RF200PD1 to RF220SU Migration

Design considerations for end-of-life replacement

17 November 2015

Overview

The RF200PD1 modules have been a workhorse in the Synapse Wireless SNAP Engine lineup since their introduction in 2011. Unfortunately, end of life has been declared for the power amplifier used on those modules, eliminating our ability to manufacture new ones.

Fortunately, the RF220SU is a pin-compatible alternative to the RF200PD1. The RF220SU not only fulfills the same role as the RF200PD1, it provides enhanced features such as an additional antenna option, and better transmit and receive ranges. These improvements come with a few design considerations, and this document provides an overview of those considerations.

Synapse is dedicated to helping our customers achieve their goals for our modules. If you have questions regarding the changeover, or need technical assistance in reviewing the implications of this change, please contact us at 877-982-7888.

Introducing the RF220SU

The RF220SU has the same 24-pin footprint as the RF200PD1 that it is replacing. This means there will be no need to adjust your application to relocate ADCs, SPI connections, I^{2}C connections, PWM outputs, or anything else.

This low-cost module can have current consumption under 390nA to enable a new generation of battery-driven systems. The RF220SU includes a new RF front-end that provides a power amplifier and LNA for increased range.

There are a few considerations that may require your attention, though.

The Platform Setting

NV Parameter 41 is the Platform field for SNAP nodes. The RF200PD1 was factory configured with "RF200" in this field. On an RF220SU, it will contain "RF220."

If you have conditional code in your SNAPpy script based on the platform, you may have to make some minor adjustments.

Any "if" statement that branches based on the platform being "RF200" should be updated to make the same branch "RF220":

```
if platform == 'RF200':
    # Your code goes here
```

becomes:

```
if platform == 'RF200' or platform == 'RF220':
    # Your code goes here
```

Firmware Category

The SNAPpy command `getInfo(3)` returns an integer that indicates what kind of hardware your SNAP node is based on. For the RF200PD1, `getInfo(3)` returns a value of 14, indicating "RF200." For RF220SU modules, `getInfo(3)` returns a 30, indicating "RF220."

If you are making use of this information in your code, you will need to make adjustments accordingly.

Firmware Version

The RF220SU module requires different firmware than the RF200PD1 modules. When you update firmware in the RF220SU modules, you must use a firmware image developed for the RF220. The appropriate firmware will include RF220SU in the filename.

Portal Version

Because the RF220SU is relatively new in the Synapse Wireless module family, older versions of Portal will not know how to work with it. You will need to use Portal release 2.6.7 (or newer) to load scripts into the modules.

> **Note:** Older versions of Portal can be used if necessary. Please contact support for assistance loading the new firmware in a previous release of Portal.

Antenna output control

The RF220SU can be switched between using an external antenna mounted on the provided RP-SMA jack, and an external antenna connected to the node's U.FL connector. A vendor-specific feature bit (in NV Parameter 64) controls which antenna option the module uses. By default, the RP-SMA antenna jack is used.

If you wish to attach an external antenna to the module via the U.FL connector, you should set bit 0x0010 in NV Parameter 64 to one.

To do this within a SNAPpy script, you can add the following code to HOOK_STARTUP and ensure that the bit is set properly on bootup:

```
@setHook(HOOK_STARTUP)
def on_startup():
    vendor_settings = loadNvParam(64)

    # To use a U.FL antenna
    if (vendor_settings & 0x10) == 0:
```

```
        saveNvParam(64, (vendor_settings | 0x0010))
        reboot()

    # To use the RP-SMA antenna
    # if (vendor_settings & 0x10) == 0x10:
    #     saveNvParam(64, (vendor_settings & ~0x0010))
    #     reboot()
```

No changes to this setting take effect until you reboot the module.

Channels 14 and 15

FCC regulations restrict "out-of-band" transmissions of RF devices, and the new power amplifier has a higher range than previous versions. In order to maintain FCC limits, the SNAP firmware disables all transmission on channel 15. There may be other restrictions governing other channels, based on the results of FCC certification tests. Those restrictions will be listed in later versions of this document, available from the Synapse Wireless website.

There is also a power restriction on channel 14. When using the RP-SMA antenna, transmissions on channel 14 are restricted to a level comparable to calling txPwr(10). When the U.FL connection is enabled, channel 14's transmissions are governed to a level comparable to calling txPwr(10).

Change in Current Draw

At maximum transmit power the RF220SU will draw 150mA. This is an increase from the 80mA maximum current draw of the RF200PD1. Be sure to check your design for any current draw implications. Reducing the transmit power (using the txPwr() function in SNAPpy) will reduce the current consumption.

FCC Considerations

Since the RF220 has a different FCC ID from the previous modules, FCC-approved end products will have to be rescanned. This should be a straightforward process. For more information and FCC certifications including recommended facilities to expedite recertification, please contact us at 877-982-7888.