



FREE STAR*

BeagleBone and Raspberry Pi

Image Installation and Quick Start Guide for Gateway and

Personal Hotspots



This guide is for users wishing to build an embedded system or appliance, such as a BeagleBone or Raspberry Pi.

Do not use this guide if you intend to install on a PC with an existing CENTOS installation.

The FREE STAR* team has put together two disk images that can be downloaded from here:

For the BeagleBone:

www.va3uv.com/hp/free-star-beagle-bone-4gb.zip

For the Raspberry Pi:

www.va3uv.com/hp/free-star-pi-4gb.zip

Unzip the images in prep' for burning to a SD / μ SD card.

Burning the image to your SD / μ SD card

Option 1:

Download physdiskwrite.

(<http://mOn0.ch/wall/downloads/physdiskwrite-0.5.2.zip>) - usage example here (<http://linhost.info/2010/05/write-a-img-to-a-compact-flash-with-physdiskwrite/>)

Open a DOS window and navigate to where you saved physdiskwrite.

Be sure to know exactly which device your SD / μ SD card is... use physdiskwrite.exe -a to list the devices. On my XP system, the SD card was device 4.

To burn the image:

```
physdiskwrite.exe -u free-star-pi-4gb.img
```

Option 2:

On a Windows box, you can use winimage to burn the image to your micro SD Card (in the case of a BeagleBone) or a full size SD card in the case of the Raspberry Pi (a 4GB card is required in both cases).

Download the image and unzip it, you will have a *.img file.

Greg, VA3OMP, offered the following instructions to help folks to burn the image to a μ SD card with Win Image:

Win Image can be downloaded from here:

<http://www.winimage.com/download.htm>

Bare bones instructions for Winimage

1. Download the image file for FreeStar* Beaglebone. Usually with an ext of .img
2. Insert your USB card reader with your 4G microSD card into your PC.
3. Open WinImage (administrator).
4. You'll get the standard "Do you want to allow..." message click on yes.
5. You'll get a nag message to register. Just click on okay.
6. A window will appear "Click the partition to connect to" with a pull-down option with a default of "Partition on disk 0, size:#####MB, FAT".
7. Click on okay.
8. Click on the Disk tool and click on "Restore Virtual Hard Disk image on physical drive..."
9. Click on the disk with the USB 2.0 SD MMC Reader. On the type of file, change to *.*. Navigate to your .img file and click it.
10. You'll get a last chance before you write screen, click on Yes.
11. It'll take a few minutes to write and you'll be finished.

If for some reason the write fails or has errors, do a full format with the HP USB Disk Format Storage Tool and try the above process again.

At this point you will have a μ SD card or a full-size SD card with the FREE STAR* image, ready to plug into your BeagleBone or Raspberry Pi - go ahead, plug in the card. It is a good idea to plug in your radio/repeater interface at this point (GMSK board, DVRPTR board, or the red DVAP device) before powering up for the first time. Power-up your board (in the case of the BeagleBone, we recommend an external 5V supply so that the Bone will run at 700MHz). In the case of the Raspberry Pi, power is applied via the micro USB connector (we used a Blackberry USB charger to power the Pi in our Lab).

Communicating with the Bone from your Windows computer via USB:

Connect to a PC via USB - use Windows Control Panel > Device Manager to confirm the COM Port for the Bone.

Use PuTTY to communicate via the appropriate COM port (115200 baud, N, 8, 1)

Press <Enter> a few times to get the login prompt

The Raspberry Pi image has been configured to acquire a dynamic IP address from your router / DHCP server. Since the Pi has a HDMI video output, which may present a challenge for older monitors. On our test system, we determined the IP address from the router and then used an SSH client to login remotely (port 222). *Note the micro USB connector on the PI does not have the data lines connected, so you cannot communicate with the PI via the USB port.*

Login with user: root password: Fr33starAdm1n

Change the root password with the 'passwd' command. Choose a strong password – a combination of letters and numbers do not forget it!

Note there is no graphical user interface – 'startx' on the Pi will have no effect.

Network Setup (BeagleBone)

Execute the following command - confirm the address of your network interface adapter (e.g., eth0, eth1, etc...)

`ip link show`

You may find that your network adapter is something other than eth0 (e.g., eth1)

The image will have my network adapter (MAC address) assigned to eth0.... when you first boot-up, your NIC adapter will be assigned the alias eth1. You may wish to re-assign your eth1 adapter with the alias eth0.

Edit the file `/etc/udev/rules.d/70-persistent-net.rules`

```
# This file was automatically generated by the /lib/udev/write_net_rules
# program, run by the persistent-net-generator.rules rules file.
#
# You can modify it, as long as you keep each rule on a single
# line, and change only the value of the NAME= key.

# Unknown net device (/devices/platform/cpsw.0/net/eth0) (cpsw)
#SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*",
ATTR{address}=="00:18:31:8f:e7:4f", ATTR{dev_id}=="0x0", ATTR{type}=="1",
KERNEL=="eth*", NAME="eth0" ← comment out this line
```

```
# Unknown net device (/devices/platform/cpsw.0/net/eth0) (cpsw)
```

```
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*",  
ATTR{address}=="00:18:31:e1:ae:e1", ATTR{dev_id}=="0x0", ATTR{type}=="1",  
KERNEL=="eth*", NAME="eth1" ← Rename eth1 to eth0
```

Comment out the line where eth0 is specified (which has my MAC address)... then rename, your eth1 as eth0.

Save / Exit

The BeagleBone image has been set with a static IP of 192.168.1.10 - if you need to change this per your own network IP scheme, follow the instructions below.

Network Setup (Raspberry Pi)

Since the image for the Raspberry Pi was set to acquire a dynamic IP address, we recommend setting a static IP address as described below.

Setting a Static IP (BeagleBone)

in /etc/network/interfaces file:

```
# This file describes the network interfaces available on your system  
# and how to activate them. For more information, see interfaces(5).
```

```
# The loopback network interface  
auto lo  
iface lo inet loopback
```

```
# The primary network interface  
#allow-hotplug eth0  
#iface eth0 inet dhcp
```

```
# Static IP address  
auto eth0  
iface eth0 inet static  
    address 192.168.1.10 ← edit this block  
    netmask 255.255.255.0  
    network 192.168.1.0 ← 4th octet is 0  
    broadcast 192.168.1.255 ← 4th octet is 255
```

gateway 192.168.1.1 ← your router address

Setting a Static IP (Raspberry Pi)

In /etc/network/interfaces file, you will find the following:

```
auto lo
```

```
iface lo inet loopback
iface eth0 inet dhcp
```

Modify this file as follows:

```
auto lo ← line 1 same as before
iface lo inet loopback ← line 2 same as before

# Static IP address ← add this block
auto eth0
iface eth0 inet static
    address 192.168.1.10 ← edit address to suit
    netmask 255.255.255.0
    network 192.168.1.0 ← 4th octet is 0
    broadcast 192.168.1.255 ← 4th octet is 255
    gateway 192.168.1.1 ← your router address
```

Save / Exit

For both the BeagleBone and Raspberry Pi...

In /etc/resolv.conf add the following:

```
nameserver 192.168.1.1 ← the address of your router
nameserver 8.8.8.8 ← Google public DNS
```

Save / Exit.

To stop and start the network:

```
ifdown eth0
ifup eth0
```

Reboot your BeagleBone or Raspberry Pi with the `reboot` command.

When it comes back online, check to confirm your network adapter is live:

`ifconfig`

You should see something like this (NOTE in the example below, the IP was set to 192.168.1.4)

```
root@beaglebone:~/g2_link# ifconfig
eth0  Link encap:Ethernet HWaddr 00:18:31:8f:fd:37
      inet addr:192.168.1.4 Bcast:192.168.1.255 Mask:255.255.255.0
      inet6 addr: fe80::218:31ff:fe8f:fd37/64 Scope:Link
      UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
      RX packets:50179 errors:0 dropped:1 overruns:0 frame:0
      TX packets:9996 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:1000
      RX bytes:4010461 (3.8 MiB) TX bytes:696614 (680.2 KiB)

lo    Link encap:Local Loopback
      inet addr:127.0.0.1 Mask:255.0.0.0
      inet6 addr: ::1/128 Scope:Host
      UP LOOPBACK RUNNING MTU:16436 Metric:1
      RX packets:111110 errors:0 dropped:0 overruns:0 frame:0
      TX packets:111110 errors:0 dropped:0 overruns:0 carrier:0
      collisions:0 txqueuelen:0
      RX bytes:6303110 (6.0 MiB) TX bytes:6303110 (6.0 MiB)
```

Now check for connectivity to the outside world:

`ping www.yahoo.com` (CTRL c to stop)

Firewall Configuration

Forward the following ports on your router / firewall to the static address that you assigned to your BeagleBone or Raspberry Pi:

- TCP 222 (default port used for SSH) and port 80 for web / dashboard (optional)
- UDP 20001
- UDP 30001
- UDP 40000

Customizing the Configuration Files

Download the install script from the VA3UV site and execute as follows:

```
cd /tmp
```

```
wget http://www.va3uv.com/hp/debian-setup.sh
```

```
chmod +x debian-setup.sh
```

```
./debian-setup.sh
```

The script will first update your system with any packages / updates since the image was built. This process may take a while.

Next the script will prompt you to select your location info – e.g., geographic zone and then the city so that the local time can be set.

Following customization of the environment, you will be prompted to answer a few questions, please have your ircddb password (the long one!) issued for your Gateway callsign on-hand.

NOTE – if you are setting up a personal hotspot:

Please use your personal callsign when prompted for a Gateway callsign. When prompted for your ircddb password, you can enter anything you like – e.g., 1234.

The install script will prompt you to select your radio interface – options supported are the GMSK board (Dutch Star, NI2O, Star Board, Satoshi, GMSK Micronode, etc.), the DVRPTR v1board from the German team, the red DVAP device or either the DVRPTR v1 or v2 boards using the XDVRPTR firmware.

We have tested a BeagleBone and Raspberry Pi running both a Satoshi GMSK node adapter and a DVRPTR board (in a dual module setup, with both modules running full-duplex) with excellent results (using a USB hub with external power). The install script allows you to setup one RF module. Please contact us for additional information if you wish to setup a second RF module.

All config files will be updated via the install script. Note if you select the dvrptr board as your radio interface, the script will advise you to look at the dvrptr.log file (/var/log/dvrptr.log or /var/log/dvrptr2.log) to obtain the serial number of your board; take a note of the serial number and then manually edit the serial number in the dvrptr.cfg file (found in /root/dvrptr/dvrptr.cfg), save / exit and then restart the dvrptr service with the `service dvrptr restart` command (or `service dvrptr2 restart` if you are using the XDVRPTR firmware). A similar process applies for the red DVAP device – the serial # will need to be retrieved from the /var/log/dvap_rptr.log file and entered into the dvap_rptr.cfg file (found in /root/dvap_rptr/dvap_rptr.cfg).

You will need to edit the g2_ircddb.cfg file (in the /root/g2_ircddb folder) to update your Gateway coordinates and frequency - as shown below:

Editing g2_ircddb.cfg

This config file is found in the /root/g2_ircddb directory. An extract is shown below, highlighting the lines to be edited.

```
# This is for APRS/GPS
SEND_APRS=Y
# The repeater module specifications
#   LATITUDE, LONGITUDE, RANGE, DESCRIPTION
# If you do NOT want to define the aprs parameters for a module,
# then leave the line BLANK

RPTR_ID_A=
RPTR_ID_B=43.5930,-79.78917,10,FREE STAR* DV 443.8125 +5.00 MHz
RPTR_ID_C=43.5930,-79.78917,10,FREE STAR* DV 147.5400 +0.00 MHz
```

← EDIT the above lines to suit your location / frequencies. If you only have one module, leave the other 2 lines blank (do not delete them!)

```
# Which local address on your Linux box will be used
# to report to the remote IRC database server(group2, group1,...)
# For most installations it is 0.0.0.0 (which binds to all local IP addresses)
# If you have more than one ethernet card, then you may set it to a specific local IP
# that is assigned to that specific ethernet card
# If you have one ethernet card, you can use 0.0.0.0
LOCAL_IRC_IP=0.0.0.0
```

```
# This is for the Live IRC site
SEND_QRGS_MAPS=Y
# LATITUDE, LONGITUDE, description1, description2, url
QTH=43.5930, -79.78917, Mississauga ON, BeagleBone, www.freestar.us ← EDIT to suit
# Frequency, shift, range, antenna's height above ground(agl)
QRG_A=
QRG_B=443.8125, 5, 10, 20 ← EDIT these 2 lines.
QRG_C=147.540, -0.0, 10, 20 ← If you only have one module, leave the other 2 lines blank
Once you have edited this file, save / exit... then restart g2_ircddb as follows:
```

NOTE: if this is a personal hotspot, please change the ircddb server setting to use the Italian TEST server:

```
IRC_DDB_HOST=server1-ik2xyp.free-dstar.org
```

service g2_ircddb restart

Changes to crontab for the web Dashboard

`crontab -e` to get to the crontab editor.

Locate this line:

```
*/2 * * * * /root/g2_link/g2_lh VA3UV VE3URU "FREE STAR* GW v3.07" >
/var/www/index.htm
```

Change to:

```
*/2 * * * * /root/g2_link/g2_lh 1NFO VE3URU "FREE STAR* GW v3.09" 127.0.0.1 >
/var/www/index.html
```

<Note on the Raspberry Pi, the output is sent to index.html; on the BeagleBone the output is sent to index.htm>

Replace 'VA3UV' with 1NFO.

Replace VE3URU with your Gateway callsign (or personal callsign for a personal hotspot).

Update the GW version #

Add the IP address (127.0.0.1)

IF – you are setting up a personal hotspot, please locate this line:

```
5 6 * * * /root/my_scripts/get_gwy_list.sh > /var/log/get_gwy_list.log 2>&1
```

Comment it out (by inserting a '#' at the front of the line.

<Ctrl> x to exit / Press y to save the file.

Then enter:

```
service cron restart
```

Log Files

The image, as supplied, has logging disabled. This is to preserve CPU cycles so that we can get optimal system response, the best audio quality possible and preserve the life of the SD card.

For troubleshooting, you may wish to enable logging; this can be done by editing the following:

| Package | Enable Logging (By Editing) | Log File |
|-----------|------------------------------|------------------------|
| g2_ircddb | /etc/init.d/g2_ircddb | /var/log/g2_ircddb.log |
| g2_link | /etc/init.d/g2_link | /var/log/g2_link.log |
| rprr | /root/rprr/rprr.sh | /var/log/rprr.log |
| dvrprr | /root/dvrprr/dvrprr.sh | /var/log/dvrprr.log |
| dvrprr2 | /root/dvrprr/dvrprr2.sh | /var/log/dvrprr2.log |
| dvap_rprr | /root/dvap_rprr/dvap_rprr.sh | /var/log/dvap_rprr.sh |

We recommend disabling logging once your system is online and stability has been confirmed. That's it – welcome to the FREE STAR* project.

Last Item for Personal Hotspots

Edit the gwys.txt file in /root/g2_link :

```
cd /root/g2_link
```

```
nano -w gwys.txt
```

```
<CTRL> w - search for XRF
```

The port # for XRF reflectors, will be 30001 (by default), change the port number to 20001 for all XRF reflectors.

```
<CTRL> x to save / exit
```

```
service g2_link restart
```

Please drop me a note (Ramesh@va3uv.com) so that I can add you to my mailing list for system updates, notices, etc.