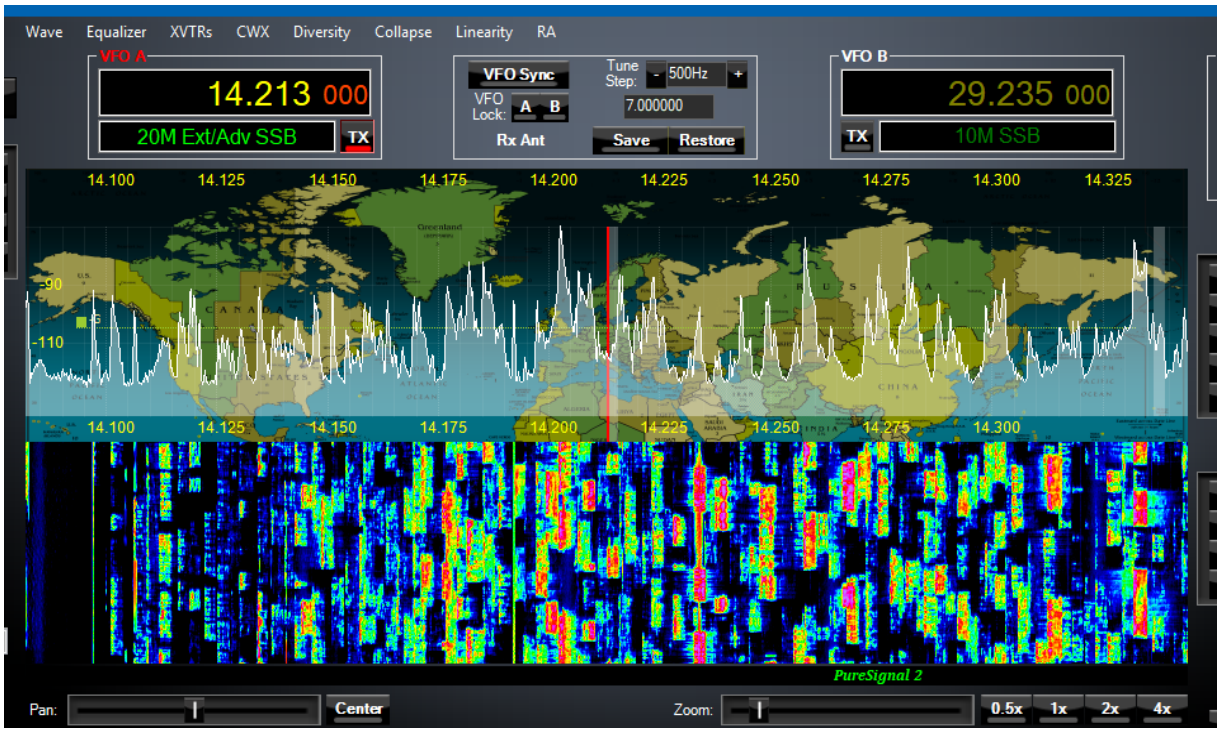
# BRICK SDR from EU1SW
# by Lin00bs

## Transceivers First Step User Guide



BRICK SDR from EU1SW
by Lin00bs

Facebook: https://www.facebook.com/groups/1934352337083273
Telegram: https://t.me/brick_sdr
Blog: https://linoobs.com.ua

# BRICK SDR from EU1SW
# by Lin00bs

## Warning: Beta release Documentation

## Minimum Requirements

### Computer basic requirements

1. Intel Pentium 4, 3 Ghz (bare minimum), or Intel i3, 2.8Ghz or better (recommended).

2. 4GB Ram, or 6GB Ram (recommended).

3. 1280x1024 display screen (or higher) resolution recommended

4. Win7 or newer. It is possible some older machines will not give satisfactory performance, regardless of processor speed.

5. Computer with Full Duplex Ethernet NIC card capable of 100 baseT/Gigabit Ethernet.

6. **Full Duplex Ethernet switch** or router with 1 free 100Mbs Ethernet port.

7. CAT5E or CAT6 (recommended) Ethernet patch cable to connect BRICK SDR to Ethernet switch, router or computer.

Older and slower computers may require considerable optimization before they can provide necessary performance for trouble free SDR operation. This optimization may require that certain applications and services be stopped in order for Hermes to operate correctly. It is possible some older machines will not give satisfactory performance, regardless of processor speed.

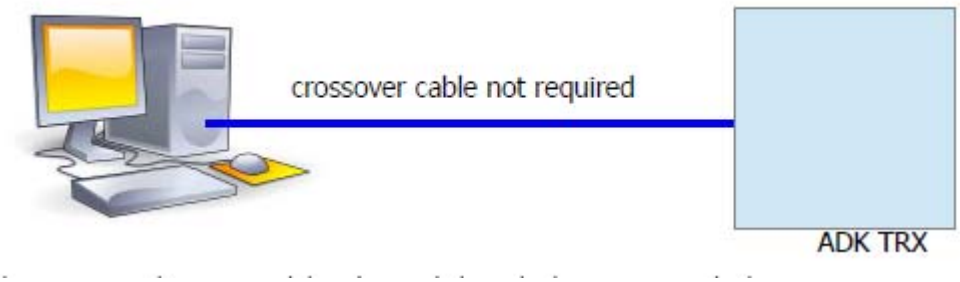
Neal Campbell K3NC shared this optimization link: http://www.blackviper.com/service-configurations/

(Neal's web page: http://www.abrohamnealsoftware.com/)

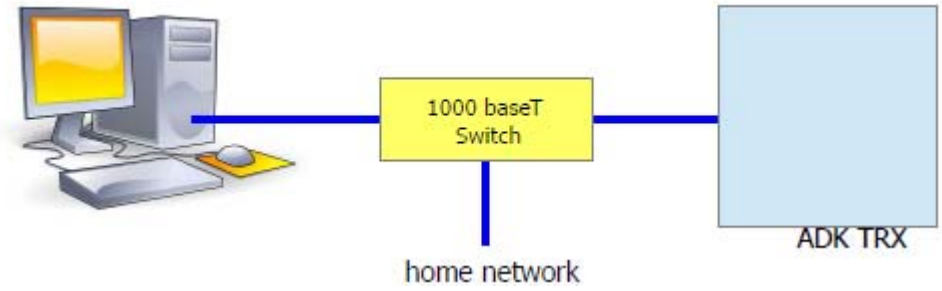
### Suitable routers or LAN Network switches:

A Full Duplex wired or wireless Ethernet Router with sufficient ports to connect the host computer and the BRICK SDR at 100 baseT required to handle 80Mbps. Optional Full Duplex Ethernet 5 port **switch** with 100 baseT Internet connectivity may be required if additional Ethernet ports are needed.
Ethernet **HUBS** will **NOT** work properly for this application.

### Ethernet Connection




The BRICK SDR must be connected directly to a dedicated Ethernet port on the host PC or to a port on a suitable Ethernet router or switch. Connection to a dedicated Ethernet port is shown above




Ethernet switch is shown above

For direct connection of the BRICK SDR to a dedicated Ethernet port, a CAT 5 Ethernet cable is used. Note that a 'crossover' cable is **not** necessary.

**IMPORTANT**: The Ethernet switch must be capable of operating in **full duplex** mode at 100 baseT. The initial release of the BRICK SDR FPGA code operates at 100 baseT.

An Ethernet "HUB" will not work properly and is **not** recommended.

# BRICK SDR from EU1SW
# by Lin00bs

## Simple network setup

The OpenHPSDR Hermesbased BRICK SDR radio are designed to work
via Ethernet cabling on a "Local Area Network" or "LAN". Ethernet simplifies the installation, and configuration of hardware and software on a PC, making the installation basically plug and play. No sound card interface wiring, no Firewire cards or drivers, no USB ports or drivers needed. It just works!

How simple does it get? This simple:
1. For the most basic network, you don't need any external hardware other than a CAT5 or CAT6 network/Ethernet cable between your BRICK SDR LAN port and your computer's LAN port.
2. Done. Nothing more to do. It just works, but it may take a while to connect each time unless you assign static IP addresses.

OK, how do I hook my brand new BRICK SDR to my home WiFi (wireless network) router?
1. Connect a CAT5 or CAT6 network/Ethernet cable between the BRICK SDR LAN port and a free LAN port on your Linksys/FritzBox/Mikrotik/Belkin/NetGear/DLink 802.11n wireless router.
2. Done. Nothing more to do. It just works.

Note : Direct connection between BRICK SDR and PC is not recommended due to the excessive time which may be required for an IP address to be assigned.

Note : CAT5 and CAT6 Ethernet cables have 8 pin male modular connectors on both ends. The Hermes based BRICK SDR radios have a corresponding female 8 pin modular LAN port on the front panel.

**Author KC9XG**

## APIPA - Automatic Private IP Addressing

**Definition:** A feature of Microsoft Windows, **APIPA** is a DHCP failover mechanism for local networks. With APIPA, DHCP clients can obtain IP addresses when DHCP servers are non-functional. APIPA exists in all modern versions of Windows except Windows NT.

When a DHCP server fails, APIPA allocates IP addresses in the private range 169.254.0.1 to 169.254.255.254. Clients verify their address is unique on the network using ARP. When the DHCP server is again able to service requests, clients update their addresses automatically.

In APIPA, all devices use the default network mask 255.255.0.0 and all reside on the same subnet.

APIPA is enabled on all DHCP clients in Windows unless the computer's Registry is modified to disable it.
APIPA can be enabled on individual network adapters.

Also Known As**:** Automatic Private IP Addressing; AutoNet

Examples**:**
Because APIPA uses IP addresses in the private Class B space, APIPA is a feature generally only useful on home or other small intranet LANs.

Reference:
http://en.wikipedia.org/wiki/APIPA

# BRICK SDR from EU1SW
# by Lin00bs

## Here is what you need to get started with the ADK TRX

### BRICK SDR Hardware Requirements

1. **13.8v DC minimum, 5A and 13.8v DC and 25A 13.8v for "Sotka" 100W**
Note: some switching DC supplies create objectionable EMI/RFI which may degrade performance of the BRICK SDR transceivers.

2. Ham band resonant 50 ohm **HF antenna** and **Dummy Load** required for calibration.

3. Yaesu MH-42b or Yaesu MH-48 Mic or PC microphone terminated in 3.5mm - 1/8" plug, optional.

4. CW key or keyer terminated in 3.5mm - 1/8" Stereo plug, optional.

5. DO NOT TURN THE BRICK SDR RADIO ON until OpenHPSDR-Thetis software is properly installed and configured.

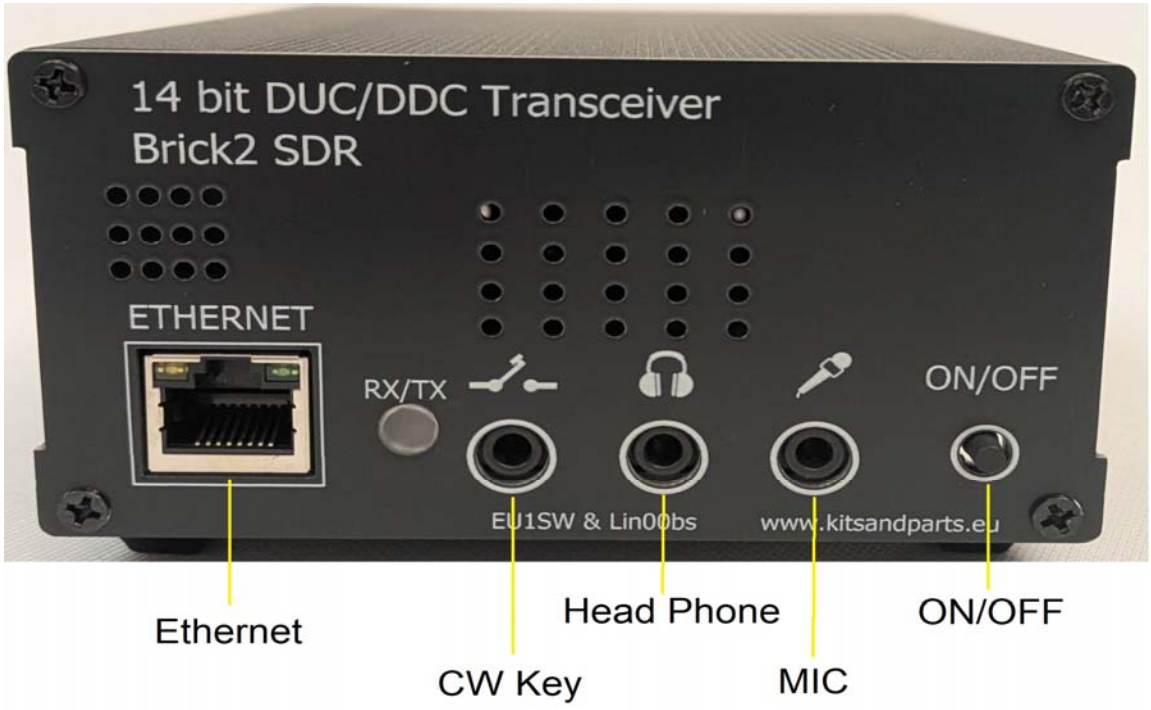
## BRICK SDR Recommended Software requirements :

1. Windows 7 or later.
2. Microsoft .NET 4.0 Framework or later.
3. OpenHPSDR-Thetis 2.x.

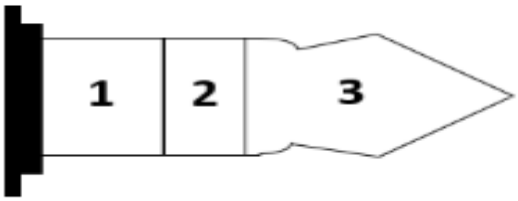
** please see OpenHPSDR Software and download information
http://openhpsdr.org/download.php.

** direct link to Download https://github.com/ramdor/Thetis/releases/

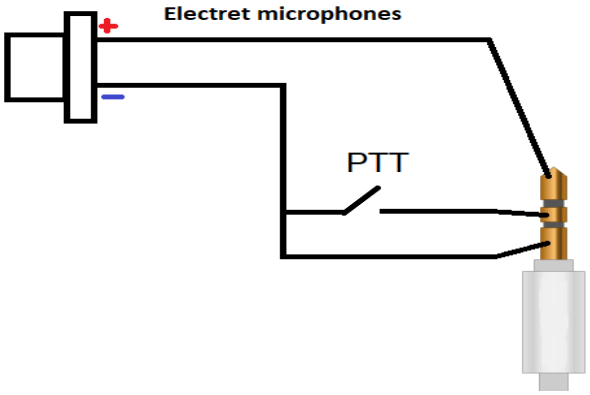
BRICK SDR from EU1SW
by Lin00bs




MIC/PTT Pinout:




| Pin | Description |
|---|---|
| 1 | GND |
| 2 | PTT |
| 3 | MIC |





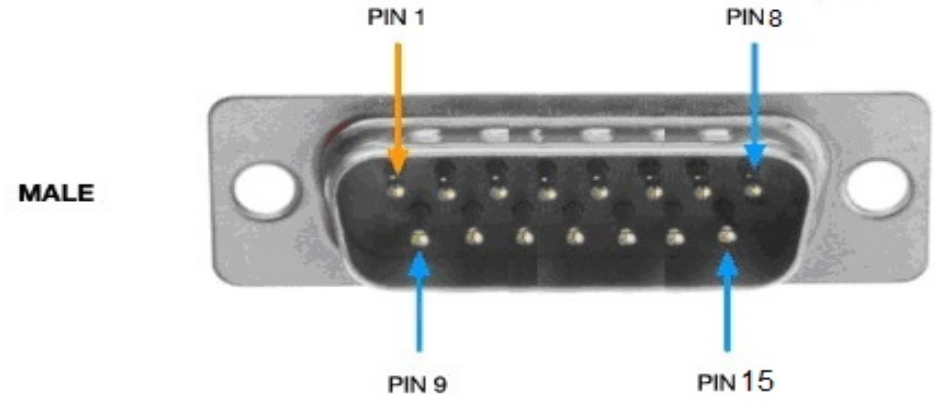

An additional SMA connector (Duplex ANT/PS-A) is used to connect the receiving antenna in transmit mode and in some cases serves as a *"Pure Signal" input. This is no separate RX input.

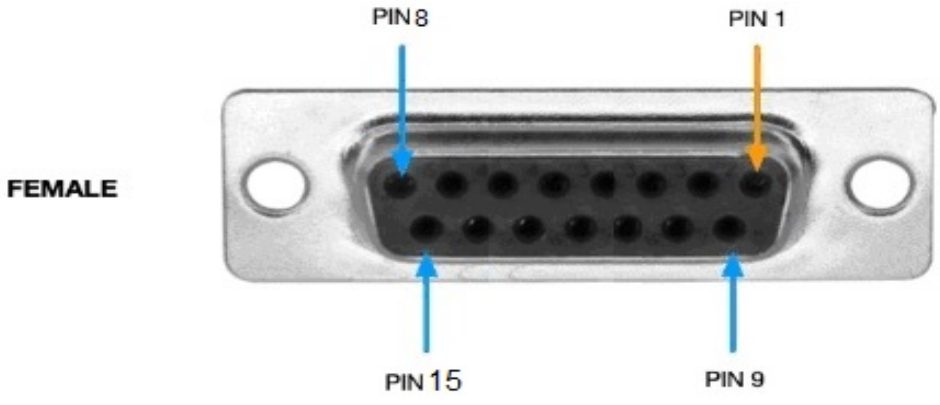
*"Pure Signal" is not yet fully implemented and in some cases may not work.

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by Lin00bs

# BRICK SDR from EU1SW
# by Lin00bs

| Accessory Port PTT out | BRICK2 SDR DB15 |
|---|---|
| DB1 | GND |
| DB2 | BCD-B |
| DB3 | BCD-D |
| DB4 | BCD-C UART-TX |
| DB5 | BCD-D Voltage Band Dec Xiegu XPA125B |
| DB6 | CNTRL 2 (P1) |
| DB7 | CNTRL 4 (P3) |
| DB8 | CNTRL 6 (P5) |
| DB9 | BCD-A |
| DB10 | BCD-C |
| DB11 | UART-RX |
| DB12 | PTT out (go to GND MAX 50v 100mA) |
| DB13 | CNTRL 1 (P0) |
| DB14 | CNTRL 3 (P2) |
| DB15 | CNTRL 5 (P4) |



# BRICK SDR from EU1SW
# by Lin00bs

**Quick Start Instructions** please refer to front and back panel illustrations above

## Hardware Setup

DO NOT TURN THE BRICK SDR RADIO ON until Thetis software is properly installed.

1. Connect the supplied 13.8VDC cable to the rear panel power connector and to a filtered 13.8VDC +/- 5%, power supply capable of providing up to 25A.

2. Connect a 50 ohm transmission line between the rear panel ANT SO-239 connection and a 50 ohm dummy load capable of dissipating 100 watts for at least 5 minutes.

3. Optional. Connect a electric PC microphone equipped with a 1/8"/3.5mm mono plug into the front panel mic jack. See appendix for interfacing other mics. NOTE: The central contact is responsible for the microphone input, the ring is the pedal; when shorted to ground, the device will switch to transmission (check the version of the boards before using, this is only valid for the latest version).

4. Connect a CAT 5 Ethernet cable between the rear panel RJ45 LAN jack and your router or PC Ethernet port.

## Software Setup

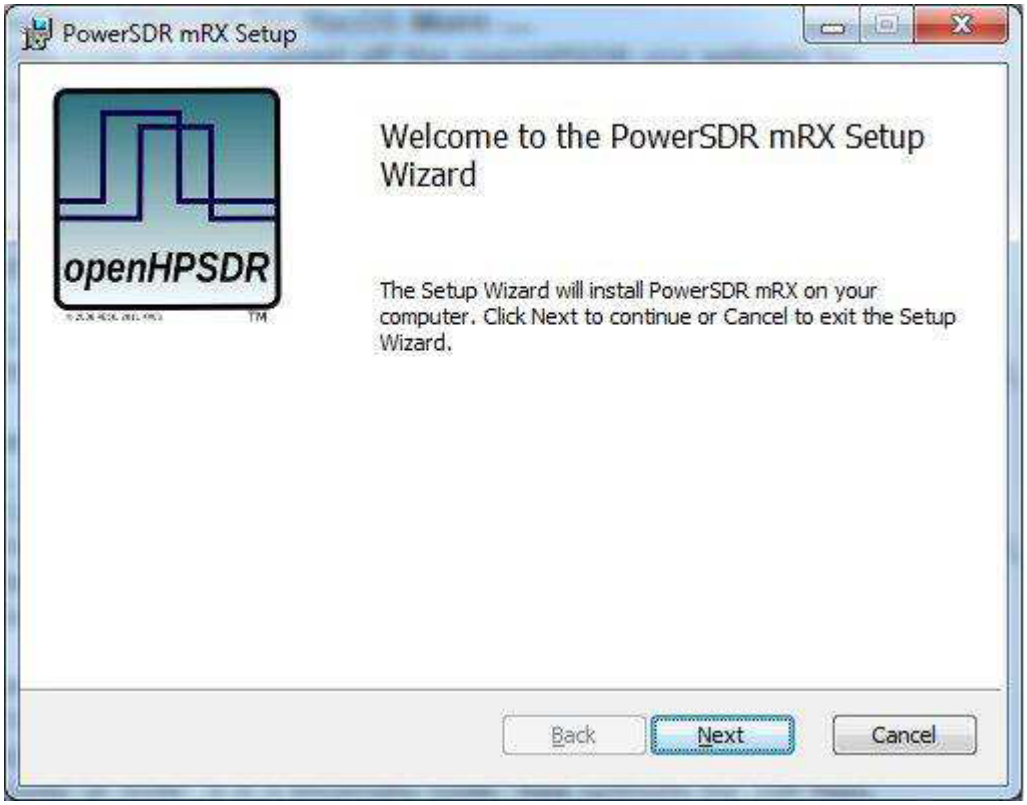
**If you have other HL2-type hardware installed and configured, remove all software, files, and settings associated with it before continuing, as they may cause various problems with Brick2 in the future.**

Go to the Ramdor Github download page and download the Thetis Installer software:
https://github.com/ramdor/Thetis/releases/

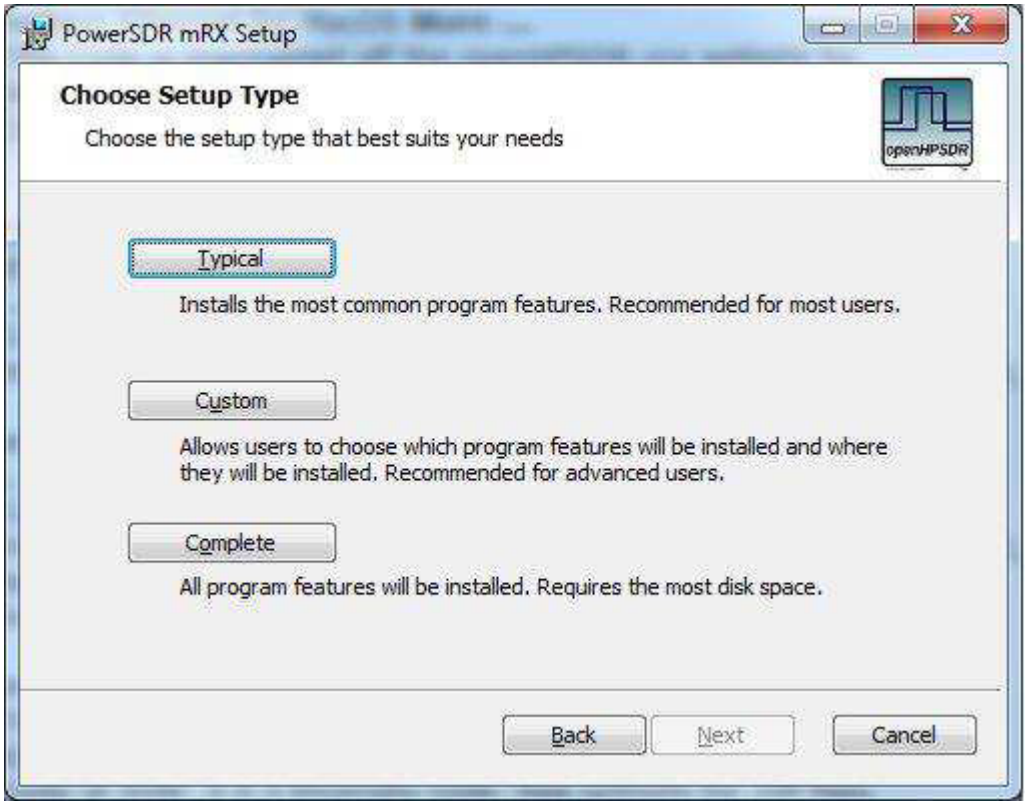
Execute (RUN) to start the Installer at this time.

Note: You may be asked to install the full Microsoft .NET 4.x Framework at this time if the Installer determines that your PC does not have the necessary .NET full 4.0 version installed. If you receive this message, chose "O.K." then you will get a dialogue that will indicate that OpenHPSDR-Thetis installation failed at this point. If you have reached this point, you must install the Microsoft .NET 4.0 Framework from
HERE
**http://www.microsoft.com/en-us/download/details.aspx?id=17851**

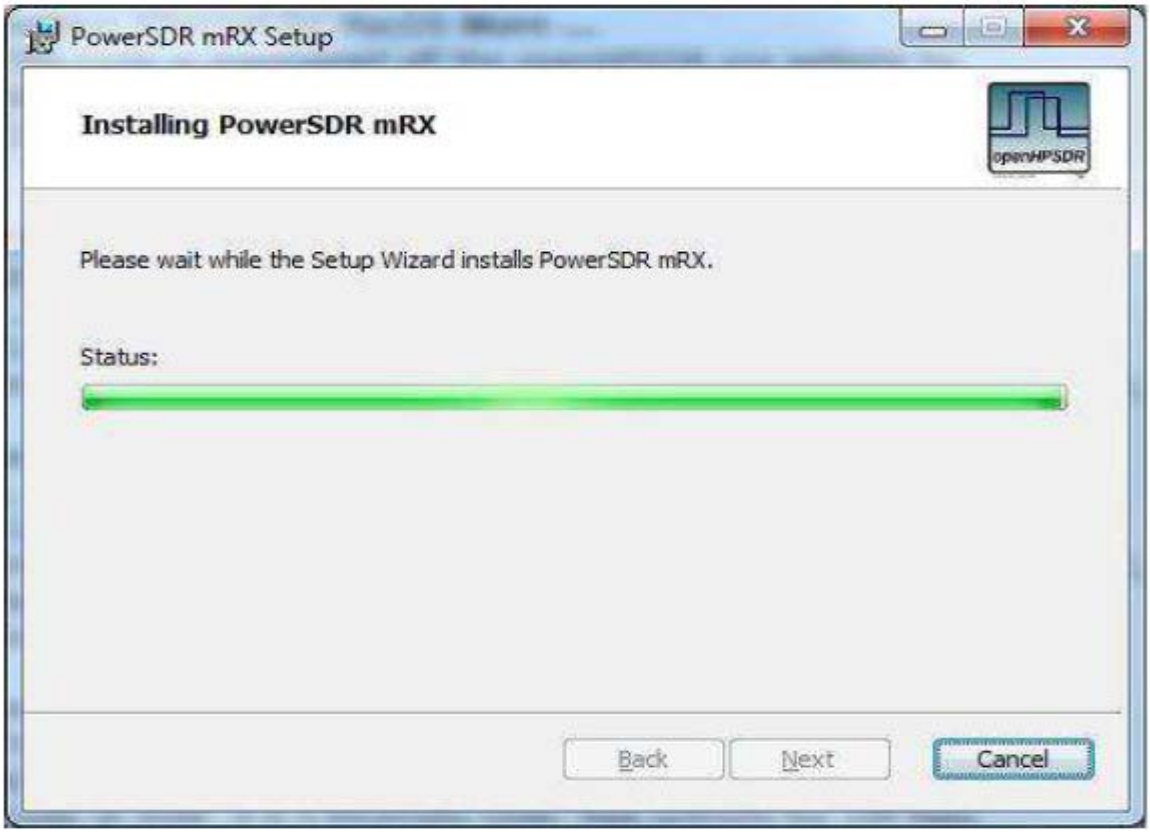
Once you have Microsoft .NET 4.0 installed successfully, you can run the OpenHPSDR-Thetis installer again to complete this process. See the example above:

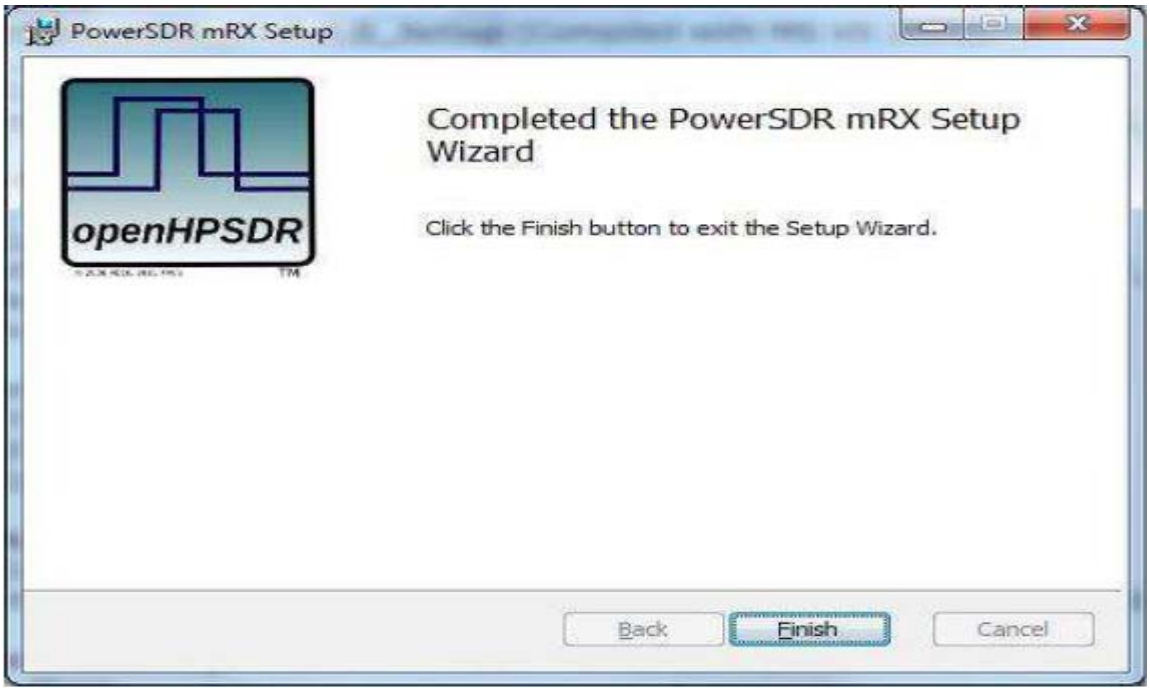



PowerSDR mRX Setup
End-User License Agreement
Please read the following license agreement carefully
openHPSDR
GNU GENERAL PUBLIC LICENSE
Version 2, June 1991
Copyright (C) 1989, 1991 Free Software Foundation, Inc.
59 Temple Place, Suite 330,
Boston, MA 02111-1307
USA
Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.
I accept the terms in the License Agreement
Print
Back
Next
Cancel


PowerSDR mRX Setup
Choose Setup Type
Choose the setup type that best suits your needs
openHPSDR
Typical
Installs the most common program features. Recommended for most users.
Custom
Allows users to choose which program features will be installed and where they will be installed. Recommended for advanced users.
Complete
All program features will be installed. Requires the most disk space.
Back
Next
Cancel

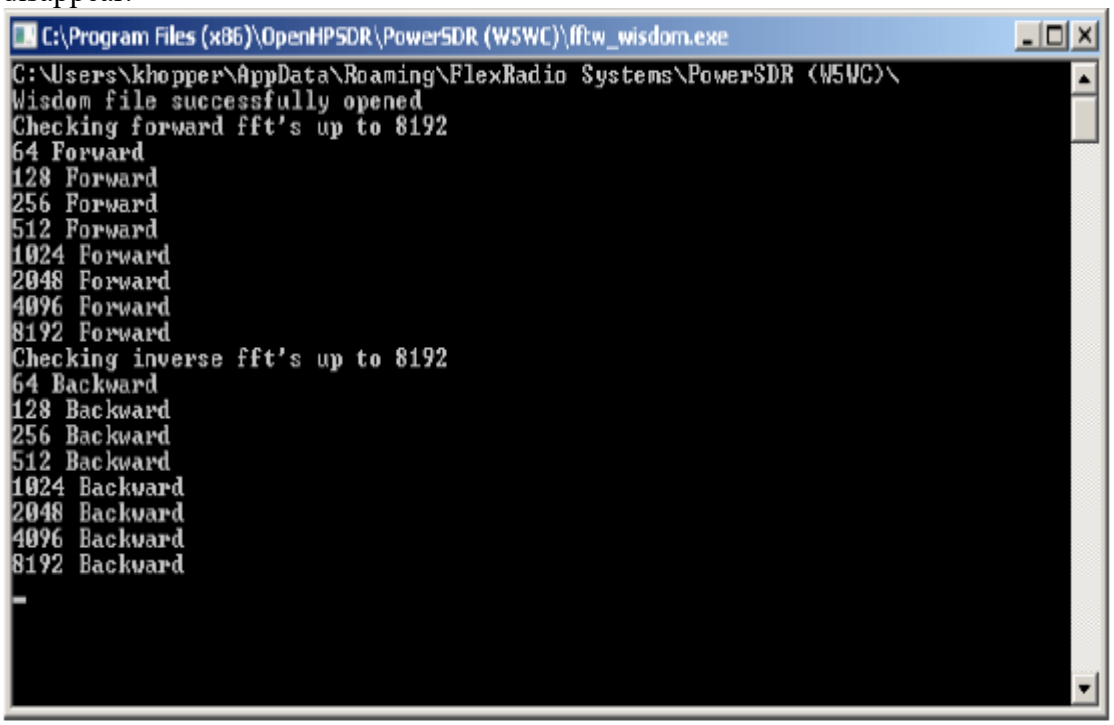

PowerSDR mRX Setup
Ready to install PowerSDR mRX
openHPSDR
Click Install to begin the installation. Click Back to review or change any of your installation settings. Click Cancel to exit the wizard.
Back
Install
Cancel


PowerSDR mRX Setup
Installing PowerSDR mRX
openHPSDR
Please wait while the Setup Wizard installs PowerSDR mRX.
Status:
Back
Next
Cancel



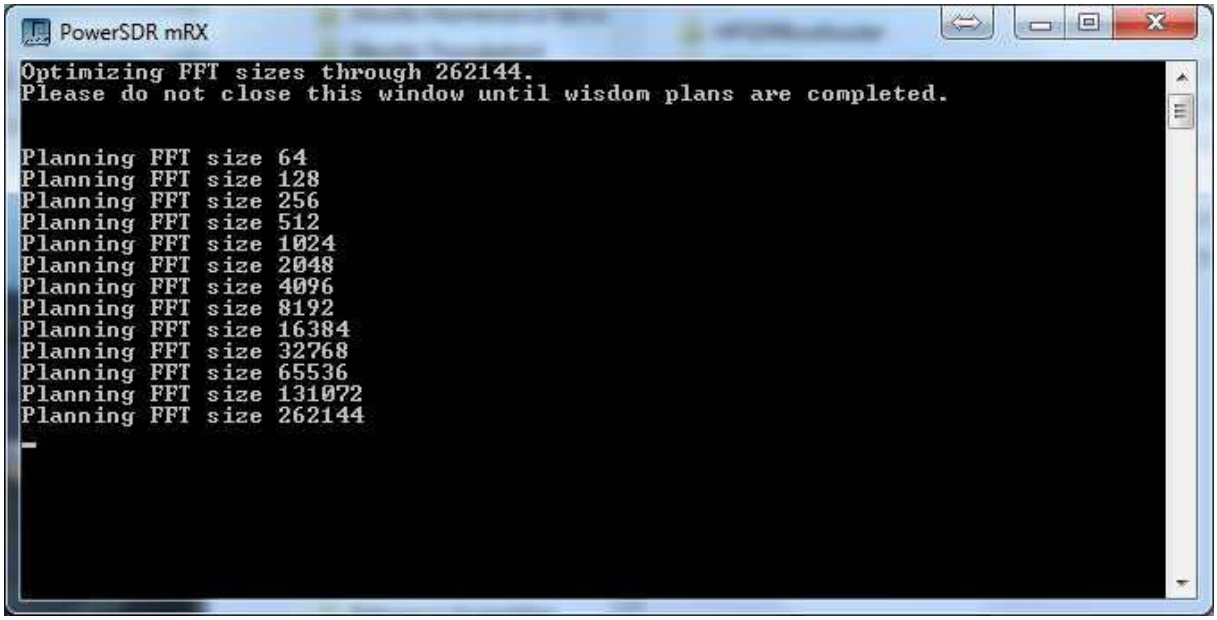

Click on the desktop ICON to start OpenHPSDR-Thetis.
If a OpenHPSDR-Thetis icon is not clearly apparent on your screen, use your start menu to locate the program.

The program will begin with the “WISDOM” optimization. A one time DOS FFT optimization screen will appear. Wait for this process to finish and the DOS screen will disappear.




Optimization DOS Screen

A second Wisdom screen will appear which continues the optimization through a lengthy calculation.




This may take 10 minutes or more to complete the extended FFT calculation trough 262144.

Wait for the message that it is OK. select “OK” to finish.

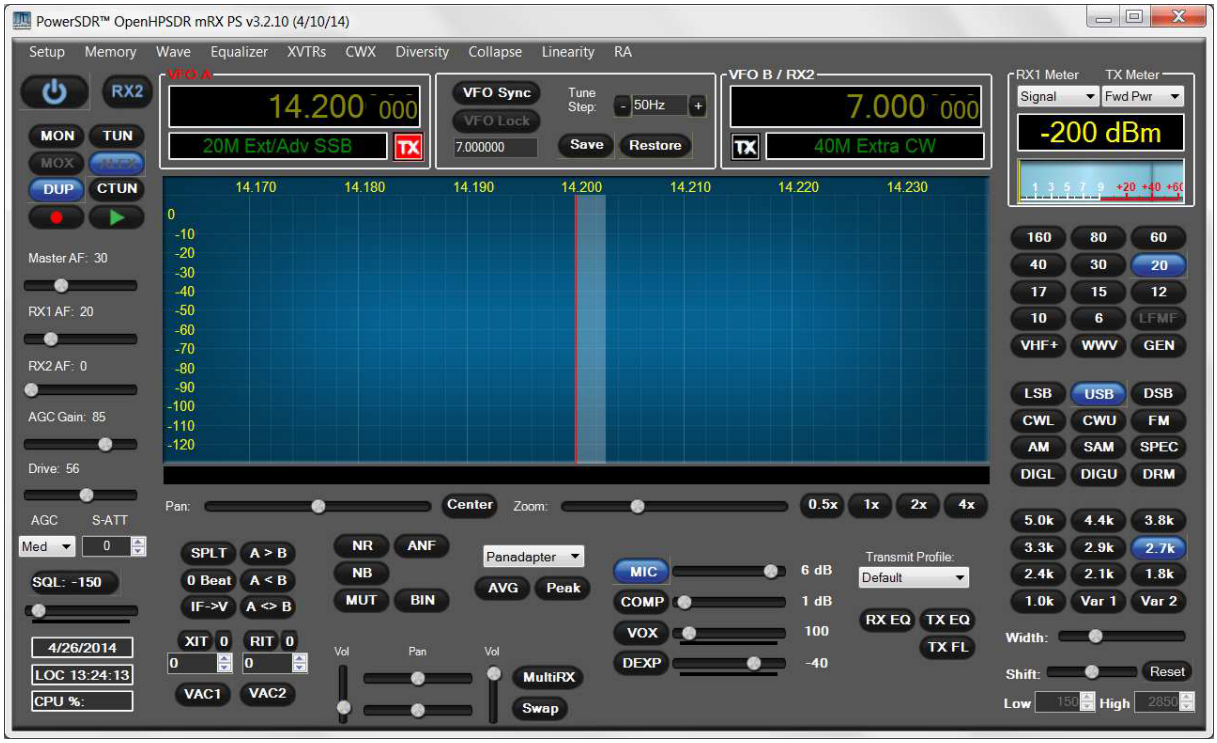
Turn on your power supply. Push the **POWER ON** button on the BRICK SDR.

Depend on, how you connected BRICK SDR to your LAN or directly to PC, wait a 5 seconds or 20 seconds and then press the **POWER** button on OpenHPSDR-Thetis™.

Then click on the Setup Menu selection.

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Click on the “SETUP” menu selection to configure the OpenHPSDR-Thetis software.
OpenHPSDR-Thetis basic display screen

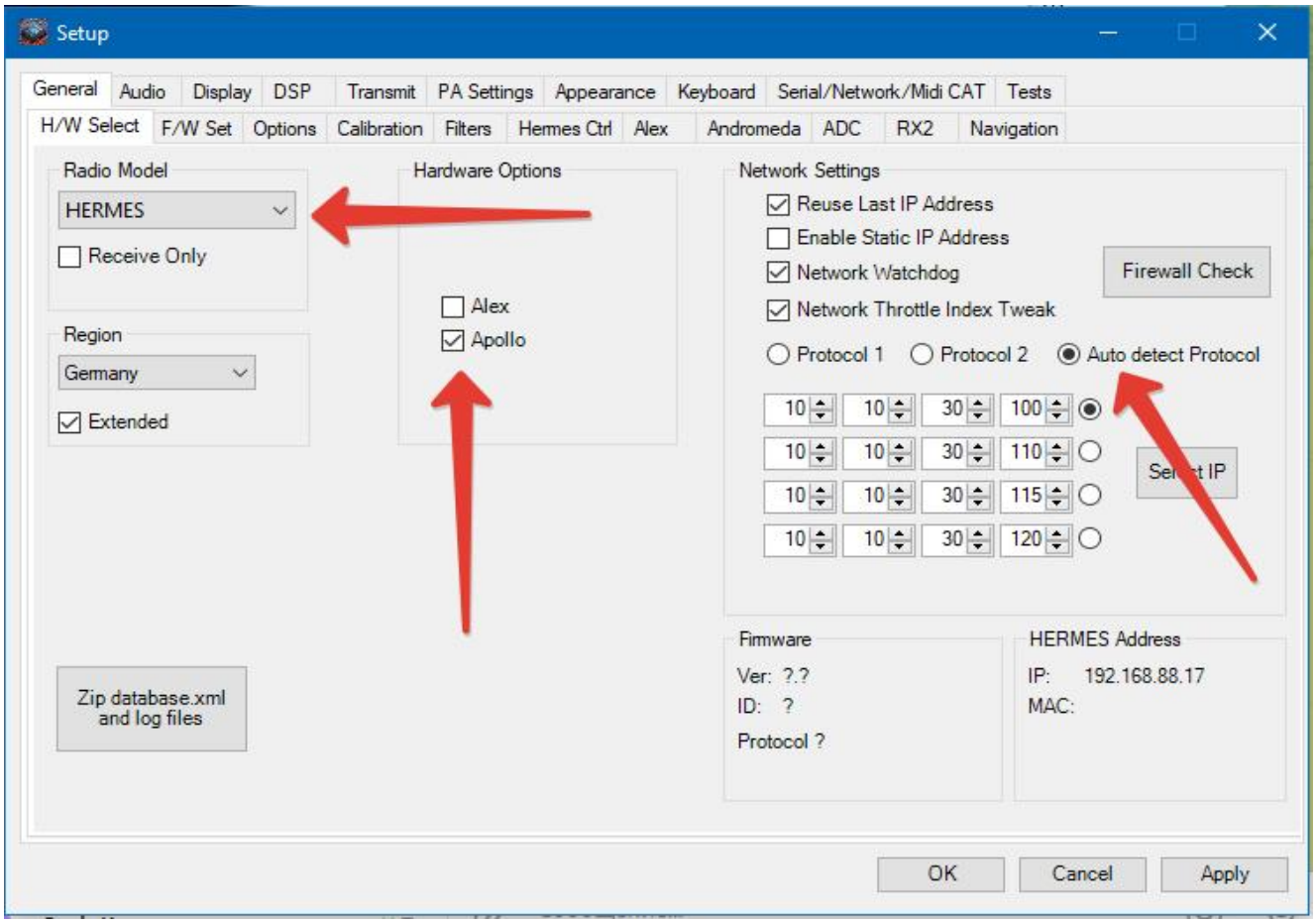



Go to → GENERAL → Hardware Configuration tab and check Apollo so that power and SWR are displayed correctly.

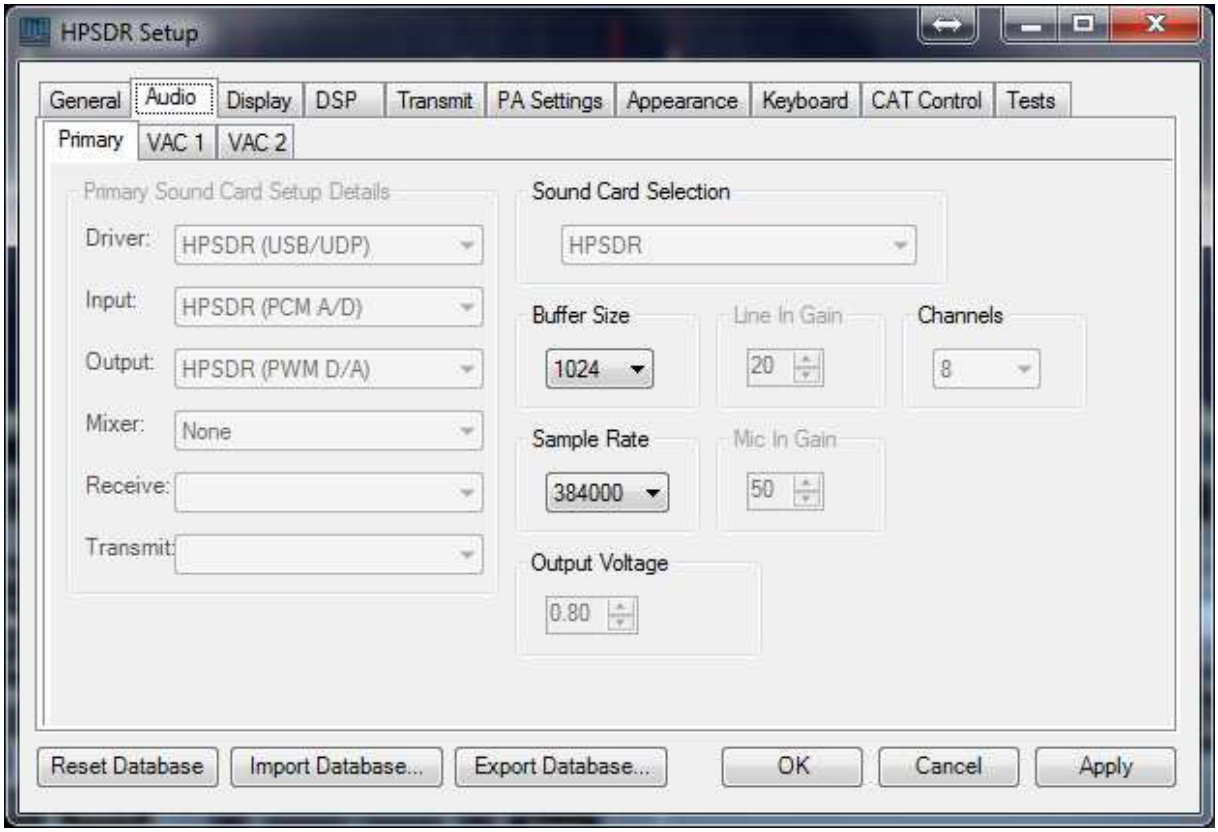
You need to set HERMES as Radio Model and use Auto detect Protocol.

The BRICK SDR IP address and Firmware version number in the green box highlighted above will be set automatically by your network router DHCP server, or if connected directly to your PC, the IP address will be assigned by the “APIPA” process – WHICH MAY TAKE UP TO SEVERAL MINUTES TO ASSIGN AN IP ADDRESS.

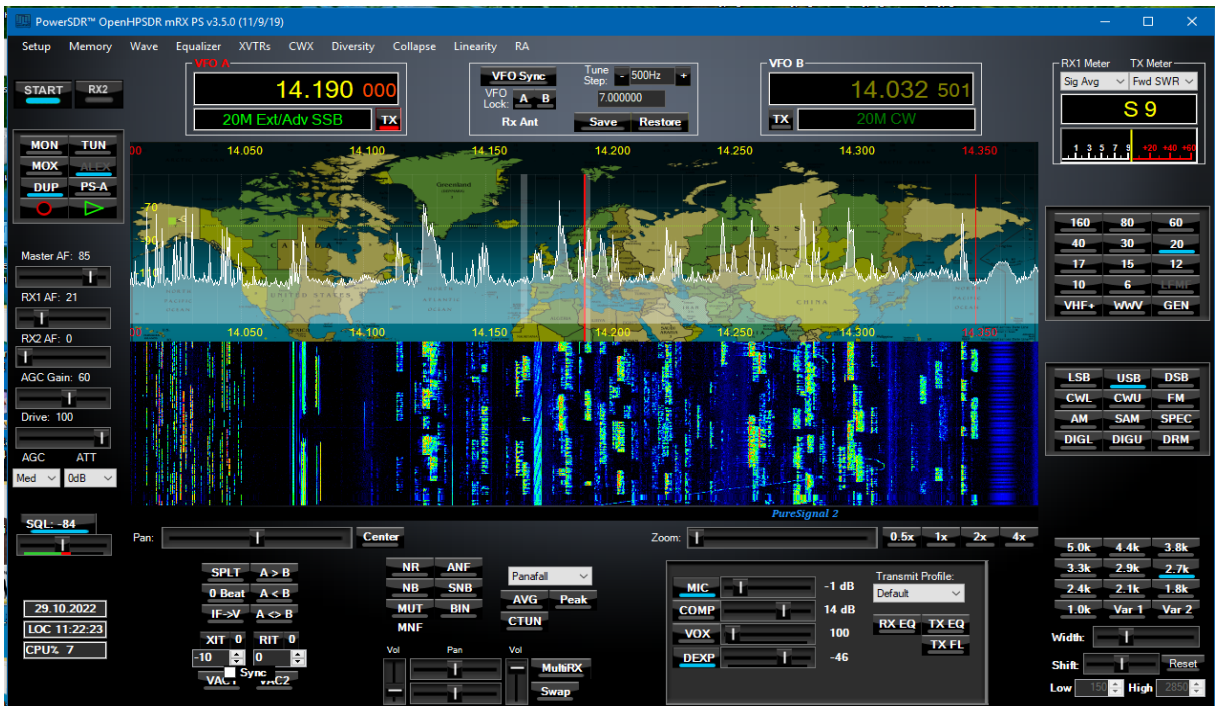
If your LAN is properly configured, the BRICK SDR board IP ADDRESS and MAC ADDRESS should be automatically be detected and assigned. An incorrect default value is 169.254.1XX.XXX.
OpenHPSDR-Thetis™ will display the currently assigned IP address and MAC address of the BRICK SDR board if the LAN connection is properly connected and configured. If the BRICK SDR IP ADDRESS remains 0.0.0.0 then you must determine if OpenHPSDR-Thetis and your PC network connection is operating correctly. Some typical problems could be that the Ethernet connection to your PC or LAN connector is disabled in Windows. The Ethernet connector may not be properly seated in your PC or
Router. DHCP addressing must be properly enabled on your router.


Setup
General
Audio
Display
DSP
Transmit
PA Settings
Appearance
Keyboard
Serial/Network/Midi CAT
Tests
H/W Select
F/W Set
Options
Calibration
Filters
Hermes Ctrl
Alex
Andromeda
ADC
RX2
Navigation
Radio Model
HERMES
Receive Only
Region
Germany
Extended
Hardware Options
Alex
Apollo
Network Settings
Reuse Last IP Address
Enable Static IP Address
Network Watchdog
Network Throttle Index Tweak
Firewall Check
Protocol 1
Protocol 2
Auto detect Protocol
10 10 30 100
10 10 30 110
10 10 30 115
10 10 30 120
Select IP
Zip database.xml and log files
Firmware
Ver: ?.?
ID: ?
Protocol ?
HERMES Address
IP: 192.168.88.17
MAC:
OK
Cancel
Apply

Please select a Sample Rate of 384 khz or whatever you need 48-384 kHz, for the Panadapter display width.

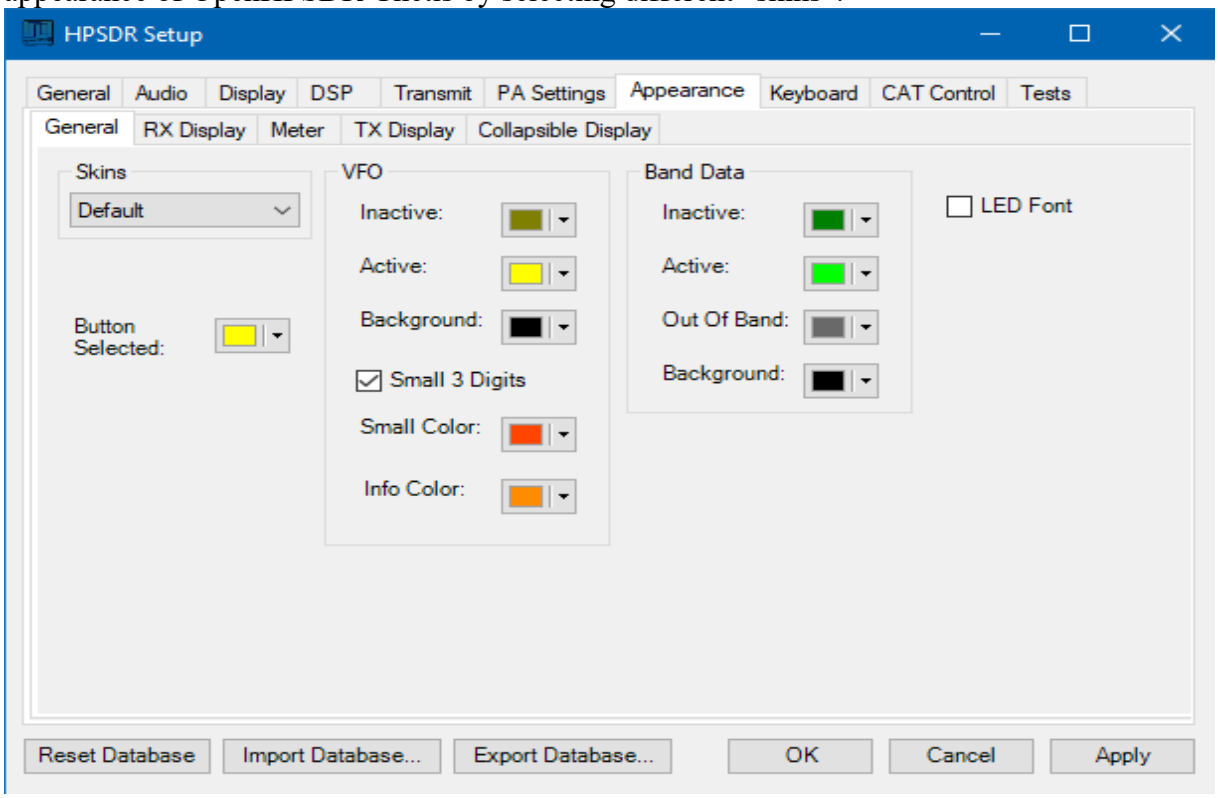


# BRICK SDR from EU1SW
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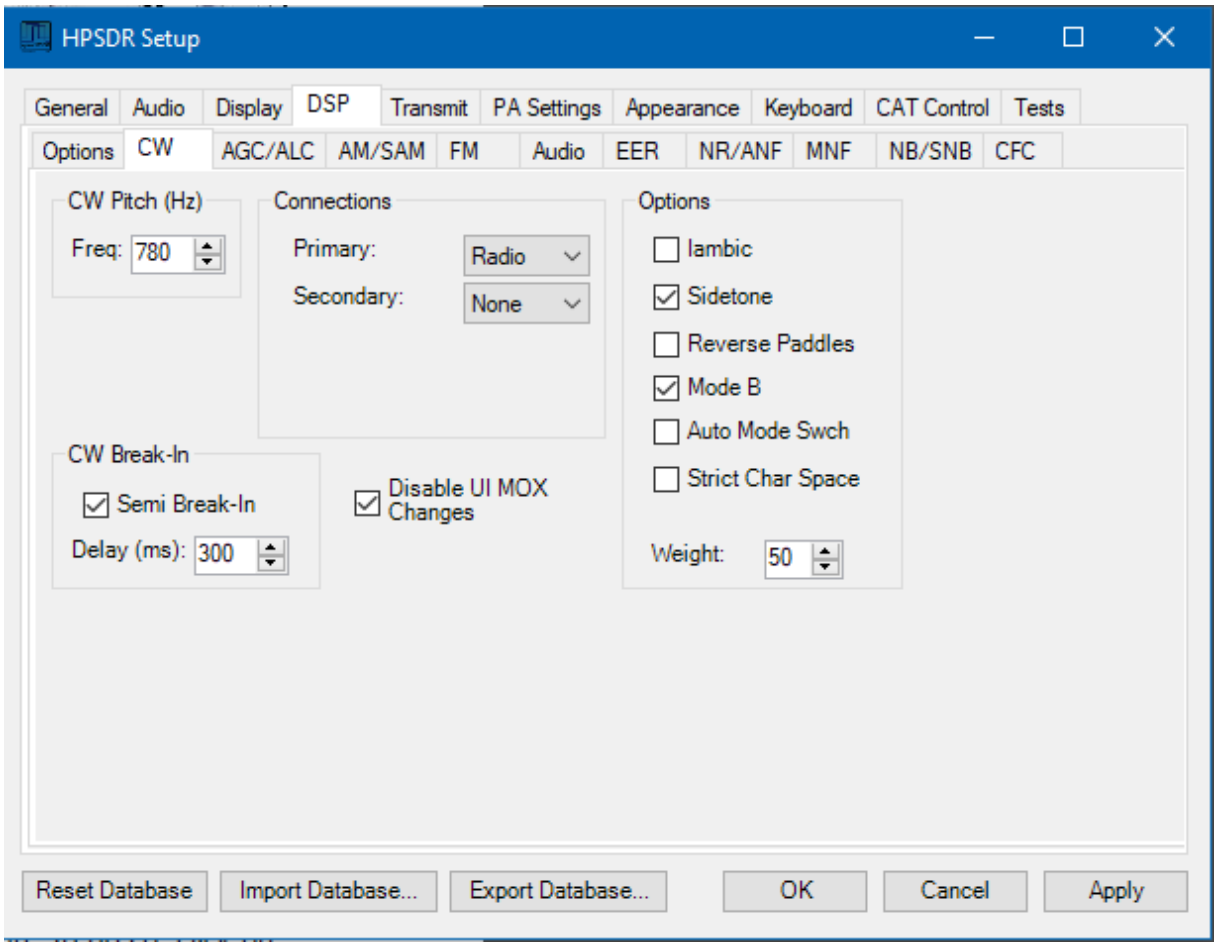



20M band
shown using 384khz for RX1

General tab ---> APPEARANCE tab, and you should be able to change the graphical appearance of OpenHPSDR-Thetis by selecting different “skins”.



## CW Key Selection and Wiring

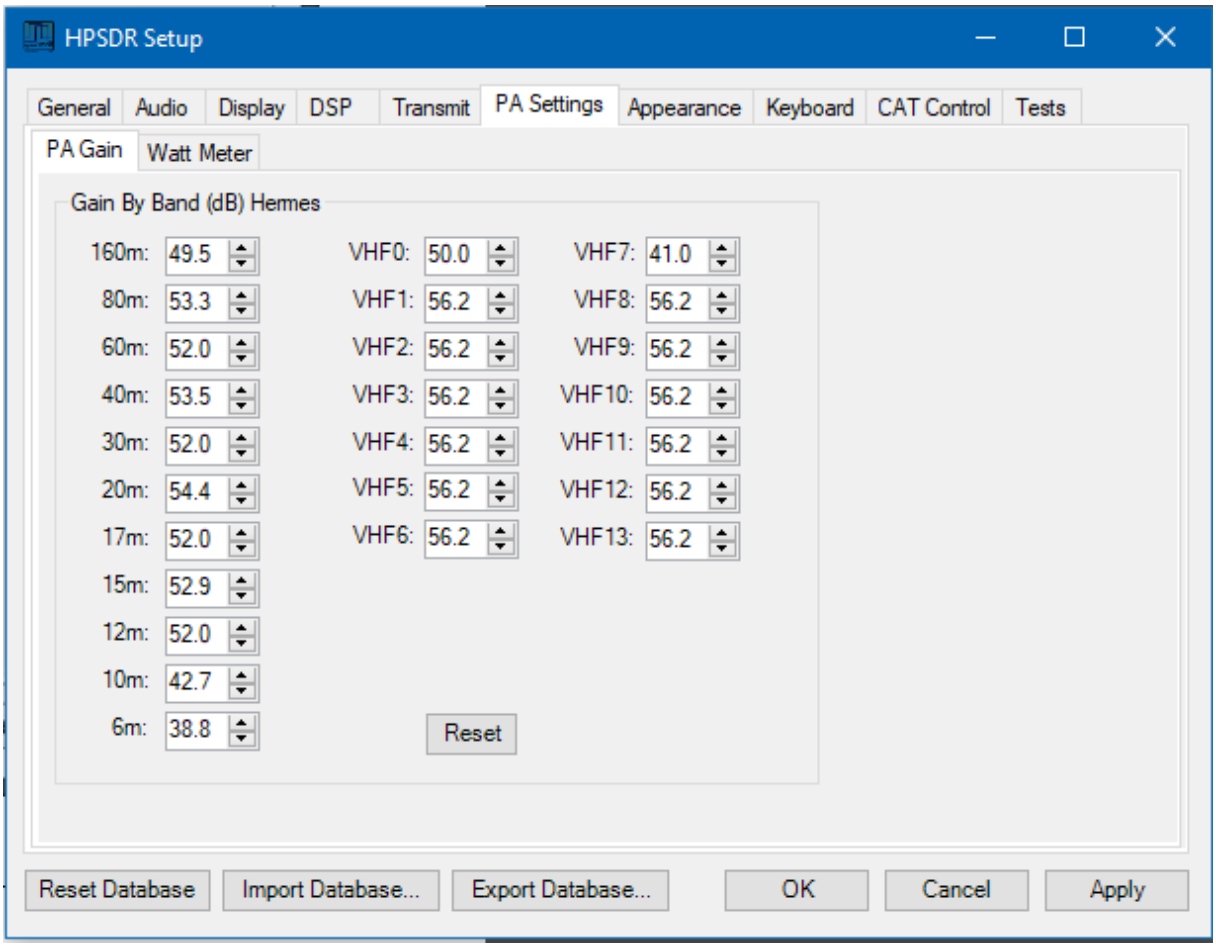



## Select Iambic Paddles or straight key

To use a CW key with OpenHPSDR-Thetis™ you will need to enable it in the menu. To do so, click on Setup → DSP tab followed by the Keyer tab.

Provides connection for a CW key, either straight, single-paddle or Iambic. If using dual-paddle or Iambic mode, the common connection of the key should be made to the sleeve of a 3.5mm 1/8" stereo plug, the "dot" side to the ring and the "dash" side to the tip. If a straight key is used, this should be connected between the sleeve and the tip of the plug. Some PC SDR Software enables the dot and dash connections to be reversed via a menu selection (above). The dot and dash connections are connected to a 3.3vdc via a 10k resistor.

## Manual PA Calibration




Each BRICK SDR user needs to manually calibrate the Transmitter Power Output settings within OpenHPSDR-Thetis™. OpenHPSDR-Thetis allow a slight touch-up of transmitter power output.

Use the following manual calibration procedure to properly set/calibrate your BRICK SDR power output into a dummy load:

1. Connect a suitable Dummy Load to ANT1 port on the back panel of the Transceiver.

2. Click on menu selection, Setup, Transmit.

3. Set “TUNE” (left side of window), Power (W) to 100

4. Select “FWD Pwr” from the “TX Meter” upper right corner of the main OpenHPSDR-Thetis window.

5. Enable the Antenna window by clicking on Setup ---> General ---> ANT/FILTERS tab to access the antenna settings (“Sotka” 100w only).

6. Select the Transmit antenna ANT1 where you connected the Dummy Load ("Sotka" 100w only).

7. Select the PA settings TAB on the Setup menu window.
The PA Settings TAB allows you to set (calibrate) the BRICK SDR Power Amplifier gain by band (dB – Power Output per Band) for each of the available Ham Bands. There is an up/down gain control for each band, which regulates the Power Amplifier output for that band. **As you increase the Gain By Band, power output will decrease. Conversely, decreasing Gain By Band will increase Power Amplifier output**.

Maximum power output per band can be reached at the lowest value in this menu.

## Setup PA settings Band:

8. Select one of the bands on the PA settings TAB.

9. Ensure you have the Setup ---> Transmit tab ---> Tune control set to 100 and a **150W** or larger **Dummy Load** connected to the selected antenna port on the ANT/FILTERS setup tab.

10. Press "TUN" (Tune) on the upper left side of the OpenHPSDR-Thetis™ main display form on your computer.

11. Adjust the band gain value for a **MAXIMUM** TX Meter "FWD PWR" output reading of 100 watts while using your suitable Dummy Load. Do NOT use an Antenna for this calibration adjustment.

12. Press "TUN" button again to key the radio.

Repeat the above procedure for each Ham Band to properly calibrate the RF CW power output for a **MAXIMUM** 20 or 100 watts.

13. When all bands have been calibrated, remove the Dummy Load and select the antenna of your choice in the ANT/FILTERS setup Tab.

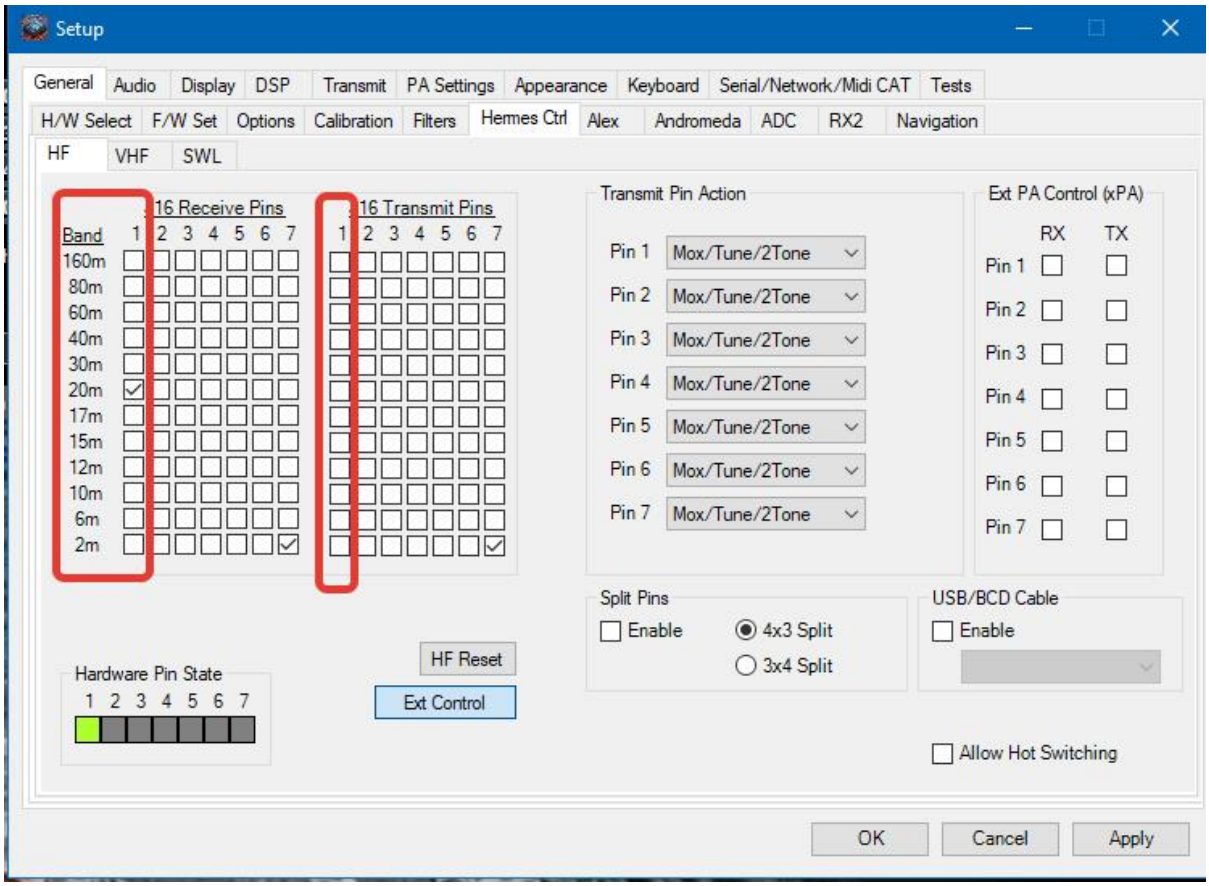
14. Remember to reduce the "TUN" power wattage setting on the Setup ---> Transmit tab to approximately 9W.

## FAN Control

If the fan noise bothers you during operation, you can turn it off on certain bands or when receiving/transmitting.

Go to → Hermes Ctrl → HF and set in column 1 each band you need to power Off the fan on Receive and/or Transmit.

Example: When receiving, the fan will be turned off on the 20m band and will turn on when transmitting.



## IMPORTANT

**The FPGA and other components on the BRICK SDR PCBs can be damaged by Electrostatic Discharge (ESD). When handling the PCB, you should take ESD precautions (e.g. use a work bench with an antistatic mat on it and wear a grounded wrist strap).**

**When powered on do not touch the top of any IC in order to determine its temperature. In particular, do not touch the Switch Mode Regulator IC. Touching its leads can change the switching frequency and alter the output voltage.**

BRICK SDR from EU1SW
by Lin00bs

## APPENDIX – A – OpenHPSDR Software

OpenHPSDR/PowerSDR modifications

W5WC source code: click here
http://svn.tapr.org/repos_sdr_hpsdr/trunk/W5WC

KD5TFD source code: click here
http://svn.tapr.org/repos_sdr_windows/OpenHPSDR/PowerSDR/branches/kd5tfd

W5WC skins with installer here
http://svn.tapr.org/repos_sdr_hpsdr/trunk/W5WC/OpenHPSDR_Skins/

A BIG thank you to Joe, K5SO and Doug, W5WC for adding support for the **100W PA** and other refinements to the code!

**K.I.S.S_Konsole from OpenHPSDR team**
http://svn.tapr.org/repos_hpsdr_kiss/branches/K9TRV/KISSKonsoleUnified

VK6APH has added new VNA capabilities to FPGA and K.I.S.S. codes.

Hermann, DL3HVH, is experimenting with parallel code using CUDA, OpenGL and OpenCL

https://plus.google.com/107168125384405552048/posts

**cuSDR32-VS**: cuSDR32_MSVS (Compiled with MS VS 2010 requires .Net 4.0)
Code at SVN: http://svn.tapr.org/repos_sdr_hpsdr/trunk/DL3HVH/cuSDR32/

**cuSDR64-VS**: cuSDR64_MSVS (Compiled with MS VS 2010 requires .Net 4.0)
Code at SVN: http://svn.tapr.org/repos_sdr_hpsdr/trunk/DL3HVH/cuSDR64

**ghpsdr3 - QtRadio from John Melton** GIIIORX/N6LYT
and a new branch by Alex Lee

**Heterodyne (MAC/OS) by Jeremy McDermond**

**OpenHPSDR software repository and information**
http://openhpsdr.org/download.php

## Appendix – B -- VK6PH DDC/DUC Presentation

## HIGHLY RECOMMENDED FOR ALL NEW DDC LEARNERS

To learn all about Digital Down Converter technology, **please purchase DVD #6** from (Amateur Radio Video News) in which Phil Harman VK6APH teaches us the practical details from his wonderful presentation at ARRL/TAPR DCC-2008. The DVD consists of 4 hours of high quality education in DDC by Phil Harman. The ARVN webpage says: Software Defined Radio "Through the Looking Glass" Phil Harman VK6APH leads you on an entertaining, detailed trip through the design of the Mercury SDR receiver. With the A/D converter preceded only by a bandpass filter, Mercury does everything in software, at a price hams can afford. It is the leading edge in ham radio technology.

**http://www.arvideonews.com/dcc2008/**

BRICK SDR from EU1SW
by Lin00bs

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