

AN520

Converting BUILD5-SP1 devices to SM125 V3.x



APPLICATION NOTE

1. INTRODUCTION

This application note, gives necessary instructions to upgrade existing 125 KHz RFID chips or modules to new generation firmware, V3.x.

The same hardware for CY8C0104 RFID Chip and CY8C0105 RFID module is preserved, and naming for the hardware is changed as SM125-IC RFID Chip and SM125-M1 RFID module.

! IMPORTANT NOTICE

If UART_RX pin is not being used in your designs, it should not be left floating in V3.x. They can be connected to MCU pin (pulled-up), max232/st232 pin or, can be pulled up to VCC with a resistor (i.e. 47K) if not used. Otherwise module will not work as stable and be affected from the noise on UART_RX pin.

There are many new features added based on customers' wish list, and at the same time some features are removed and the communication protocol is changed. If you think this document and the SM125 datasheet do not include adequate information about the migration, then please contact with us to request more information based on your system.

Please note that, SonMicro will be able to supply old firmware for the customers who do not want to migrate to new firmware. However, there won't be any improvement on the previous firmware (Build5 SP1).

Please note that, once the module or chip is upgraded, it will not be possible to reverse the upgrade operation and the device will never be upgraded back to Build5 SP1 firmware again. Therefore it is under user responsibility to upgrade or not.

SonMicro encourages users to upgrade to the new firmware because any new development, reference designs and technical support will be based and focused on the new V3.x firmware.

After the 125 KHz RFID chip or module with BUILD5 SP1 firmware is upgraded to the V3.x firmware, the SMRFID 2.x Software, the Getting Started document and CY8C0104/05 device datasheet will be useless. The upgraded chip or module will be a SM125 device. You need to download the new SM125 tools and the documents.

1.1 What's New in V3.0

V3.0 Firmware is an improvement on old Build 5 SP1 firmware. The new features collected for years in the field, and implemented upon customer standard and most wanted requirements.

- **Bootloader embedded for easy upgrading**
This feature results in faster custom programming and better technical support by us
- **New UART and I2C communication protocol is implemented**
UART communication protocol is changed. Header and command frame structure is used. UART protocol implemented as interrupt model, so any time it is possible to send UART commands now. The previous "acknokok" type communication is removed
- **Read range is improved 1-2 centimeters**
Better on-chip analog system is designed to improve the read range
- **Auto-Read Mode improved**
Now, users can select which tag type, modulation type will be used in Auto-Read Mode. Once it is setup, the auto mode will be stored in non-volatile memory and the SM125 get configured easily.
- **UART Output can be configured**
UART Output can be configured, to output as ASCII or HEX, with Carriage Return(CR) and Line Feed(LF) character options in the footer
- **Wiegand 26-Bit Output feature is added**
User can select Wiegand type output with flexible options.
- **Automatic Output Trigger feature is added**
If enabled; when a tag is read, Output0 can be High for a determined period. A relay or buzzer can be triggered. (External transistor driver may be required, Output0 can supply up to 25mA to the target)
- **Software and Hardware Sleep operation features are added**
Sleep operation will reduce current consumption down to 10-15uA. Eco power mode is removed
- **'Software Reset' command is added**
Now, Reset can be done with UART or I2C commands in addition to hardware reset pin.
- **'Stop Read' command is added**
A read operation can be halted now
- **'Get Configuration' command is added**
Users can investigate the configuration parameters of SM125.
- **'Change Baud Rate' command is added**
Baud rate can be changed easily now
- **I2C Slave Address change feature is added**
I2C Slave address can be changed easily now. Especially useful to run multiple SM125 devices on the same I2C bus
- **I2C and UART operation embedded in the same firmware**
No need for extra upgrade. V3.x firmware supports both communication interfaces at the same time.
- **M_SELECT – is removed**
Mode Select is removed; Module can be accessed over UART or I2C bus at any time.

1.2 What is removed in V3.0

Before migrate to V3.x, which is an **irreversible** migration/upgrade, users should investigate this section very carefully. This section explains what was supported in Build5 firmware and now is not supported.

- **UART communication protocol is changed**
UART communication protocol is completely changed and the “acknwldge” , “acknokok” type protocol is removed. For customers who use this protocol, are encouraged to use the new and better interrupt-model protocol.
- **“Programmability by customer” feature is removed**
Customers can no more embed their own code themselves. Required modifications or add-ons will be done by SonMicro with the embedded bootloader feature. This way customer will be kept away to enter deep technical details which can cause delay in final product. Please contact us for your specific requirements.
- **M_SELECT – Mode Select function is removed**
In V3.x firmware there is no necessary to work in multiple modes. The new firmware does not require M_SELECT pin to enable auto-read mode. This pin is attained as Input0 pin and its logic state can be read by “read input pin” command. Thus the existing hardware connections will not cause any conflict.
- **ST (Sequential Terminator) mode is removed**
There is no demand in the industry for a reader that supports the tags configured for sequential terminator. The industry most used tags uses Manchester RF/64 type tags with byte track option and especially the EM4102 read only tags. Those tags are the primarily supported in V3.x
- **Eco power is removed**
Instead of Eco Power mode, sleep operation and stop read commands are added for better power management
- **SPI communication is on hold**
It will be possible to support SPI communication but the current firmware does not include SPI communication protocol embedded. This feature is left for the future time. Users are encouraged to use I2C or UART.

1.3 What's the SM125 V3.0 Advantage for SonMicro

The old firmware was written completely in assembler language and, the all functions and APIs had to remain in the same flash memory address for customer access. Now the entire system is designed both with assembler and C language, slow bootloader is surprisingly improved, customer programmability is removed, we can prepare new features more quickly, with very less effort no matter the API addresses changes. Moreover this will enable us to develop single chip applications just in days and can release reference designs easily and quickly.

A SonMicro Reference Design hint for the future;

With a single chip, it will now be possible and easy for SM125 act as an I2C Master, access to external EEPROM, seek for the tag ID in the EEPROM and drive the relay for a very basic access control device.

2. LET'S UPGRADE to V3.x

- The upgrade process is not reversible. Once the module/chip is upgraded it will not be possible to return back to previous BUILD5 SP1 firmware.
- If upgrade is going to be done on the SM3005/4005 kit, a DC adapter instead of a battery or a brand new battery is recommended to minimize the power failure risk.
- If the chip or the module is going to be upgraded directly, a RS232 interface and connection to PC is required.
- If the chip/module is working with 3.3V operating voltage, make sure it is supplied with 5V during upgrade.

The necessary tools for upgrading;

1. SM125 Compatibility Upgrader for BUILD5 SP1 devices
2. SM125 First Time Upgrader
3. SM125 V3.x encrypted .rme file
4. ~2 minutes patient

The necessary tools after upgrading;

1. New SM125 SMRFID 3.x Software and the documents (including new datasheet)

2.1 Step 1 – SM125 Compatibility Upgrade

The first step is to use sm125_compatibility.exe file. This software tool will convert existing BUILD5 SP1 devices to SM125. However, the upgraded module still needs to be burned with V3.0x firmware in the next step. After applying this upgrade, the device is now a SM125 device and will be waiting in the boot mode.

- Open the sm125_compatibility.exe file.
- Connect kit/module/chip over RS232 interface to PC. Make sure M_SELECT pin is logic 0 (Command Receive Mode)
- Select appropriate com port.
- Click on the "Check credits and then Upgrade Device" to start upgrade operation
- Wait around 125 seconds. Make sure progress bar is changing
- Make sure you see the "Operation Successful" message. Now it is a SM125 device.
- After you see "Operation Successful" message, reset the device and apply the Step-2

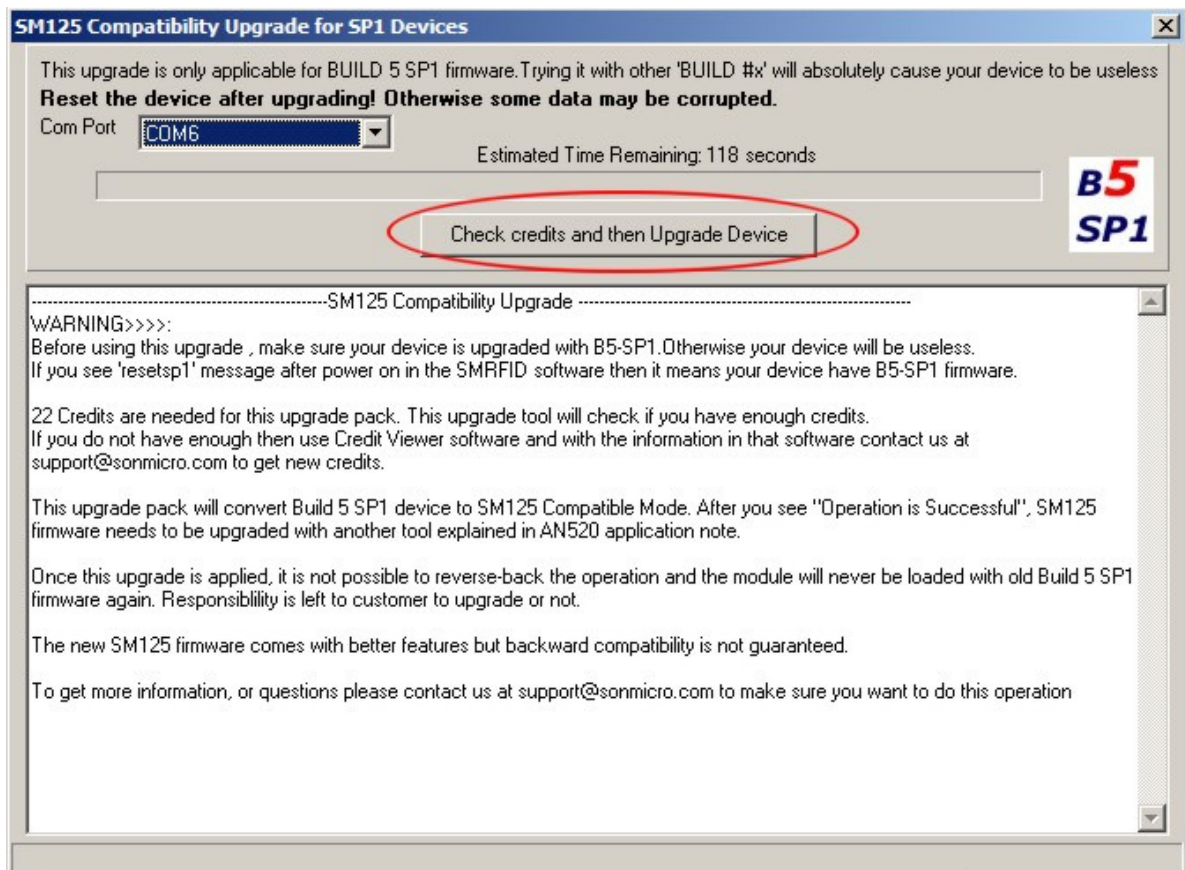


Figure 1 – sm125_compatibility software – Starting upgrade operation

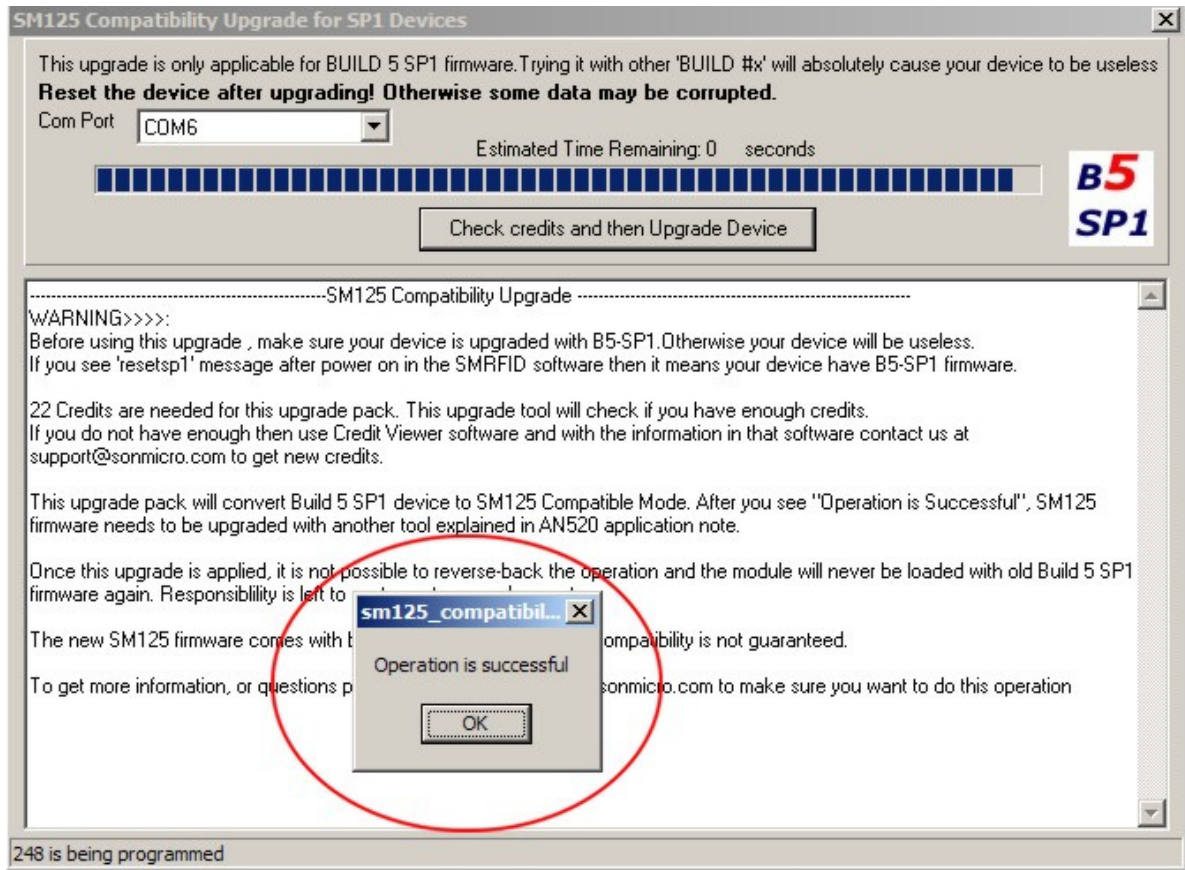


Figure 2 – sm125_compatibility software – Confirmation of success upgrading operation

After you see "Operation is successful" message, click ok, close the software, reset the module/chip and go for the next step.

2.2 Step 2 – SM125 First Time Upgrader

In the previous step, the module is converted to SM125 and it is in boot mode waiting to be flashed with an “.rme” file. This is an encrypted version of ROM file. The V3.00B05 will be flashed in this step with SM125_FU tool.

- Open SM125_FirstTimeU.exe file
- Select appropriate com port. Leave the baud rate as 19200bps
- Click on the ‘...’(browse) button to locate the .rme file that comes with the upgrade pack
- Click on “Initialize Boot Mode “button. Make sure you see the message “Module is now in boot mode...” on the status bar.
- Click on “Upgrade Data” button. Make sure there is a progress on the status bar. Wait around 10 seconds until you see “Upgrade operation is completed successfully” message.

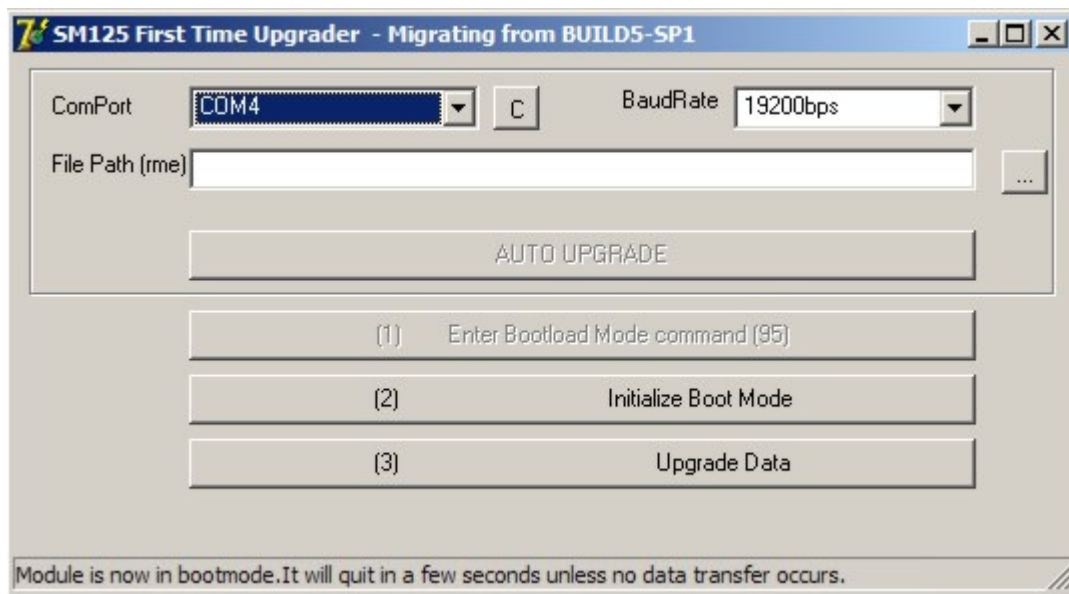


Figure 3 – SM125_FirstTime – First Time Firmware Upgrade Tool

Congratulations, the upgrade process is completed.
Please obtain the new SMRFID software and documents including the datasheet.
Any software or documentation for the BUILD5-SP1 will no more valid for SM125.

PLEASE NOTE THAT, AFTER YOU UPGRADE TO SM125 V3, BY FOLLOWING THE INSTRUCTIONS ON THIS APPLICATION NOTE, NEW FIRMWARE VERSIONS FOR V3, IF AVAILABLE, WILL BE FLASHED WITH SM125_FU(SM125 Firmware Upgrade) UPGRADE TOOL THAT IS DIFFERENT THAN ANY TOOL USED IN THIS APPLICATION NOTE.