

NH7020 EXPANSION USERS MANUAL

Version	Time	Description	Notes
1.0	2020/4/20	First Release	

1.Attention.

The circuit board for this product is **ESD sensitive**.Be mindfull of electro static discharge.
Maintain adequate grounding if handeling the **PCB** of this product.

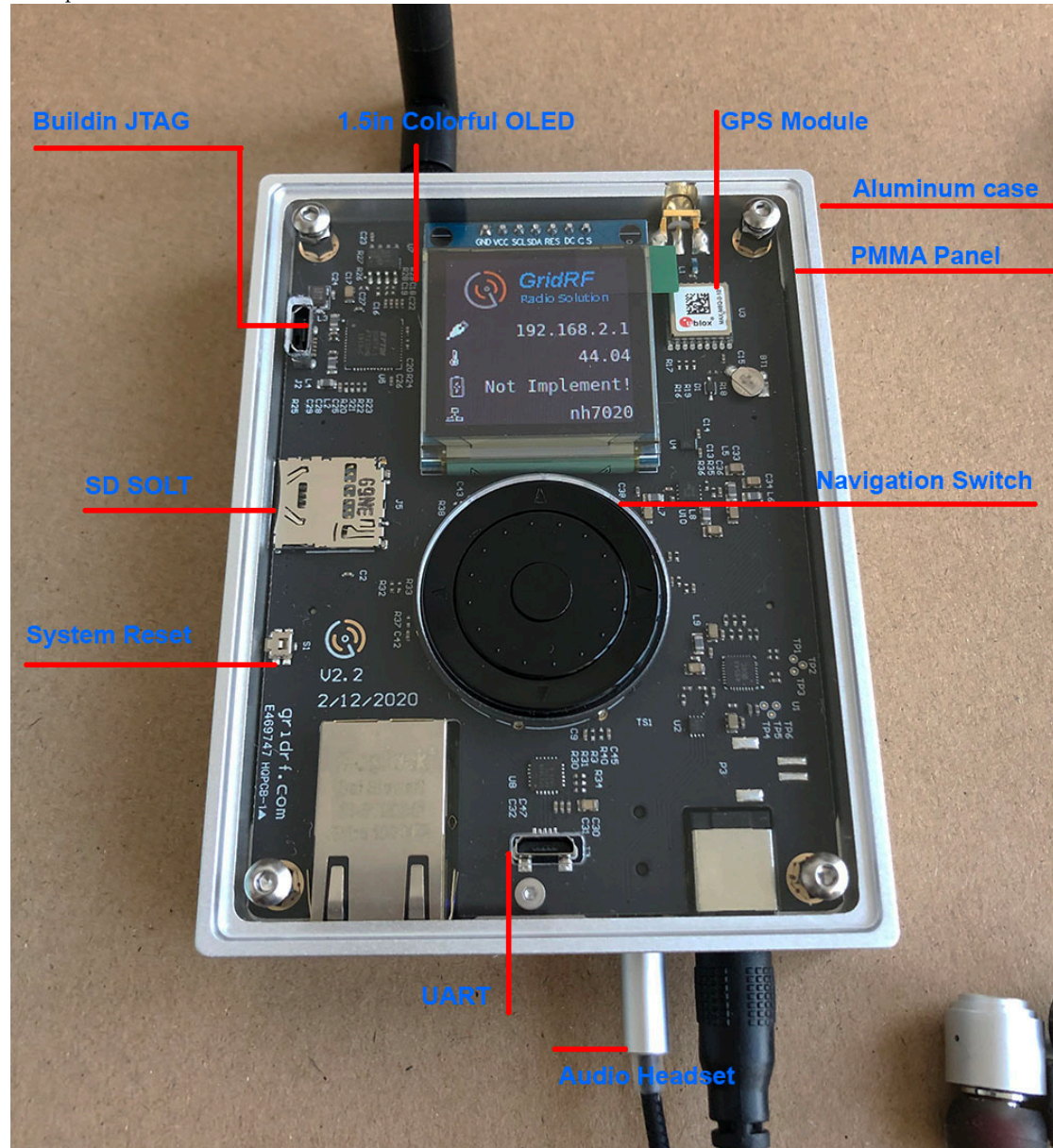
Unit ships with a protective film over its clear front panel; see below how to remove it



2. Product Introduction.

The NH7020 expansion board provides the NH7020 a wealth of usefull enhancements. This expansion board comes equipt with a JTAG debugging port, UART port, 32-bit sound card, Series 8 U-BLOX GPS module, 1.5 inch OLED screen SD Slot and round button interface.

3. Expansion Board:



4. Function and use.

1. JTAG debugging:

Connect USB cable to the JTAG port, select JTAG port from within VIVADO hardware manager

See image below:

HARDWARE MANAGER - localhost/xilinx_tcf/Digilent/210251A08870

There are no debug cores. [Program device](#) [Refresh device](#)

Hardware	
Name	Status
localhost (1)	Connected
xilinx_tcf/Digilent/210...	Open
arm_dap_0 (0)	N/A
xc7z020_1 (1)	Programmed
XADC (System M...	

In this window users can select to program the non-volatile FLASH or FPGA.

2. UART serial port debugging:

Connect a USB cable to the UART port.

The NH7020 will output information after powering on; This interface is connected to the internal ttyPS0, and has SHELL (Equivalent to LINUX Command line), see below:

COM3 (Silicon Labs CP210x USB to UART Bridge (COM3))

File Edit View X server Tools Settings Macros Help

Serial Servers Tools Sessions View Split MultiExec Tunneling Packages Settings Help

Quick connect...

Saved sessions

SCRT sessions

192.168.2.1

COM3 (PlutoSDR Serial Console (C

COM3 (Silicon Labs CP210x USB to

U-Boot NH7020 (Jan 06 2020 - 07:07:38 +0800)

```
I2C: ready
DRAM: ECC disabled 1 GiB
SF: Detected N25Q256A with page size 256 Bytes, erase size 4 KiB, total 32 MiB
In: serial@e0001000
Out: serial@e0001000
Err: serial@e0001000
Model: GridRF.Com NH7020 (Z7020/AD9361)
Hit any key to stop autoboot: 0
Booting silently
Uncompressing Linux... done, booting the kernel.
Starting syslogd: OK
Starting klogd: OK
Starting mdev: OK
Starting watchdog: OK
Starting initializing random number generator: OK
Starting miscellaneous setup: OK
Starting UDC Gadgets: OK
Starting system message bus: done
Starting network: OK
Starting dhcpd Daemon & httpd Server: OK
Starting MSD Daemon: OK
Starting dropbear sshd: OK
Starting gpsd: OK
Starting OLED Display: done
Starting input-event-daemon: done

Welcome to New Horizons
nh7020 login: 
```

3. Sound Card Output:

Insert the headphone cable into the AUDIO Headset port, enter the following commands into the command line:

speaker-test -c 2

The built in **ALSA** application will test both headphone output channels.

The built in **FM** application can be used to demodulate stereo **FM**.

Enter at the command line: **softfm -f 105.4e6 -s 521000**

The **FM** application will demodulate **FM** and output to the **AUDIO Headset** port.

Note: The **FM** application only uses the **RX1** input port, be sure to have an antenna installed on **RX1** before using the application.

Use the command: **softfm -h** for a detailed list of available parameters.

4. GPS Application:

Insert the **GPS** antenna into the **GPS** antenna port, Wait for the **PPS LED** to begin flashing, enter this at the command line: **cgps -s**

The systems **gpsd** application will display current **GPS** location information, see below:

```

Time: 2020-04-11T21:59:24.000Z
Latitude: 20.0000 N
Longitude: 117.0000 E
Altitude: 668.963 ft
Speed: 0.67 mph
Heading: 0.0 deg (true)
Climb: 0.00 ft/min
Status: 3D FIX (12 secs)
Long Err (XDOP, EPX): 2.53, +/- 122 ft
Lat Err (YDOP, EPY): 5.08, +/- 248 ft
Alt Err (VDOP, EPV): 5.31, +/- 400 ft
2D Err (HDOP, CEP): 5.66, +/- 277 ft
3D Err (PDOP, SEP): 7.77, +/- 487 ft
Time Err (TDOP): 6.33
Geo Err (GDOP): 10.04
ECEF X, VX: n/a n/a
ECEF Y, VY: n/a n/a
ECEF Z, VZ: n/a n/a
Speed Err (EPS): +/- 339 mph
Head Err (EPD): n/a
Time offset: -1586642078.282 sec
Grid Square: 0L87ex

```

Seen	0/Used	01	12	5
PRN	Elev	Azim	SNR	Use
GP 12	38	63	39	Y
GP 24	14	49	37	Y
GP 32	49	334	27	Y
GL 66	50	353	29	Y
GL 75	31	29	47	Y
GP 10	0	0	27	N
GP 14	33	310	0	N
65	45	106	0	N
GL 67	6	323	21	N
GL 72	7	127	0	N
GL 76	84	359	26	N
GL 77	36	214	0	N

5. User Interface:

1. The **RESET** button on the expansion board soft resets the system. the unit will power on and be configured.
2. The four arrow directional buttons and center button is used as general pourpouse input. Unit has four directional buttons and a center **ENTER** button, The center button is an encoder that could be rotated clockwise or couter clockwise, it is configured as **gpio-key rotary**.
3. Color **OLED** screen:

This screen can be configured as you would a standard **FrameBuffer**, the driver **fb0** was built in **QT5** as was the user interface.

5. How to develop for this platform.**1. OLED interface:**

The following sample implements an interface using **QT5**:

<https://github.com/gridrf/rfsom-box-gui/tree/master/fft-plot>

2. Sound Card:

The built in **ALSA** driver is the standard **LINUX** **ALSA** driver,

A Sample program could be found in **buildroot/package/softfm**.

Source Code: https://github.com/gridrf/softfm_nh7020/tree/nh7020

Binaries could be generated in **UBUNTU** or **WINDOWS** using **cmake**.

The **NH7020** provides a cross platform wireless solution.

3. GPS:

Please refer to: <http://savannah.nongnu.org/projects/gpsd/>

4. Break free from cookie cutter source code:

Configure the unit to take full advantage of the provided hardware schematics.

6. Product Service.

Technical Email: tech@gridrf.com | QQ: 120986679

7. Documentation.

Standardized to align with **CC BY 3.0** (<https://creativecommons.org/licenses/by/3.0>) ,

Any and all modification must credit the original source.

The original source for this project is **gridrf.com** and the world famous **gridrf team**,

Any and all documents are also applicable to this agreement.