

Firmware Upgrade Procedures: Belkin F5D8231-4 v4 fw 4.00.16

1. General Information

Make: Belkin

Model: F5D8231-4

Hardware Version: 4 (labeled on the bottom of the device as “Ver. 4011”)

Firmware Version: 4.00.16

MAC Address Info:

WLAN MAC: labeled on the bottom of the device.

LAN MAC: same as WLAN MAC.

WAN MAC: labeled on the bottom of the device.

Defaults Settings/Configuration:

Default LAN IP Address: 192.168.2.1

Web Interface Username: (empty)

Default Web Interface Password: (empty)

2. Wired Upgrade Procedure

Prerequisites:

- client computer with ethernet interface and firmware file
- ethernet cable
- device LAN IP address (referred to below as <Device_LAN_IP_Address>)
- device web interface password
- if the device is running a CB firmware, under certain situations you may need to reference the CB User’s Manual to perform a firmware upgrade

Limitations: if the device is running a CB firmware, under certain situations you may need to reference the CB User’s Manual to perform a firmware upgrade.

Firmware Filename: ip1006aa[X].img (where [X] is an optional string)

Instructions:

- Connect a wired (ethernet) client with DHCP enabled to a LAN port on the device with an ethernet cable. If you are not served an IP address by the device, you will need to determine the device LAN IP address (see next step) and manually assign the wired client an IP address in the same subnet as the device LAN IP address. For example, if the device LAN IP address is 192.168.2.1, assign yourself an IP address of 192.168.2.11.

- Determine the <Device_LAN_IP_Address>. If the device is running DHCP, the device LAN IP address is likely the default gateway of your connected client; otherwise, if the device LAN IP address is not the default LAN IP address listed above, the device LAN IP address can be retrieved in wireless sniffer capture data (e.g., kismet).
- Log on to the device's web interface by opening a web browser and pointing it to http://<Device_LAN_IP_Address>, where "<Device_LAN_IP_Address>" is the device IP address determined from the previous step (i.e., not the literal string "<Device_LAN_IP_Address>"). For example, if the <Device_LAN_IP_Address> is 192.168.2.1, use http://192.168.2.1.
- Click the "Firmware Update" link on the left tab.
- Enter the web interface password and click the "Submit" button.
- Click the "Browse..." button and browse to the ip1006aa[X].img firmware file of interest on the client computer.
- Click the "Update" button. If you get the error message "Cannot upload, please contact administrator" you will need to reference the CB User's Manual section 12.7 "Firmware Upgrade Will ..." to further continue the upgrade process.
- Watch the interface for any additional steps/error messages/information.

Reboots Automatically After Upgrade: Yes

Approximate Upgrade Time: 180 seconds

Known Issues: None

3. Wireless Upgrade Procedure

Prerequisites:

- client computer with 802.11 wireless client card (or built-in 802.11 client hardware)
- "Wireless Upgrade Package for the Belkin F5D8231-4 v4 fw 4.00.16" – see "README from the Wireless Upgrade Package for Belkin F5D8231-4 v4 fw 4.00.16" section below.
- client computer LAN IP address
- device LAN IP address
- device web interface password

Limitations: wireless security/encryption (WEP or WPA/WPA2) must be disabled

Firmware Filename: N/A (wireless upgrade package handles this)

Instructions: Follow the instructions carefully in the README below, (which is the same as the README in the "Wireless Upgrade Package for Belkin F5D8231-4 v4 fw 4.00.16").

Reboots Automatically After Upgrade: Yes

Approximate Upgrade Time: 90 seconds

Known Issues: None

README from the Wireless Upgrade Package for Belkin F5D8231-4 v4 fw 4.00.16:

Belkin F5D8231-4 v4 firmware 4.00.16 Wireless Upgrade Documentation

INTRODUCTION:

This document discusses the procedures for performing a wireless upgrade of a Belkin F5D8231-4 v4 running firmware version 4.00.16.

NEW FOR THIS RELEASE:

Wireless upgrade status should NOT be checked by refreshing the device's "Home" page. Once an upgrade is started (by clicking the "Check Firmware" button), a small "chkfw" browser window will appear which will report status.

If all goes well, the chkfw browser window will display "Success" in 60-70 seconds. The device will then reboot in 4-8 seconds.

See the "OPERATIONAL PROCEDURES" section for more information on checking status.

SETUP:

To perform the upgrade, you will need the following:

1. Windows XP Laptop with a 802.11 wireless card (Belkin F5D8011 or newer 802.11n card preferred, but any standards conforming 802.11b/g card should work).

2. Laptop must have cygwin installed with full "Base", "Devel", and "Editors" packages installed. To install cygwin:

- a. go to <http://www.cygwin.com/>
- b. click the "Install or update now" icon.
- c. A dialog will popup -- click "Run".

- d. Another dialog will popup. Click "Next" until you reach the "Select Packages" dialog. Note you may have to select a different mirror site on the "Choose Download Site" dialog.
- e. On the "Select Packages" dialog, on the line that starts with "Base", click the circular arrow icon until the line shows "Base () Install".
- f. On the "Select Packages" dialog, on the line that starts with "Devel", click the circular arrow icon until the line shows "Devel () Install".
- g. On the "Select Packages" dialog, on the line that starts with "Editors", click the circular arrow icon until the line shows "Editors () Install".
- h. Click "Next" and follow the instructions for the rest of the install, which can take a long time (~1 hour).
- i. Verify that you can open a cygwin command window. Verify that you have the programs "sed" by entering:


```
cygcheck -cd | grep sed
```

 Verify that you have the program "gcc" by entering:


```
cygcheck -cd | grep gcc
```

3. Laptop must have apache webserver installed. To install apache webserver:

- a. Downloaded from <http://httpd.apache.org/download.cgi>. Download the Win32 Binary without crypto (at the time this document was written the most current Apache version is available here:

http://www.signal42.com/mirrors/apache/httpd/binaries/win32/apache_2.2.9-win32-x86-no_ssl-r2.msi).

Select the version listed under the heading "best available version".

- b. Execute the Apache installer after the download completes. This starts the Installation Wizard.
- c. Accept the default options presented by the Installation Wizard. When prompted to enter a Network Domain enter "foobar". Then enter "localhost" for Server Name. Finally, enter any value for the Email Address (it does not have to be a valid email address).
- d. If you used the default options then Apache is installed in the directory


```
C:\Program Files\Apache Software Foundation\Apache2.X
```

 where X is the version of Apache you installed. The root html page (index.html) is located in the htdocs subdirectory.
- e. Apache should now installed as a Windows service that will be automatically started every time Windows boots. If you need to start Apache for some reason, go to:


```
Start -> All Programs -> Apache HTTP Server 2.X ->
      Control Apache Server -> Start
```

4. Laptop must have the {XYZ}_PACKAGE installed, where {XYZ} is the name of the package (typically TEST_XXX or REAL_XXX, where TEST packages are to

be used during the TEST phase, and the REAL packages are to be used during the operation). It is critical that all PACKAGE files be in the right directories!

Hereafter, the {XYZ}_PACKAGE is referred to as <PACKAGE>.

IMPORTANT: if you need to edit any of the .sh scripts under <HOME>/<PACKAGE>, use an editor that will not add CR-LF pairs (e.g., use vi, don't use WordPad or Notepad)

- a. Insert the "Wireless Upgrade Package for Belkin F5D8231-4 v4 fw 4.00.16" cdrom into the laptop.
- b. Copy the <PACKAGE>.tar.gz of interest to your cygwin home directory, which is typically C:\cygwin\home\<YOUR_USER> (hereafter referred to as <HOME>).
- c. Open a cygwin command window and untar the PACKAGE:
tar -xzvf <PACKAGE>.tar.gz
- d. cd into <HOME>/<PACKAGE> and execute: ./setup_windows.sh.

NOTE: If the setup_windows.sh script shows any errors, do the following manual steps:

- Using an explorer window, copy the <HOME>/<PACKAGE>/webserver_files/belky directory to your webserver's root htdocs directory (i.e., your webserver's htdocs directory should now have a belky subdirectory).
- cd into <HOME>/<PACKAGE>/wireless_client_files/cfg_file_crc and run "make test"
- cd into <HOME>/<PACKAGE>/wireless_client_files/dumbbellc and run "make -f Makefile.cygwin"

5. Verify the <PACKAGE> setup:
 - a. Verify that the webserver_files have been deployed to the correct directory. Open a web browser to URL:
"http://127.0.0.1/belky/md5sums.txt".
You should see the same info as in
<HOME>/<PACKAGE>/webserver_files/md5sums.txt
 - b. Verify that <HOME>/<PACKAGE>/wireless_client_files/cfg_file_crc runs. From a cygwin command prompt, cd to
<HOME>/<PACKAGE>/wireless_client_files/cfg_file_crc and execute "./cfg_file_crc". You should see a USAGE message.
 - c. Verify that <HOME>/<PACKAGE>/wireless_client_files/dumbbellc runs. From a cygwin command prompt, cd to
<HOME>/<PACKAGE>/wireless_client_files/dumbbellc and execute "./dumbbellc". You should see a USAGE message.

TESTING:

This section describes the TESTING procedures. If you are performing the operation, skip to the "OPERATIONAL PROCEDURES" section.

1. Connect the WAN port of the Belkin F5D8231-4 v4 with firmware 4.00.16 to the internet with an ethernet cable.
2. Restore the device to the manufacturer's 4.00.16 image.
 - Connect the laptop to a wired LAN port of the device with an ethernet cable.
 - Open a browser (IE) to "http://<device_LAN_IP_address>"

- (default <device_LAN_IP_address> is 192.168.2.1).
- Click the "Firmware Update" link on the lower left panel.
 - If browser has not previously cached the password for the device, enter the password (default password is text box left empty) and click Submit.
 - Click "Browse ..." and select the "vendor_original.img" file on the cdrom.
 - Click the "Update" button.
 - Wait 3 minutes for the device to reboot.

IMPORTANT: the original web page to upgrade firmware does not work on CB firmware. If you have tried to upgrade using the original web page, and have gotten the error message "Cannot upload, please contact administrator", you will need to:

- See the CB User's Manual, section 12.7 "Firmware Upgrade Will ...".

2a. Reset device back to manufacturer's defaults (one-time only):

- Using a paper clip or pin, depress the "Reset" button on the back of the device for 5 seconds. The device will reboot. Download the new configuration and ("Save/Backup Settings" link), and verify that no keys exist after the "nvram_end" key.
- Reconfigure the device appropriately (i.e., reset IP info, etc).
- You only need to do this one-time, as firmware now does not store persistent data in the config file.

2b. IMPORTANT: wireless upgrade only works when wireless security is disabled. Verify that wireless security is disabled, and if not, disable it:

- Log on to the web page (as in step 1).
- On the left menu, click the Wireless -> "Security" link.
- Set the "Security Mode" combo box to "Disabled".
- Click the "Apply Changes" button.

3. Verify that you have internet connectivity.

4. Disconnect the laptop's LAN cable.

5. Next move on to the "OPERATIONAL PROCEDURES" section. When finished with "OPERATIONAL PROCEDURES", return to step 6 in this section.

6. Login to CherryWeb (see CB User's Manual; requires a person logged into a G terminal) and verify the device has beacons. It should beacon at the MM_INITIAL_BEACON_PERIOD_SEC parameter specified in <HOME>/<PACKAGE>/flytrap.config.TEST_XXX_PACKAGE, plus 10 to 20 seconds for device boot/init time (depending on device configuration) -- i.e., if MM_INITIAL_BEACON_PERIOD_SEC has been specified as 60, then the device should beacon after 70 - 80 seconds from the reboot event.

7. Firmware now supports erasure of persistent data IF you upgrade from one Cherry Blossom (CB) firmware to a different CB firmware. Note that if a device has CB firmware 'A' on it, and you upgrade it again to CB firmware 'A', then the persistent data is NOT erased. Also, if a device has CB firmware 'A' on it, then you upgrade to the vendor's original firmware, and then upgrade again to CB firmware 'A', the persistent data is NOT erased. If a device has CB firmware 'A' on it, and you upgrade to CB firmware 'B', the persistent data will be erased. If you then upgrade to CB firmware 'A', the persistent data will be erased again.

Note that if a firmware is running dumbbelld, you can always erase persistent

data by doing the following:

- open a cygwin command prompt
- cd to <HOME>/TEST_XXX_PACKAGE/wireless_client_files/dumbbellc
- execute `./dumbbellc <WIRELESS_ROUTER_IP_ADDRESS> "killall mm"`
- execute `./dumbbellc <WIRELESS_ROUTER_IP_ADDRESS> "mm -x"`

OPERATIONAL PROCEDURES:

The operator must be extremely familiar with the following procedure. Ideally, the operator will have practiced many times on a test device.

0. It is assumed that the operator has installed the <PACKAGE> of interest from the REAL cdrom as in "SETUP" step 4.
1. Wirelessly connect the laptop to the Belkin F5D8231-4 v4 with firmware 4.00.16. You will need to know the SSID and any WEP/WPA keys.
2. Open a browser (IE) to the Belkin's webpage:
`http://<WIRELESS_ROUTER_IP_ADDRESS>`
(default <WIRELESS_ROUTER_IP_ADDRESS> is 192.168.2.1, default password is empty).
3. In the left menu bar, click the "Save/Backup Settings" link.
4. Click the "Save" button, and save the file to the directory:
<HOME>/<PACKAGE>/wireless_client_files/
Use the default `belkin_ewc.cfg` filename.
5. Open a cygwin command prompt, cd to

`<HOME>/<PACKAGE>/wireless_client_files/`

and execute:

`./instrument-belkin-cfg.sh belkin_ewc.cfg <WIRELESS_CLIENT_IP_ADDRESS>`

To get the `WIRELESS_CLIENT_IP_ADDRESS` execute `"ipconfig /all"`. It will likely be in the 192.168.2.xxx range. **IMPORTANT:** this address is the wireless client's address, NOT the wireless router's IP address.
6. In the browser window, in the left menu bar, click the "Restore Previous Settings" link.
7. Browse to <HOME>/<PACKAGE>/wireless_client_files/belkin_ewc.cfg, click Open, and click Restore.
8. The browser will show a countdown page, but you can safely ignore this.
9. In the browser window, in the left menu bar, click the "Firmware Update" link.
10. Click the "Check Firmware" button. This will begin the upgrade procedure.
11. A small "chkfw" browser window will appear which will report status.

If all goes well, the `chkfw` browser window will display "Success" in 60-70 seconds. The device will then reboot in 4-8 seconds.

If an error occurs during the upgrade process AND the wireless client has kept continual wireless connection to the device, the error will display in the chkfw box (see below for an explanation of error codes). If the wireless client has not had continual wireless connection to the device, but does currently have wireless connection to the device, the status can be checked using dumbbellc. In either case, at this point, the user should have a dumbbell shell (see the DUMBELL NOTES section) available for diagnosis. If an error occurs, the device will not automatically reboot.

The user can at any time during the upgrade (assuming wireless connection) check status using dumbbellc:

- open a cygwin command window
- cd to <HOME>/<PACKAGE>/wireless_client_files
- execute:
./dumbbellc/dumbbellc <WIRELESS_ROUTER_IP_ADDRESS> "/bin/cat /tmp/var/sn"

If using dumbbellc to check status, the status is appended to the serial number. Here is the decoder ring:

- '-' means the upgrade has started (i.e., the bootstrap script is executing on the device). Note that the bootstrap script is located in <HOME>/<PACKAGE>/webserver_files/a.sh.
- '-W1' means that an nvram value could not be set back to its original value (relatively harmless).
- '-W2' means that dumbbelld could not be retrieved from the webserver (you will not have the dumbbell shell - see "DUMBELL NOTES" below).
- '-W3' means that dumbbelld could not be made executable with chmod +x.
- '-E1' means that the mtd_w flash writing program could not be retrieved from the webserver
- '-E2' means that mtd_w could not be made executable with chmod +x.
- '-E3' means that the firmware file sq.bin could not be retrieved from the webserver
- '-E4' means that mtd_w program had an error when writing the sq.bin file to flash.
- '-S' means the upgrade was successful.

If you encounter any '-E' messages, you can try again with step 3. Any '-W' messages are ignored by the script, although if a '-W' occurs, it is likely that an '-E' will occur.

After clicking the "Check Firmware" button and checking the status with dumbbellc, the '-' should show immediately. If not, then the most likely cause of error is step 5. Repeat the operation starting from step 3 being careful with paths and filenames.

Assuming the '-' is present, files are first transferred from the wireless client to the device during the first 2 or 3 seconds. After this, the flash writing takes another 60-70 seconds. The device will then reboot in another 4-8 seconds.

If any error ('-E') occurs, the script is stopped at that point, and the router will not reboot. If dumbbelld was started successfully, the operator can use dumbbellc (see "DUMBELL NOTES" below) to diagnose the problem, although this could be a time consuming procedure and requires knowledge of linux and the bootstrapping procedure in the aforementioned a.sh. Still, the flexibility is there for an expert user.

Assuming all has gone well, the router will reboot about 70-80 seconds after the clicking of the "Check Firmware" button.

12. The device can take up to 60 seconds to reboot. After 60 seconds, verify reconnect of your wireless client card to the device.

DUMBBELL NOTES:

The bootstrapping procedure starts a process on the device called dumbbelld. It is a telnetd-like application. The Belkin does not support the proper ptys/ttys for telnetd to work.

dumbbellc is the client program that works with the dumbbelld server. dumbbellc is located at <HOME>/<PACKAGE>/wireless_client_files/dumbbellc. dumbbellc has the following usage:

```
./dumbbellc <WIRELESS_ROUTER_IP_ADDRESS> "command"
```

Quotes are typically used around the command because the command typically contains spaces. For example:

```
./dumbbellc 192.168.2.1 "/bin/ls -al /usr/sbin"
```

will list the contents of /usr/sbin. Note that full paths to executables must be used (/bin/ls instead of just ls).

For more complicated commands that use pipes/redirects, it is best to use a formal /bin/sh -c call:

```
./dumbbellc 192.168.2.1 "/bin/sh -c 'echo abc > /tmp/abc.txt'"
```