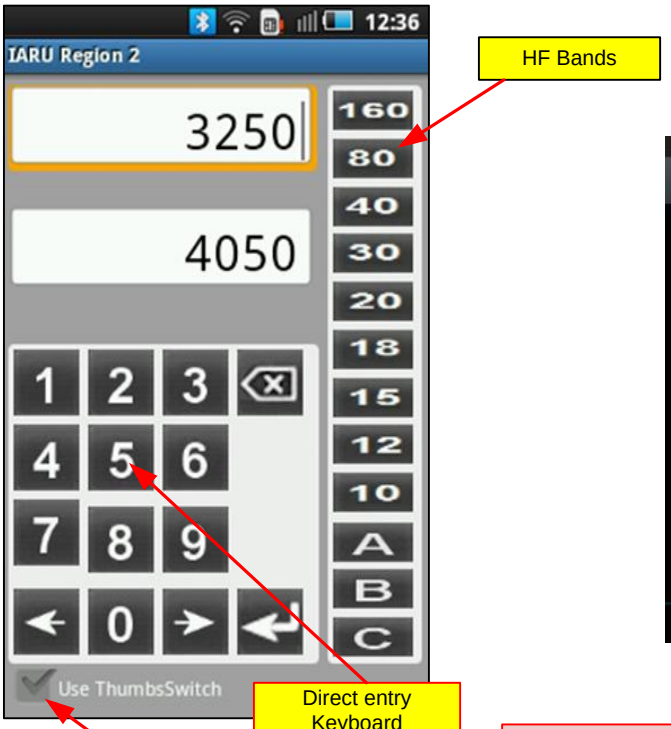
3. Launching the APP.

- BY default the last saved analysis is shown when the APP is launched. If this is the first time that the APP is launched or if an analysis has never been saved, then the default graph of the ***"I2TZK 80m scan"*** is displayed. In "SetUp" there is an option to "Restore last graphic" .
- Set Up also offers two Frequency limit entry modes.

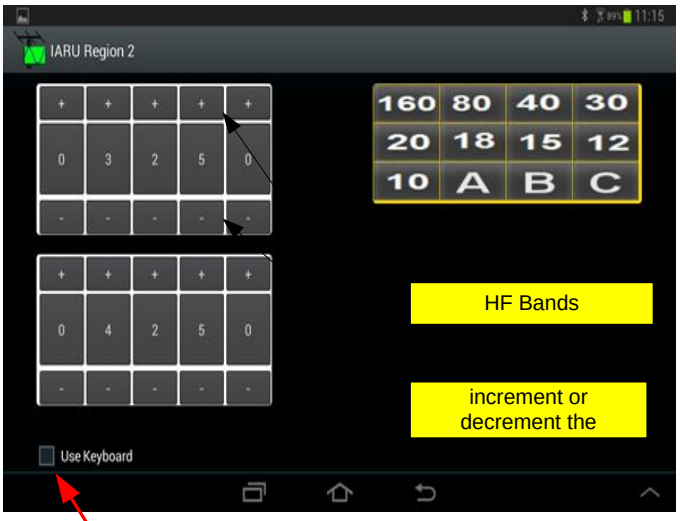
3.1 Running the antenna analysis

- Selecting the Frequency setting or HF Bands to be scanned.

DIRECT ENTRY



THUMB WHEEL SELECTION

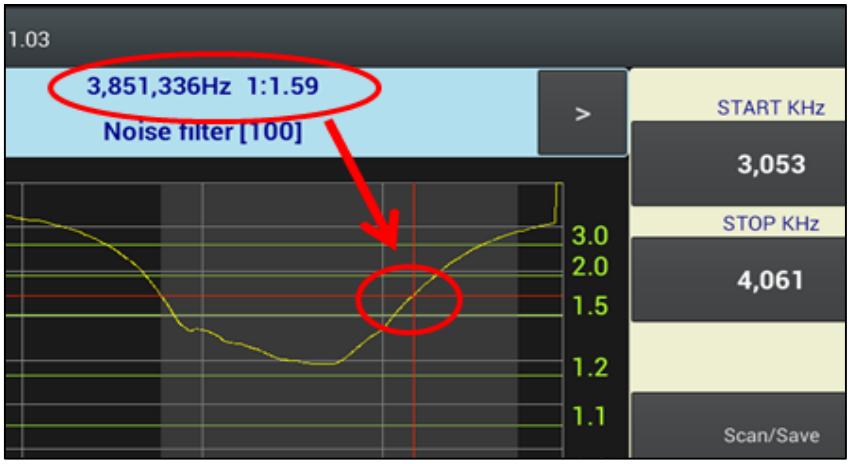


Each frequency entry screen has a check box to revert to the other frequency input screen.

- First erasing the two frequencies using the "X" button, then enter the "START" & "STOP" frequencies in kHz by touching the digits on the keyboard.
- or by selecting the band button on the right of the screen.

- The Frequencies are changed using the "thumb buttons" above & below each digit.
- Touch **"+"** to increment or , **"-"** to decrement each digit value.
- To clear any digit to zero simply touch the digit..

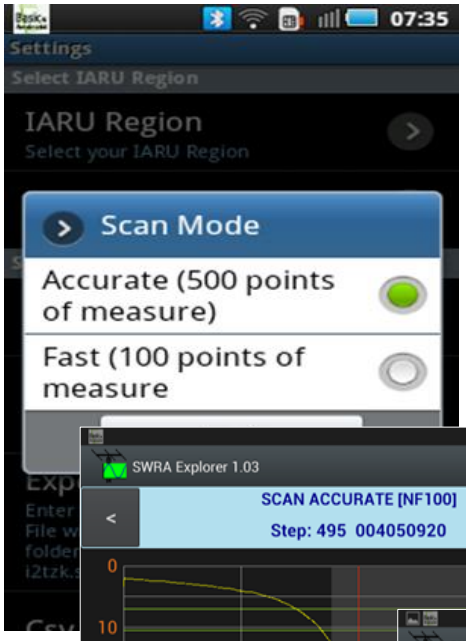
4. ACCURACY OF THE SWRA SCANS



The two red cursors indicate the frequency as **3,851,336 Hz** and the corresponding value for the SWR as 1:1.59 .

5.1 MEASURING CURSOR OPERATION

- Move the measuring cursors (red vertical and horizontal lines) by touching the screen to where you want to read the scan trace value. For fine precise movements of the cursors, use the two chevrons (< and >) either side of the banner. This moves the cursors by 1 scan step enabling you to determine the precise value of a particular point on the trace
- The application operates with a 1 Hz frequency resolution enabling the red line measuring cursor to display the precise value of any point on the scan's trace in the banner area.



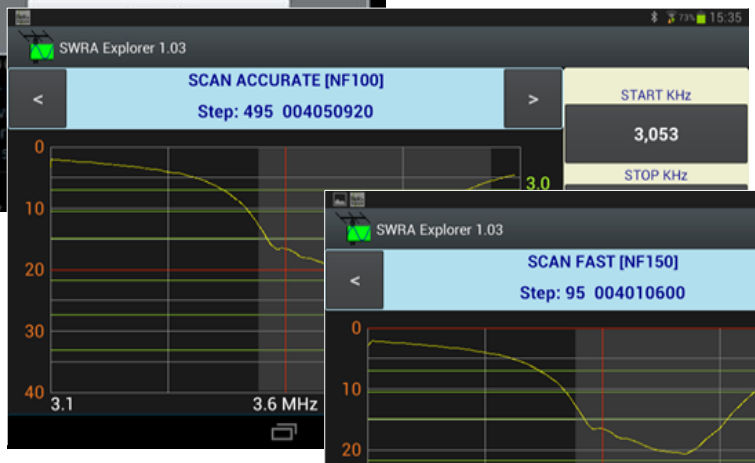
5.2 SCANNING MODES

In the "SetUp" menu there are two scanning options available;

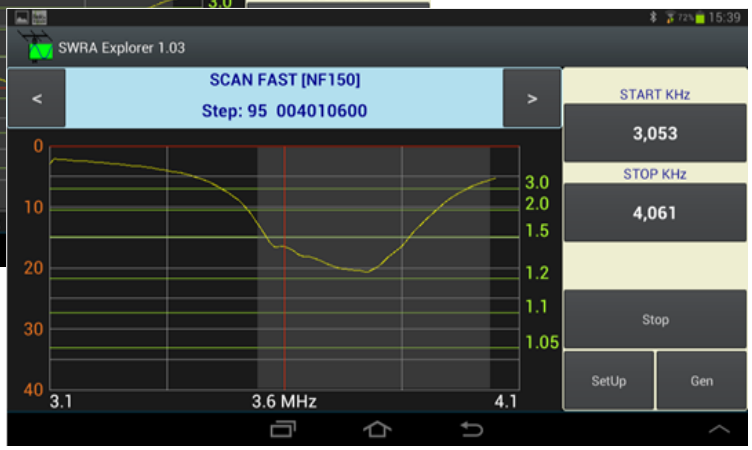
*i). **ACCURATE** : the scanning cycle Carries out 500 measurements.*

*ii). **FAST**: the scanning cycle is limited to 100 measurements.*

***N.B.** For changes to "Scan Mode" the application must restart to take effect.*



"ACCURATE"



"FAST"

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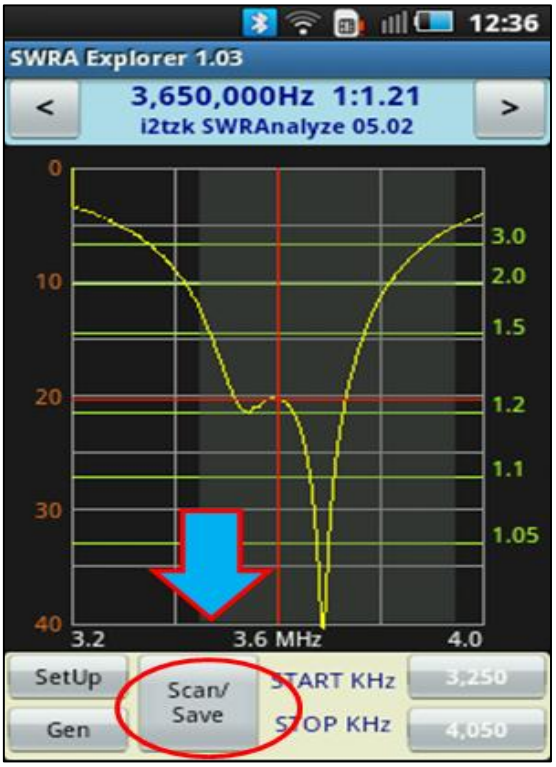
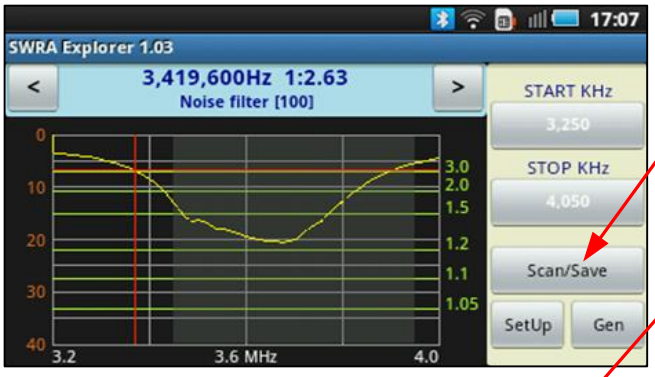
6. NOISE FILTER SETTINGS

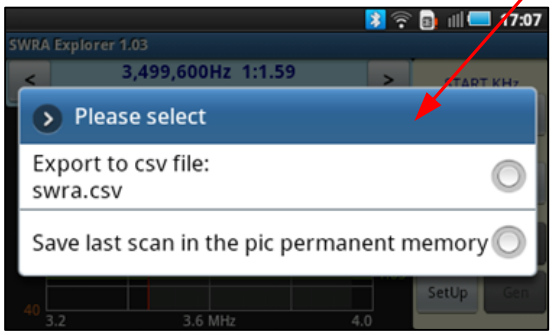
- The Noise Filter works by averaging consecutive scans, so this action will slow down the scanning process. Use it only if you are experiencing local noise pickup or receiving strong broadcasts.
- The Noise Filter characteristics is defined in Set-up. The default value is 100, the max filter setting is 255 and is disabled with 5.

7. STARTING & STOPPING A SCAN

- Activate the scan by touching the "scan" button momentarily.
- Once the scan starts, the frequency scale is updated to any new values.
- The Stop" appears once a scan starts.
- Touch this button to stop it.







8. Saving the scan data

Touch and hold the dual purpose "Scan" button to select mode and Save Data.

- The data can be saved in two ways

I). Saving the last scan's date into the SWRA board's PIC permanent memory

II). Exporting the scan data CSV (comma separated values) file into the SD memory card of your portable terminal

9. Importing Data with the PC program v5.03

The program enables the scan data to be imported in Two ways for a further analysis:

- Import from the SWRA Board permanent PIC memory
- Import a saved CSV file (Android exported to PC)

When the APP starts it automatically imports the last saved CSV file if the option "ACCURATE" scan is selected.

Graphics by G8ODE Sept 2013 iss 1.1A

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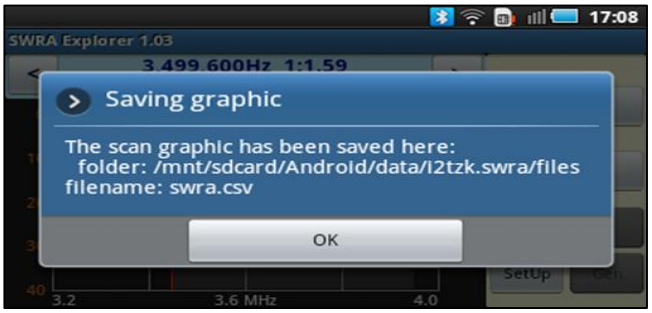
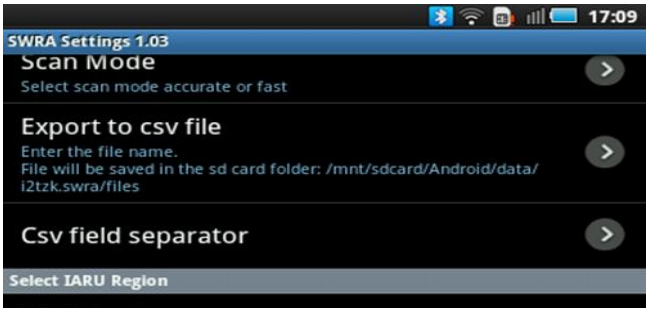
10. Exporting a CSV file

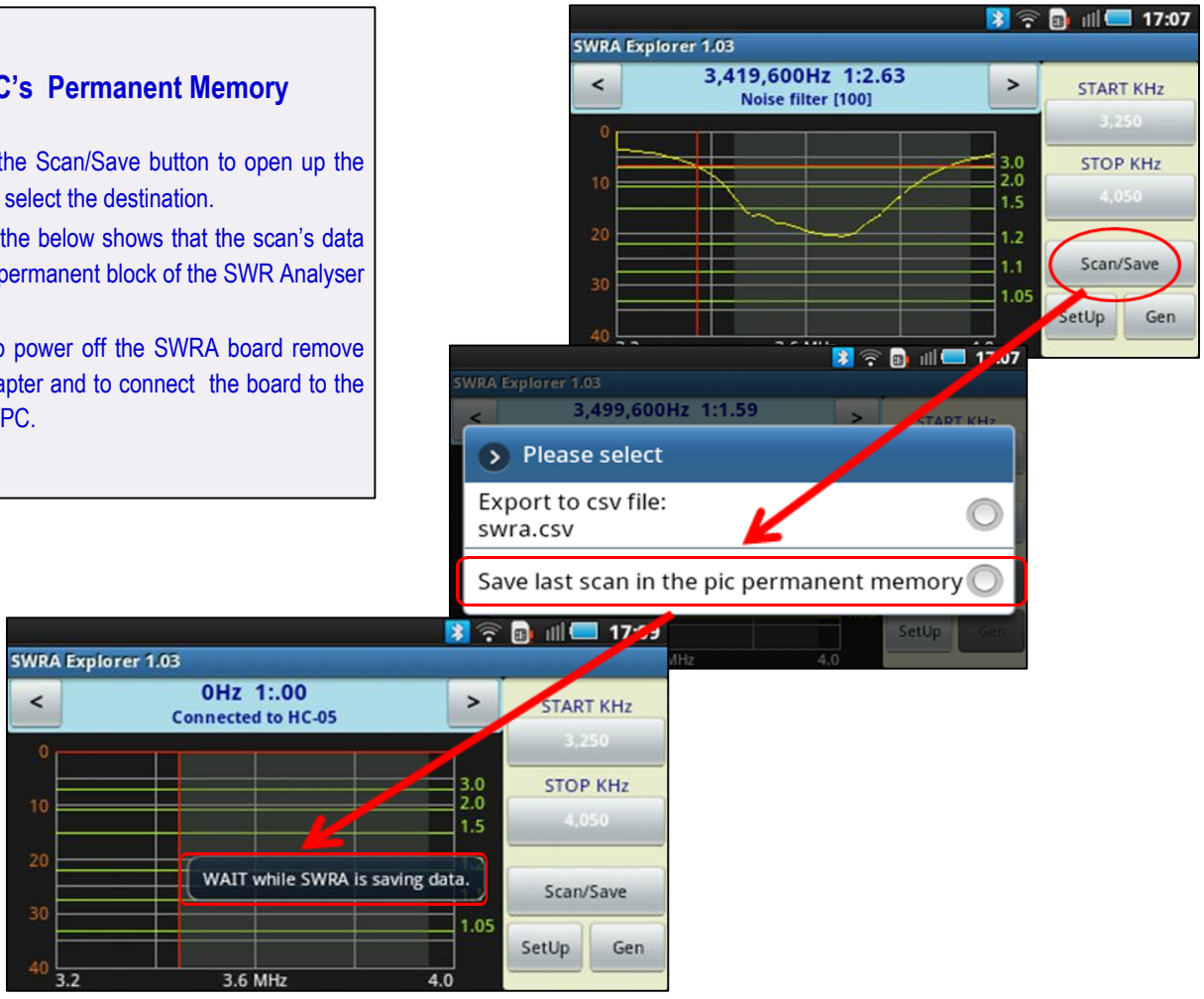
- *Only "ACCURATE" scan's data can be saved as a CSV file.*
- **Touch and hold** the dual purpose "Scan" button to activate the save/export function.
- Then select: "Export to CSV file".
- The Filename and the CSV file fields separator can be edited in "SetUp" as shown on the right.





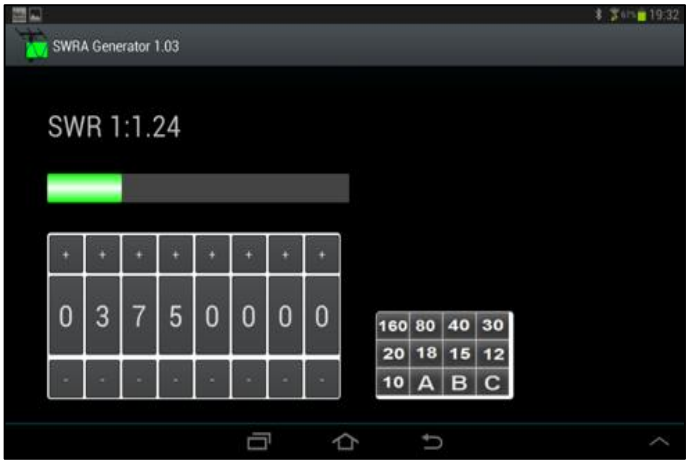
11. Saving to PIC's Permanent Memory

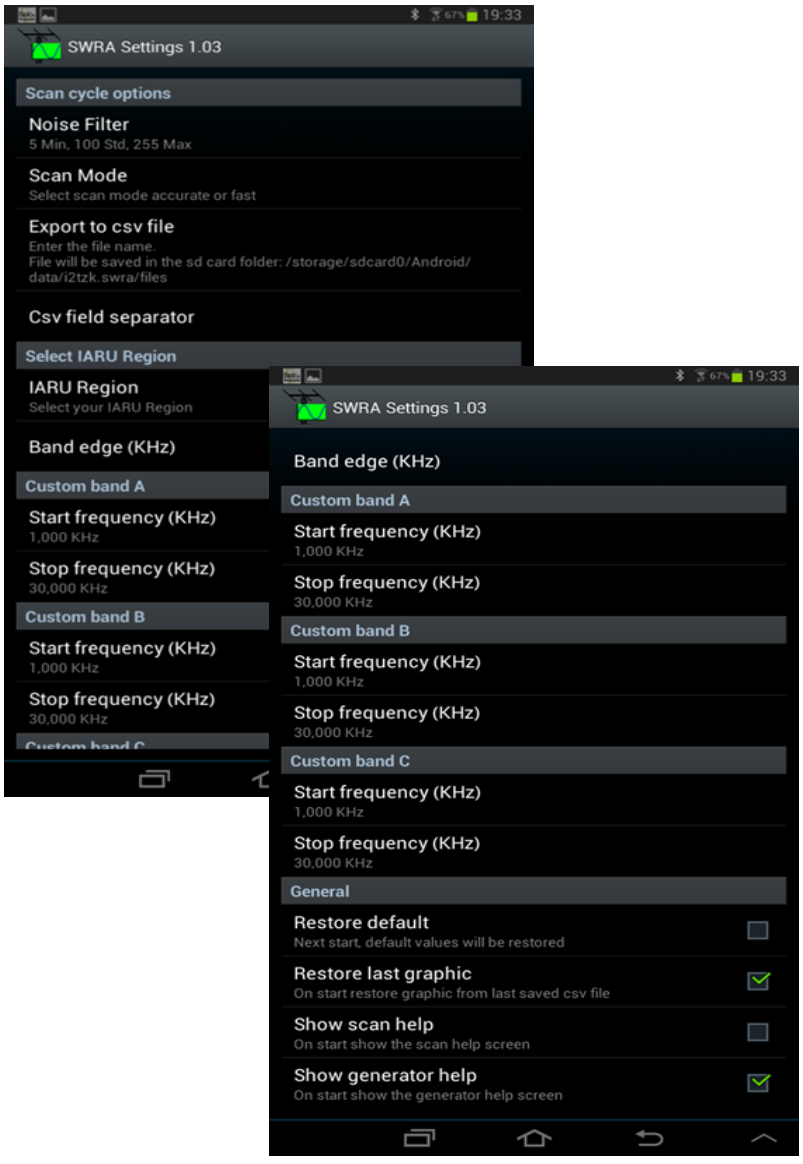
- Touch and hold the Scan/Save button to open up the Export window to select the destination.
- The example on the below shows that the scan's data is saved into the permanent block of the SWR Analyser PIC memory.
- It is Now safe to power off the SWRA board remove the Bluetooth adapter and to connect the board to the USB port of your PC.



12. The Generator utility

- Use the thumb button switches above each digit to select the output frequency.
- Touch "+" to increase, "-" to decrease the frequency and touch a single digit to clear it.
- The small band panel to the right is used to set the generator frequency to mid-band of the selected band button or user defined button A, B or C.
- This feature is use for tune antennas or filter to a specific frequency





13. Parameters setting

- If the "**Scan Mode**" is changed, the new mode only takes effect after the APP is restarted.
- "**Restore default**" reset all values to their default settings and only takes effect after the APP is restarted.

14. Analyzing the scan results on PC

- The PC program ***SWR Analyzer.exe v5.03*** provides two new functions that enable the scan data to be imported by the program for a detailed analysis:

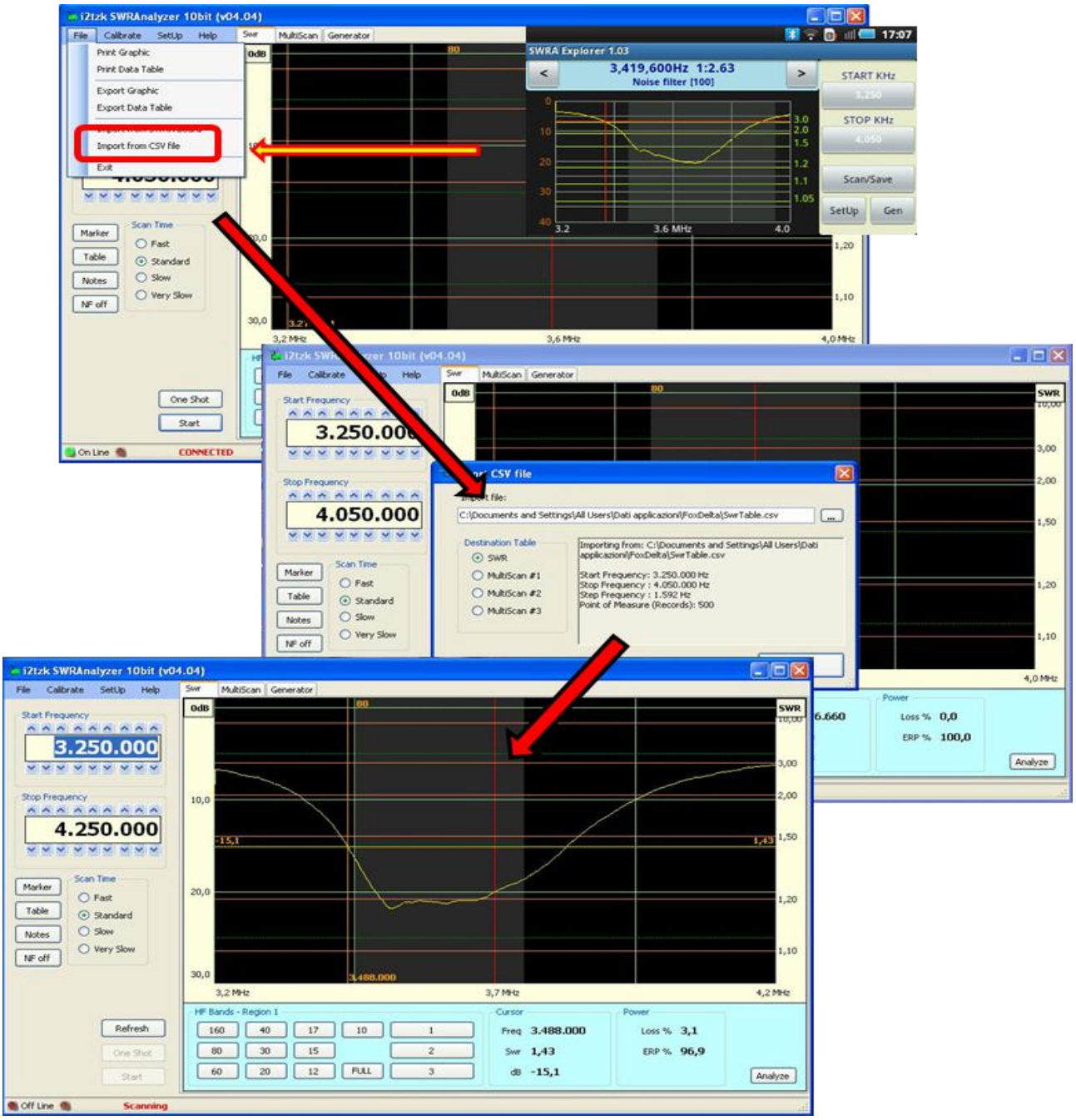
  i). Import from the SWRA Board
  ii). Import a CSV file

- N.B since the Android Setup only caters for one name to the CSV file, it is useful to save the file in different PC folders e.g. names 20m Dipole CSVdata , 10m Whip CSVdats etc.

14.1 Importing Data from SWRA board For More Detailed Analysis

- The Android Scan must be saved as a detailed scan (500 measurements) file and imported into the PC as follows.

14.1 Importing Data from SWRA board For More Detailed Analysis -- continued



NOTE . April 2014

This SWR Analyser project is still work in progress and new improved versions of hardware and software are still being developed by Tony I2TZK. The PC software is being improved and a new SWR & Impedance analyser will be available later in 2014, so please look at the Fox Delta web site http://www.foxdelta.com/products/swr.htm