

RA9530 EEPROM Programming v1.60

The RA9530 runs a temporary EEPROM downloader program that is loaded and executed in the RAM. This guide describes the EEPROM programming and verification processes of the data being sent to the EEPROM.

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1. Introduction

In EEPROM programming mode, the RA9530 runs a temporary EEPROM downloader program that is loaded and executed in the RAM. The application processor (AP) communicates with the downloader to send the data that must be programmed in EEPROM. The EEPROM downloader will perform the programming and verify the data being programmed. This approach ensures maximum speed, safety, and is the easiest implementation by the customer.

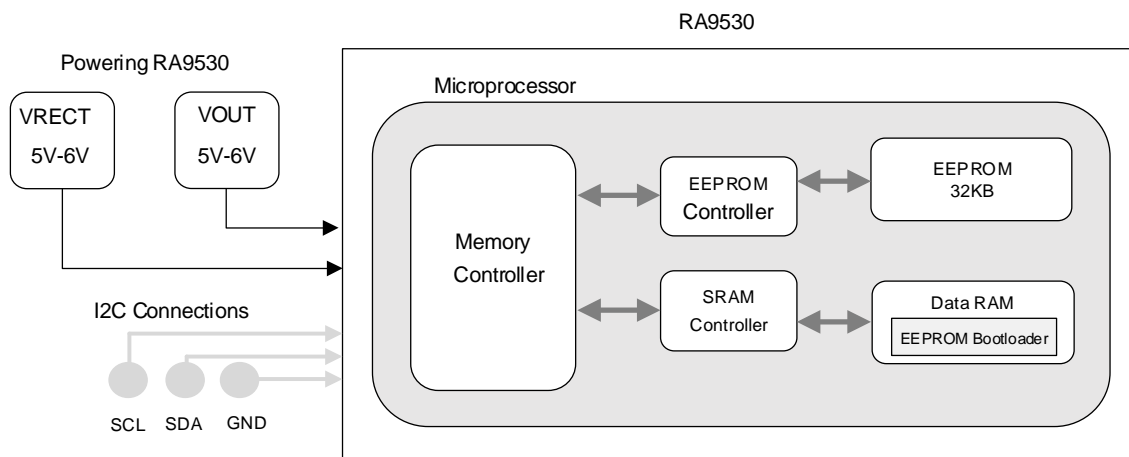


Figure 1. RA9530 EEPROM Downloader and Programming Overview

The RA9530 is halted before loading the EEPROM downloader in the RAM. Any program (or process) running up to this point is interrupted and abandoned. The RA9530 is reset (or power is removed) after EEPROM programming is completed, followed with a fresh start. If the programming was successful, the newly programmed firmware starts execution.

If the programming failed, the RA9530 enters exception state. Any partially programmed sector in the EEPROM retains its data. The EEPROM programming procedure can be restarted multiple times until completed successfully. The RA9530 does not need to be reset to restart the programming process – just run the EEPROM programming process from the beginning until completed with “pass” result. If the power is removed during programming, the process can be restarted.

In order to program the RA9530 receiver, DC power should be supplied at  $V_{RECT}/V_{OUT}$  on the RA9530 receiver. AC power that is provided by a Wireless Power Transmitter (WPTX) needs periodic communication, which the programming process does not support. The WPTX will remove the power after protocol timeout, thus leaving the EEPROM only partially programmed. Following AC resubmission is not possible because the RA9530 is left with partially programmed EEPROM memory and non-functioning function.

The EEPROM programming hardware charge pump is connected to  $V_{OUT}$  on RA9530. When the power is applied to  $V_{OUT}$ , the circuit is initially powered through the LDO body diode and after the downloader starts execution the LDO is turned ON, connecting  $V_{RECT}$  to  $V_{OUT}$ .

## 2. EEPROM Programming Procedure

1. Power up the RA9530 IC with  $5.5V \pm 10\%$  at  $V_{RECT} / V_{OUT}$ .  
Wait 2ms.
2. Open the RA9530 GUI and establish I<sup>2</sup>C connection using device address 0x3B.
3. Write address **0x3000** = **[0x5A]** to unlock system registers.
4. Write address **0x3040** = **[0x10]** to halt the 9530.
5. Write address **0x3020** = **[0x5A]** to disable watchdog.
6. Write address **0x3040** = **[0x10]** to halt the 9530.
7. Write address **0x5C50** = **[0x5A]**
8. Write address **0x5C2C** = **[0x02]**  
Wait 30ms.
9. Check 0x5C2C. If bit 7 of status is not 1 wait 30ms and retry once. Status code is bit [6:4]:  
The Status Codes are:  
    0x00 – “Check pass”  
    0x1 ~ 0x7 – “Check failure”
10. Load the EEPROM downloader program in the RAM at address **0x0000**. The program is in a text format of a ‘C’ code constant byte array EEPROMDownloaderRA9530. **The maximum size of I<sup>2</sup>C frame should be less than 2k.**
11. Write address **0x3048** = **[0xF0]** to remap RAM to program memory space.
12. Write address **0x3040** = **[0x80]** to reset the  $\mu$ C and run the EEPROM downloader program.  
*Note:* The I<sup>2</sup>C packet will not be acknowledged.  
Wait 100ms.
13. The SRAM address 0x1000 holds the current version of bootloader which is of 2 bytes. The current versions of  $V_{RECT}/V_{OUT}$  Bootloader are **BA32/CA32** correspondingly. The version would be incremented for any changes to EEPROM Downloader.

14. Start Program Readiness Check:

- a. Write 0x1008 = [0x31] to start Program check.
- b. Wait 1s.
- c. Check **0x1008**, if BIT0 is not 0, go to step b), repeat at least 5 times.
- d. After the Program check is finished, the EEPROM Downloader clears BIT0 at address **0x1008**, and loads the Status Code at address **0x1009**.

The Status Codes are:

0x00 – “Program check pass”  
0x06, 0x07, 0x08 – “Program check failure”

15. After Program check is completed, power cycle RA9530.

*Note:* The power on the device is required to be turned off completely and back on. For more information, see “Power Cycle between EEPROM Programming and CRC Verification”.

16. Write address **0x3000** = [**0x5A**] to unlock system registers.

17. Write address **0x3040** = [**0x10**] to halt the 9530.

18. Write address **0x3020** = [**0x5A**] to disable watchdog.

19. Write address **0x3040** = [**0x10**] to halt the 9530.

Wait 10ms.

20. Load the EEPROM downloader program in the RAM at address **0x0000**. The program is in a text format of a “C” code constant byte array EEPROMDownloaderRA9530. **The maximum size of I<sup>2</sup>C frame should be less than 2k.**

21. Write address **0x3048** = [**0xF0**] to remap RAM to program memory space.

22. Write address **0x3040** = [**0x80**] to reset the RA9530 and run the EEPROM downloader program.

*Note:* The I<sup>2</sup>C packet will not be acknowledged.

Wait 100ms.

23. To program the firmware in EEPROM, the SRAM buffer must be loaded with the firmware that is provided as a “hex” or “bin” file. The starting address for programming is 0x0000. The maximum firmware size should not exceed 32,512 (0x7F00) bytes.

For each 128 bytes, perform the following steps:

- a. Address 0x1008 in RAM must be loaded for every individual section of code before programming begins.

The structure declaration is provided below and the memory is in little-endian format:

```
//typedef struct { // the structure is mapped to RAM address 0x1008
//    u16 Status;
//    u16 StartAddress;
//    u16 CodeLength;
//    u16 DataChecksum;
//    u8  DataBuffer[128];
//} RA9530PgmStrType;
```

- i. Load Status at **0x1008** = 0x0000.
- ii. Load Start Address at **0x100A** = Address of the current section of the firmware. Address must be aligned to 128 bytes.
- iii. Load Code Length at **0x100C** = EEPROM Page Length. Fixed to 128 bytes always.
- iv. Load Data Checksum at **0x100E** = Sum of Start Address, Code Length, and Data bytes.

- v. Load Data Buffer at **0x1010** with 128 bytes of data from the firmware source file.
- b. Write **0x1008 = [0x01]** to start programming cycle. The downloader executes the EEPROM programming firmware and checks the integrity of the data. The EEPROM memory is verified byte by byte against the structure in the RAM. The EEPROM downloader programs an entire page of 128 bytes at a time.
- c. At completion of the programming cycle, the EEPROM downloader clears BIT0 at address 0x1008 and loads Status Code at address **0x1009**.

The Status Codes are:

- 0x01 – “BUSY”. EEPROM Write is in progress.
  - 0x02 – “SUCCESS”. Programming was successful.
  - 0x14 – “Check Sum Error”. The programming structure integrity is corrupt.
  - 0x24 – “Comparison Failure”. Data programmed did not match the data that is read back.
  - 0x34 – “Address not aligned”. The address loaded into Start Address field should align with 128 bytes.
  - 0x44 – “Length not supported”. The firmware file is larger than the EEPROM size.
- Codes not mentioned above are reserved.

- d. The AP reads the status code and if data write is successful, programs next page – 128 bytes. When entire firmware programming is successful, go to step 24.
24. After programming is completed, power cycle the RA9530.
- Note:* The power on the device is required to be turned off completely and back on. For more information, see “Power Cycle between EEPROM Programming and CRC Verification”.
25. Write address **0x3000 = [0x5A]** to unlock system registers.
26. Write address **0x3040 = [0x10]** to halt the RA9530
27. Write address **0x3020 = [0x5A]** to disable watchdog.
28. Write address **0x3040 = [0x10]** to halt the RA9530.
- Wait 10ms.
29. Load the EEPROM downloader program in the RAM at address **0x0000**. The program is in a text format of a “C” code constant byte array EEPROMDownloaderRA9530. **The maximum size of I<sup>2</sup>C frame should be less than 2k.**
30. Write address **0x3048 = [0xF0]** to remap RAM to program memory space.
31. Write address **0x3040 = [0x80]** to reset the RA9530 and run the EEPROM downloader program.
- Note:* The I<sup>2</sup>C packet will not be acknowledged.
- Wait 100ms.
32. Configure the EEPROM CRC32 Verification Utility:
- a. Load 16-bit EEPROM start address to **0x100A**. **0x100A** (low byte), **0x100B** (high byte) Start address must be set to **0x0000** to run the verifier from the beginning of the EEPROM.
  - b. Load 16-bit EEPROM data size **0x7F00** to **0x100C**. **0x100C** (low byte), **0x100D** (high byte) EEPROM data size. The data size is **32,512 (0x7F00)** bytes.
  - c. Write the 32-bit CRC into address **0x1010 (DataBuffer)**. The 32 bit CRC has to be loaded in Little Endian Format. CRC32 value is provided as part of release package for each firmware.
  - d. Write **0x1008 = [0x11]** to start EEPROM data CRC-32 check.
- Wait 120ms.

- e. After the CRC is validated, the EEPROM downloader clears BIT0 at address **0x1008**, and loads the Status Code at address **0x1009**.

The Status Codes are:

0x01 – “CRC Busy”

0x02 – “CRC OK”. CRC Verification Successful

0x54 – “CRC Failure”. The CRC provided does not match with the calculated CRC.

Codes not mentioned above are reserved (go to step 34).

33. After CRC Verification is completed, power cycle the RA9530.

34. In the case of a CRC error, repeat the process from steps 1–33 for two retries.

### 3. Program Readiness Check Flow Chart (Steps 1–15)

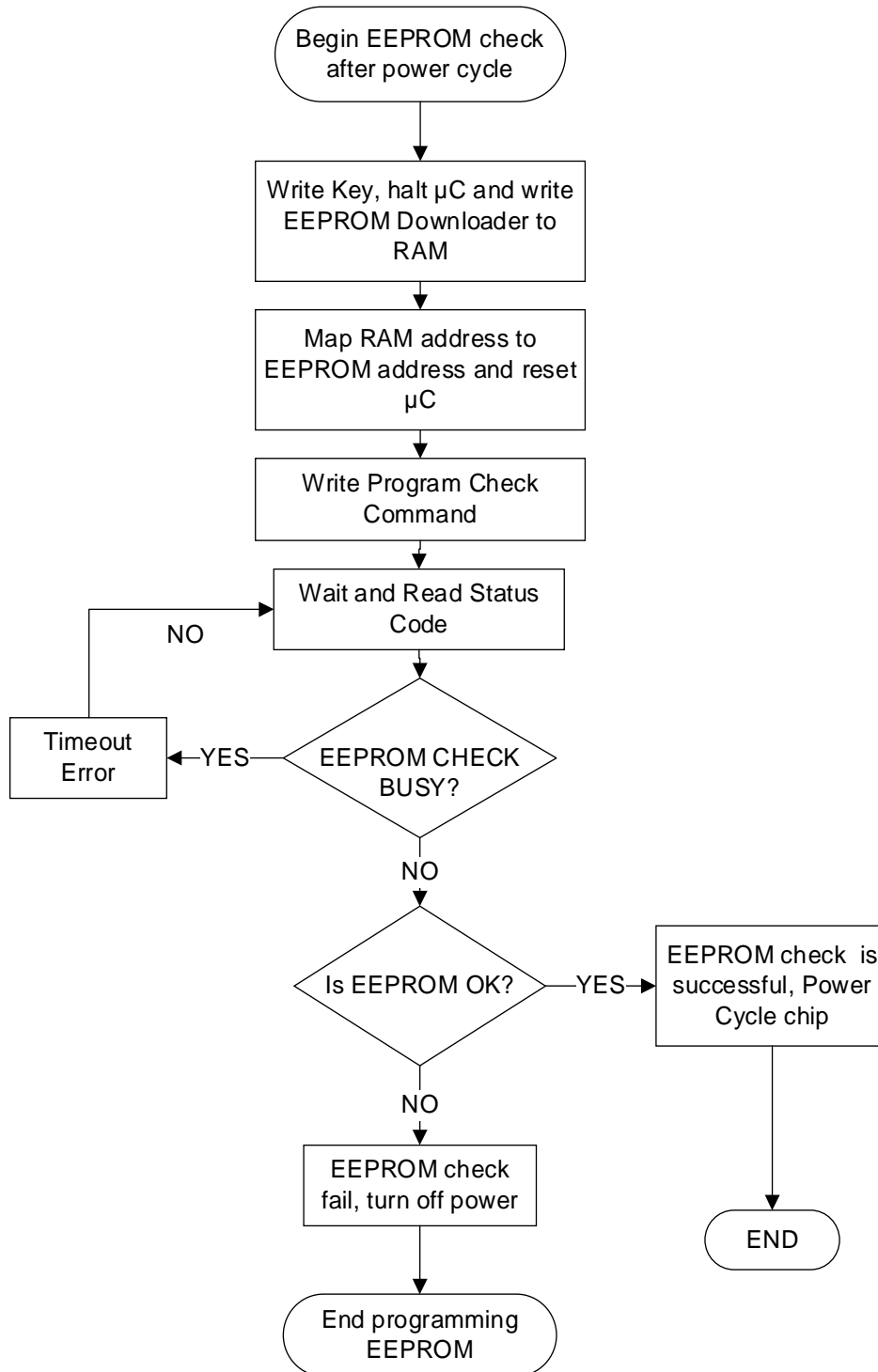


Figure 2. Program Readiness Check Flow Chart (Steps 1–15)

## 4. EEPROM Programming Flow Chart (Steps 16–24)

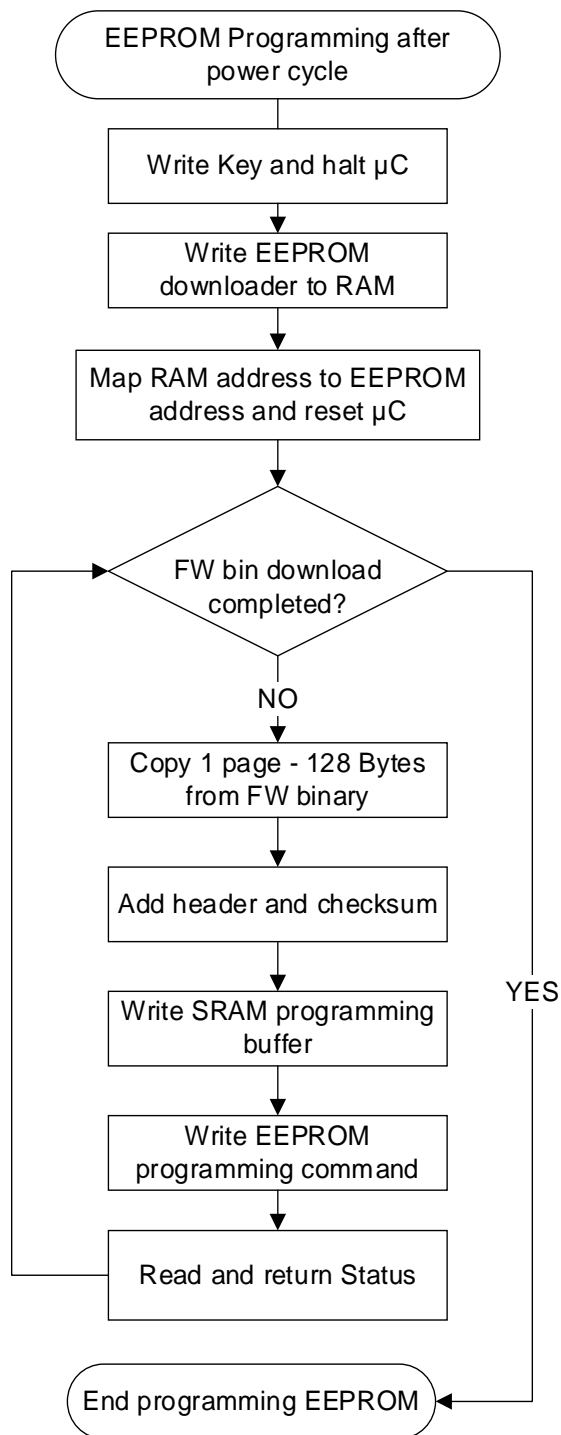


Figure 3. EEPROM Programming Flow Chart (Steps 16–24)

## 5. EEPROM CRC Verification Flow Chart (Steps 25–34)

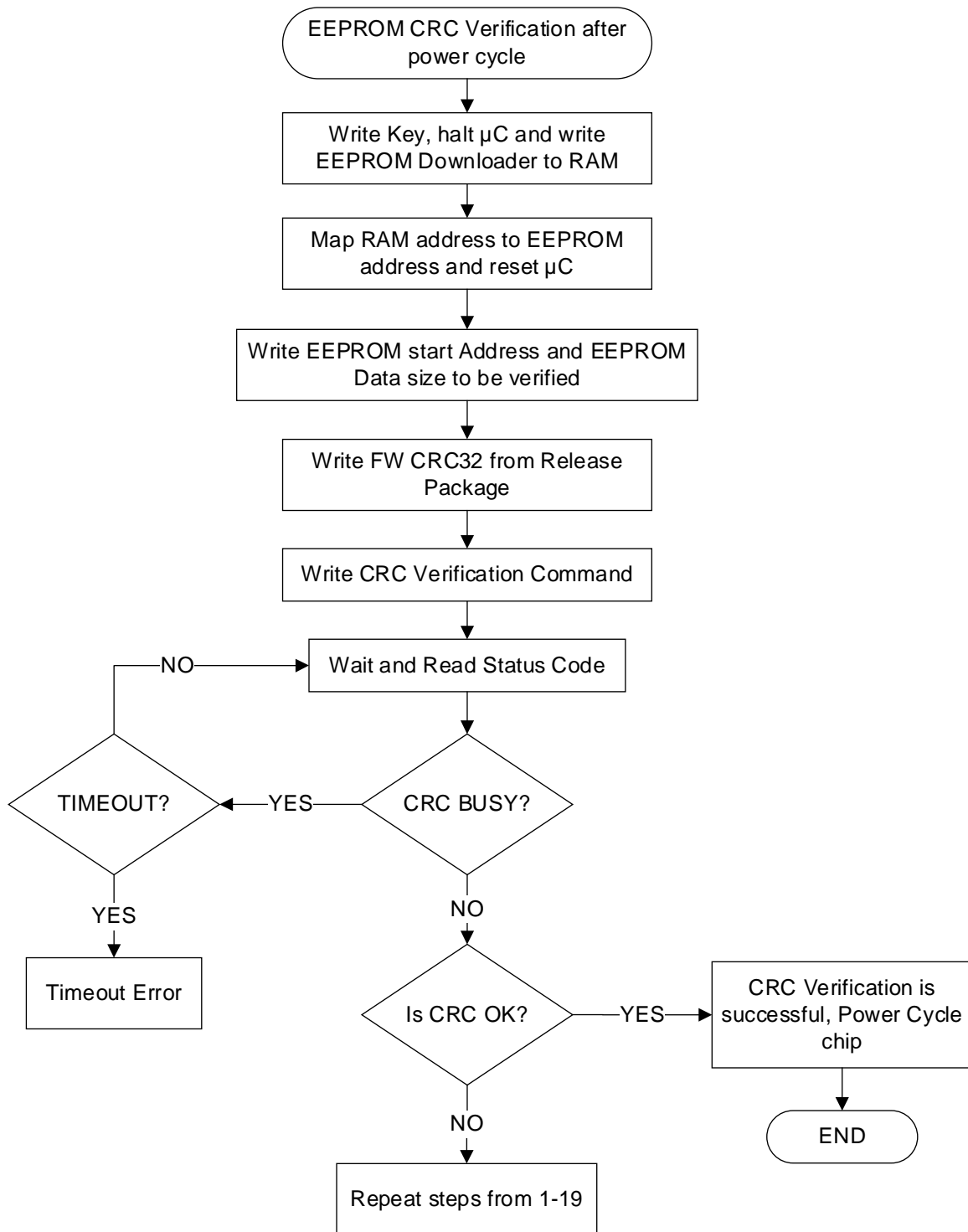


Figure 4. EEPROM CRC Verification Flow Chart (Steps 25-34)



## 6. Power Cycle between EEPROM Programming and CRC Verification

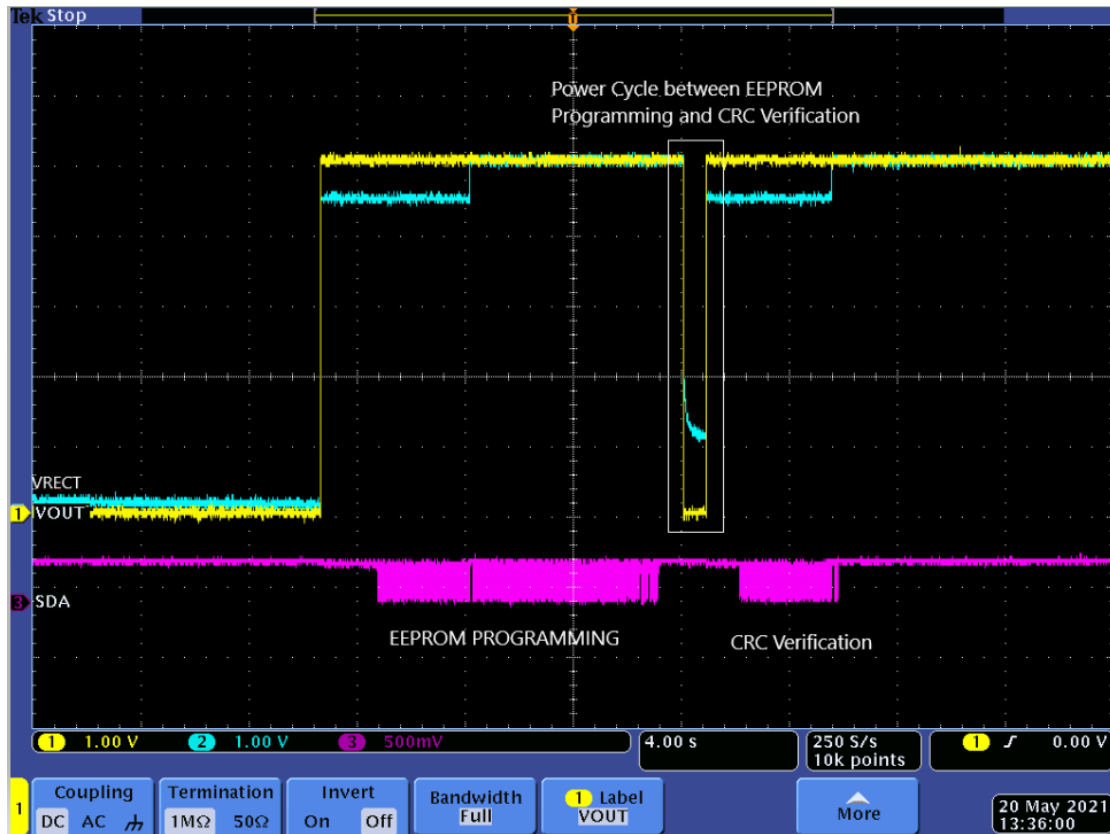


Figure 5. Capture of Power Cycle between EEPROM Programming and CRC Verification

## 7. EEPROM Downloader Code

### 7.1 EEPROM Downloader Code for Powering RA9530 at VRECT

//this byte array needs to be loaded at RAM address 0x0000. This is the EEPROM downloader and it also verifies CRC.

// use this array with power supply connected to VRECT

//Do not modify this code

```
static byte[] EEPROMDownloaderRA9530 = {
```

```
0x00, 0x12, 0x00, 0x20, 0xD9, 0x02, 0x00, 0x00, 0xF9, 0x02, 0x00, 0x00, 0xFB, 0x02, 0x00, 0x00,
0x06, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xFD, 0x02, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xFF, 0x02, 0x00, 0x00, 0x01, 0x03, 0x00, 0x00,
0xA3, 0x02, 0x00, 0x00, 0xA5, 0x02, 0x00, 0x00, 0xC0, 0x46, 0xC0, 0x46, 0x00, 0xF0, 0x04, 0xF8,
0x1F, 0xB5, 0x1F, 0xBD, 0x10, 0xB5, 0x10, 0xBD, 0x03, 0x48, 0x85, 0x46, 0xFF, 0xF7, 0xF8, 0xFF,
0x00, 0xF0, 0x0A, 0xF8, 0x00, 0xF0, 0x3A, 0xFD, 0x00, 0x12, 0x00, 0x20, 0x03, 0xB4, 0xFF, 0xF7,
0xF1, 0xFF, 0x03, 0xBC, 0x00, 0xF0, 0xC4, 0xFC, 0x1C, 0xB5, 0x8E, 0x48, 0x5A, 0x21, 0x01, 0x80,
0x01, 0x24, 0x84, 0x80, 0x05, 0x21, 0x01, 0x81, 0x8B, 0x49, 0x81, 0x81, 0x00, 0x26, 0x06, 0x80,
0x8A, 0x49, 0x32, 0x20, 0x08, 0x80, 0x8A, 0x4F, 0xFF, 0x21, 0x11, 0x31, 0x38, 0x46, 0x00, 0xF0,
0x1B, 0xFD, 0x88, 0x49, 0x39, 0x80, 0x88, 0x48, 0x94, 0x21, 0x01, 0x80, 0x15, 0x21, 0x01, 0x80,
0x85, 0x48, 0x20, 0x30, 0x04, 0x83, 0x84, 0x48, 0x60, 0x30, 0x01, 0x8A, 0x95, 0x29, 0x02, 0xD1,
0x80, 0x8A, 0x20, 0x28, 0x15, 0xD0, 0x20, 0x20, 0xB8, 0x70, 0x00, 0x20, 0x01, 0x90, 0x00, 0x90,
0x00, 0xF0, 0xB6, 0xFC, 0x7D, 0x4C, 0x02, 0x25, 0x79, 0x4F, 0xF9, 0x88, 0x00, 0x98, 0x81, 0x42,
0x20, 0xD0, 0xF8, 0x88, 0xC0, 0x07, 0x06, 0xD0, 0x78, 0x49, 0x20, 0x20, 0x40, 0x39, 0x08, 0x83,
```

0x04, 0xE0, 0x10, 0x20, 0xE8, 0xE7, 0x75, 0x48, 0x40, 0x38, 0x06, 0x83, 0x20, 0x88, 0x40, 0x08,  
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 0xF8, 0x88, 0x00, 0x90, 0x38, 0x7A, 0x01, 0x28, 0x07, 0xD0, 0x11, 0x28, 0x3F, 0xD0, 0x31, 0x28,  
 0x74, 0xD0, 0x67, 0x48, 0x00, 0xF0, 0xFF, 0xF8, 0xCE, 0xE7, 0x7E, 0x72, 0x7D, 0x20, 0x40, 0x01,  
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 0xE6, 0x4E, 0x5A, 0x20, 0x30, 0x82, 0xE5, 0x4B, 0x07, 0x20, 0x40, 0x3B, 0x18, 0x80, 0xE4, 0x4D,  
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 0x30, 0xBD, 0x40, 0x1C, 0x80, 0xB2, 0x20, 0x28, 0xDE, 0xD3, 0x00, 0x20, 0x30, 0xBD, 0x70, 0xB5,  
 0xBB, 0x4E, 0x70, 0x89, 0x40, 0x06, 0x01, 0xD0, 0x03, 0x20, 0x70, 0xBD, 0xB0, 0x89, 0x80, 0x28,  
 0x01, 0xD0, 0x04, 0x20, 0x70, 0xBD, 0x70, 0x89, 0xB1, 0x89, 0x08, 0x18, 0x82, 0xB2, 0x00, 0x21,  
 0x88, 0x00, 0x80, 0x19, 0x00, 0x69, 0x49, 0x1C, 0xC3, 0xB2, 0x04, 0x04, 0x05, 0x02, 0x24, 0x0E,  
 0xD2, 0x18, 0x2D, 0x0E, 0x12, 0x19, 0x00, 0x0E, 0x52, 0x19, 0x10, 0x18, 0x89, 0xB2, 0x82, 0xB2,  
 0x20, 0x29, 0xED, 0xD3, 0xF0, 0x89, 0x90, 0x42, 0x01, 0xD0, 0x01, 0x20, 0x70, 0xBD, 0x00, 0x20,  
 0x70, 0xBD, 0x30, 0xB5, 0xA5, 0x4C, 0x5A, 0x21, 0x21, 0x82, 0xA4, 0x4B, 0x03, 0x21, 0x40, 0x3B,  
 0x19, 0x80, 0x80, 0x00, 0x98, 0x80, 0x04, 0x20, 0x18, 0x83, 0x18, 0x8B, 0x00, 0x28, 0xFC, 0xD1,  
 0x18, 0x8A, 0x99, 0x8A, 0x09, 0x04, 0x0D, 0x18, 0xFF, 0x20, 0x91, 0x30, 0xFF, 0xF7, 0x5B, 0xFF,

0x02, 0x20, 0x18, 0x80, 0x00, 0x20, 0x18, 0x83, 0x20, 0x82, 0x28, 0x46, 0x30, 0xBD, 0x02, 0x28,  
 0x2A, 0xD9, 0x0A, 0x21, 0x98, 0x4A, 0x41, 0x43, 0x49, 0x1C, 0x93, 0x88, 0x89, 0xB2, 0x01, 0x2B,  
 0x00, 0xD1, 0x13, 0x89, 0x93, 0x88, 0x00, 0x2B, 0x06, 0xD1, 0x13, 0x89, 0x03, 0x2B, 0x03, 0xD1,  
 0x01, 0x01, 0x09, 0x1A, 0x49, 0x1C, 0x89, 0xB2, 0x93, 0x88, 0x01, 0x2B, 0x06, 0xD1, 0x12, 0x89,  
 0x05, 0x2A, 0x03, 0xD1, 0x81, 0x00, 0x40, 0x18, 0x40, 0x1C, 0x81, 0xB2, 0x89, 0x4A, 0x01, 0x20,  
 0x10, 0x80, 0x05, 0x20, 0x10, 0x82, 0x11, 0x83, 0x10, 0x8B, 0x00, 0xBF, 0x00, 0xBF, 0x00, 0xBF,  
 0xFA, 0xD1, 0x80, 0x20, 0x10, 0x80, 0x70, 0x47, 0x00, 0xBF, 0x00, 0xBF, 0x00, 0xBF, 0x00, 0xBF,  
 0x00, 0xBF, 0x00, 0xBF, 0x00, 0xBF, 0x00, 0xBF, 0x00, 0xBF, 0x00, 0xBF, 0x00, 0xBF, 0x00, 0xBF,  
 0x00, 0xBF, 0x70, 0x47, 0xF0, 0xB5, 0x79, 0x4C, 0x07, 0x20, 0x40, 0x3C, 0x20, 0x80, 0x64, 0x20,  
 0xFF, 0xF7, 0xBD, 0xFF, 0x75, 0x4B, 0x00, 0x20, 0x20, 0x3B, 0x98, 0x80, 0x01, 0x25, 0x25, 0x83,  
 0x73, 0x4E, 0x80, 0x36, 0x02, 0x27, 0x82, 0x00, 0x91, 0x19, 0x09, 0x68, 0x00, 0x29, 0x04, 0xD0,  
 0xA2, 0x80, 0x21, 0x81, 0x09, 0x0C, 0xA1, 0x81, 0x27, 0x83, 0x40, 0x1C, 0x80, 0xB2, 0x20, 0x28,  
 0xF1, 0xD3, 0x9D, 0x80, 0x03, 0x20, 0x20, 0x80, 0x00, 0xBF, 0xF0, 0xBD, 0x10, 0xB5, 0x28, 0x21,  
 0x69, 0x4B, 0x41, 0x43, 0x42, 0x08, 0x89, 0x18, 0x9C, 0x88, 0x89, 0xB2, 0x01, 0x2C, 0x00, 0xD1,  
 0x1C, 0x89, 0x9C, 0x88, 0x00, 0x2C, 0x06, 0xD1, 0x1C, 0x89, 0x03, 0x2C, 0x03, 0xD1, 0x3C, 0x21,  
 0x41, 0x43, 0x89, 0x18, 0x89, 0xB2, 0x9C, 0x88, 0x01, 0x2C, 0x06, 0xD1, 0x1B, 0x89, 0x05, 0x2B,  
 0x03, 0xD1, 0x14, 0x21, 0x48, 0x43, 0x80, 0x18, 0x81, 0xB2, 0x5A, 0x4B, 0x01, 0x20, 0x18, 0x80,  
 0x58, 0x4A, 0xF9, 0x20, 0x40, 0x32, 0x10, 0x80, 0x56, 0x4A, 0x00, 0x20, 0x20, 0x32, 0x10, 0x81,  
 0x91, 0x81, 0x13, 0x20, 0x10, 0x80, 0x55, 0x48, 0x02, 0x21, 0x01, 0x60, 0x30, 0xBF, 0x10, 0x89,  
 0x00, 0x28, 0xFC, 0xD1, 0x51, 0x48, 0x80, 0x30, 0x01, 0x60, 0x80, 0x20, 0x18, 0x80, 0x10, 0xBD,  
 0x10, 0xB5, 0x4D, 0x4B, 0x81, 0x00, 0x02, 0x09, 0x89, 0x18, 0x9C, 0x88, 0x89, 0xB2, 0x01, 0x2C,  
 0x00, 0xD1, 0x1C, 0x89, 0x9C, 0x88, 0x00, 0x2C, 0x06, 0xD1, 0x1C, 0x89, 0x03, 0x2C, 0x03, 0xD1,  
 0x06, 0x21, 0x41, 0x43, 0x89, 0x18, 0x89, 0xB2, 0x9C, 0x88, 0x01, 0x2C, 0x05, 0xD1, 0x1B, 0x89,  
 0x05, 0x2B, 0x02, 0xD1, 0x40, 0x00, 0x80, 0x18, 0x81, 0xB2, 0x3E, 0x4B, 0x01, 0x20, 0x18, 0x80,  
 0x3C, 0x4A, 0xF9, 0x20, 0x40, 0x32, 0x10, 0x80, 0x3A, 0x4A, 0x00, 0x20, 0x20, 0x32, 0x10, 0x81,  
 0x91, 0x81, 0x13, 0x20, 0x10, 0x80, 0x39, 0x48, 0x02, 0x21, 0x01, 0x60, 0x30, 0xBF, 0x10, 0x89,  
 0x00, 0x28, 0xFC, 0xD1, 0x35, 0x48, 0x80, 0x30, 0x01, 0x60, 0x80, 0x20, 0x18, 0x80, 0x10, 0xBD,  
 0xF0, 0xB5, 0x2F, 0x48, 0x80, 0x78, 0x20, 0x28, 0x15, 0xD0, 0x7E, 0x25, 0x2B, 0x48, 0x5A, 0x21,  
 0x01, 0x82, 0x2A, 0x48, 0xA5, 0x21, 0x20, 0x30, 0x01, 0x80, 0x64, 0x20, 0xFF, 0xF7, 0x1F, 0xFF,  
 0x26, 0x4E, 0x03, 0x20, 0x40, 0x3E, 0x30, 0x80, 0x64, 0x20, 0xFF, 0xF7, 0x18, 0xFF, 0x23, 0x4F,  
 0x00, 0x24, 0x20, 0x3F, 0x11, 0xE0, 0xFE, 0x25, 0xE8, 0xE7, 0xE0, 0x01, 0xB0, 0x80, 0x0A, 0x20,  
 0xFF, 0xF7, 0x0D, 0xFF, 0x11, 0x20, 0xB8, 0x80, 0x02, 0x20, 0xFF, 0xF7, 0x67, 0xFF, 0x01, 0x20,  
 0xB8, 0x80, 0x05, 0x20, 0xFF, 0xF7, 0x9C, 0xFF, 0x64, 0x1C, 0xAC, 0x42, 0xED, 0xDB, 0x64, 0x20,  
 0xFF, 0xF7, 0xFD, 0xFE, 0x00, 0x20, 0xB8, 0x80, 0x03, 0x21, 0x31, 0x80, 0x30, 0x83, 0x13, 0x49,  
 0x08, 0x82, 0x12, 0x49, 0x20, 0x31, 0x08, 0x80, 0xFF, 0x20, 0x2D, 0x30, 0xFF, 0xF7, 0xEF, 0xFE,  
 0xF0, 0xBD, 0xF0, 0xB5, 0x0E, 0x48, 0x80, 0x78, 0x20, 0x28, 0x21, 0xD0, 0x7E, 0x26, 0x00, 0x24,  
 0x0B, 0x4B, 0x00, 0x20, 0x80, 0x33, 0x05, 0x46, 0x47, 0x1E, 0xC1, 0x07, 0xCA, 0x17, 0x52, 0x1C,  
 0x00, 0x2C, 0x17, 0xD0, 0x00, 0x21, 0x0A, 0x40, 0x01, 0x2C, 0x15, 0xD0, 0x00, 0x21, 0x01, 0x40,  
 0x0A, 0x43, 0x13, 0xD0, 0x81, 0x00, 0xC9, 0x18, 0x0D, 0x60, 0x12, 0xE0, 0x40, 0x5C, 0x00, 0x40,  
 0x00, 0x10, 0x00, 0x20, 0x00, 0x54, 0x00, 0x40, 0x00, 0x30, 0x00, 0x40, 0x00, 0xE1, 0x00, 0xE0,  
 0xFE, 0x26, 0xDC, 0xE7, 0x01, 0x21, 0xE6, 0xE7, 0x01, 0x21, 0xE8, 0xE7, 0x81, 0x00, 0xC9, 0x18,  
 0x0F, 0x60, 0x40, 0x1C, 0x80, 0xB2, 0x20, 0x28, 0xD7, 0xD3, 0xB2, 0x48, 0x5A, 0x21, 0x01, 0x82,  
 0xB0, 0x48, 0xA5, 0x21, 0x20, 0x30, 0x01, 0x80, 0xFF, 0xF7, 0xEC, 0xFE, 0xAD, 0x48, 0x03, 0x21,  
 0x40, 0x38, 0x01, 0x80, 0x00, 0xBF, 0x25, 0x46, 0xAA, 0x4F, 0x20, 0x3F, 0x11, 0xE0, 0xA9, 0x49,  
 0xE8, 0x01, 0x40, 0x39, 0x88, 0x80, 0x00, 0xBF, 0x09, 0x20, 0xB8, 0x80, 0x02, 0x20, 0xFF, 0xF7,  
 0xFD, 0xFE, 0x01, 0x20, 0xB8, 0x80, 0xFF, 0x20, 0xF5, 0x30, 0xFF, 0xF7, 0x98, 0xFE, 0xAD, 0x1C,  
 0xAD, 0xB2, 0xB5, 0x42, 0xEB, 0xD3, 0x64, 0x1C, 0xA4, 0xB2, 0x02, 0x2C, 0xA8, 0xD3, 0x64, 0x20,  
 0xFF, 0xF7, 0x8D, 0xFE, 0x9B, 0x48, 0x01, 0x21, 0x40, 0x38, 0x01, 0x80, 0xFF, 0x20, 0x2D, 0x30,  
 0xFF, 0xF7, 0x85, 0xFE, 0x97, 0x49, 0x00, 0x20, 0x08, 0x82, 0x96, 0x49, 0x20, 0x31, 0x08, 0x80,  
 0xF0, 0xBD, 0xF0, 0xB5, 0x94, 0x48, 0x80, 0x78, 0x20, 0x28, 0x17, 0xD0, 0x7E, 0x26, 0x00, 0x24,  
 0x00, 0x20, 0x91, 0x4B, 0x47, 0x1E, 0x05, 0x46, 0x80, 0x33, 0xC1, 0x07, 0xCA, 0x17, 0x52, 0x1C,  
 0x00, 0x2C, 0x0D, 0xD0, 0x00, 0x21, 0x0A, 0x40, 0x01, 0x2C, 0x0B, 0xD0, 0x00, 0x21, 0x01, 0x40,  
 0x0A, 0x43, 0x09, 0xD0, 0x81, 0x00, 0xC9, 0x18, 0x0F, 0x60, 0x08, 0xE0, 0xFE, 0x26, 0xE6, 0xE7,  
 0x01, 0x21, 0xF0, 0xE7, 0x01, 0x21, 0xF2, 0xE7, 0x81, 0x00, 0xC9, 0x18, 0x0D, 0x60, 0x40, 0x1C,  
 0x80, 0xB2, 0x20, 0x28, 0xE1, 0xD3, 0x7F, 0x48, 0x5A, 0x21, 0x01, 0x82, 0x7D, 0x48, 0xA5, 0x21,  
 0x20, 0x30, 0x01, 0x80, 0xFF, 0xF7, 0x86, 0xFE, 0x7A, 0x48, 0x03, 0x21, 0x40, 0x38, 0x01, 0x80,  
 0x00, 0xBF, 0x25, 0x46, 0x77, 0x4F, 0x20, 0x3F, 0x11, 0xE0, 0x76, 0x49, 0xE8, 0x01, 0x40, 0x39,

```

0x88, 0x80, 0x00, 0xBF, 0x09, 0x20, 0xB8, 0x80, 0x02, 0x20, 0xFF, 0xF7, 0x97, 0xFE, 0x01, 0x20,
0xB8, 0x80, 0xFF, 0x20, 0xF5, 0x30, 0xFF, 0xF7, 0x32, 0xFE, 0xAD, 0x1C, 0xAD, 0xB2, 0xB5, 0x42,
0xEB, 0xD3, 0x64, 0x1C, 0xA4, 0xB2, 0x02, 0x2C, 0xB2, 0xD3, 0x64, 0x20, 0xFF, 0xF7, 0x27, 0xFE,
0x68, 0x48, 0x01, 0x21, 0x40, 0x38, 0x01, 0x80, 0xFF, 0x20, 0x2D, 0x30, 0xFF, 0xF7, 0x1F, 0xFE,
0x64, 0x49, 0x00, 0x20, 0x08, 0x82, 0x63, 0x49, 0x20, 0x31, 0x08, 0x80, 0xF0, 0xBD, 0xF8, 0xB5,
0x06, 0x46, 0x61, 0x48, 0x80, 0x78, 0x20, 0x28, 0x1B, 0xD0, 0x7E, 0x21, 0x00, 0x24, 0x00, 0x91,
0x5C, 0x48, 0x5A, 0x21, 0x25, 0x46, 0x01, 0x82, 0x5A, 0x48, 0xA5, 0x21, 0x20, 0x30, 0x01, 0x80,
0x58, 0x48, 0x20, 0x38, 0x84, 0x80, 0x57, 0x48, 0x02, 0x21, 0x40, 0x38, 0x01, 0x80, 0x64, 0x20,
0xFF, 0xF7, 0xFD, 0xFD, 0x00, 0x2E, 0x75, 0xD0, 0x02, 0x2E, 0x04, 0xD0, 0x03, 0x2E, 0x38, 0xD1,
0x38, 0xE0, 0xFE, 0x21, 0xE2, 0xE7, 0x00, 0x21, 0x30, 0xE0, 0xCA, 0x07, 0xD2, 0x17, 0x52, 0x1C,
0x00, 0x20, 0x94, 0x46, 0x4A, 0x01, 0x96, 0x46, 0x72, 0x46, 0x12, 0x18, 0x93, 0x00, 0x01, 0x22,
0x12, 0x07, 0x9A, 0x18, 0x12, 0x68, 0xC3, 0x07, 0xDE, 0x17, 0x76, 0x1C, 0x37, 0x46, 0x63, 0x46,
0x1E, 0x40, 0x03, 0x46, 0x0B, 0x40, 0x1E, 0x43, 0x00, 0x2A, 0x01, 0xD0, 0x01, 0x23, 0x00, 0xE0,
0x00, 0x23, 0x1E, 0x40, 0x63, 0x46, 0x03, 0x40, 0x0F, 0x40, 0x3B, 0x43, 0x52, 0x1C, 0x00, 0xD0,
0x01, 0x22, 0x13, 0x40, 0x1E, 0x43, 0x03, 0xD0, 0x64, 0x1C, 0x07, 0x22, 0xA4, 0xB2, 0x15, 0x43,
0x40, 0x1C, 0x80, 0xB2, 0x20, 0x28, 0xD7, 0xD3, 0x49, 0x1C, 0x89, 0xB2, 0x00, 0x98, 0x81, 0x42,
0xCB, 0xD3, 0x50, 0xE0, 0x00, 0x21, 0x30, 0xE0, 0xCA, 0x07, 0xD2, 0x17, 0x52, 0x1C, 0x00, 0x20,
0x94, 0x46, 0x4A, 0x01, 0x96, 0x46, 0x72, 0x46, 0x12, 0x18, 0x93, 0x00, 0x01, 0x22, 0x12, 0x07,
0x9A, 0x18, 0x12, 0x68, 0xC6, 0x07, 0xF6, 0x17, 0x76, 0x1C, 0x63, 0x46, 0x37, 0x46, 0x03, 0x40,
0x0F, 0x40, 0x3B, 0x43, 0x00, 0x2A, 0x01, 0xD0, 0x01, 0x27, 0x00, 0xE0, 0x00, 0x27, 0x3B, 0x40,
0x67, 0x46, 0x3E, 0x40, 0x07, 0x46, 0x0F, 0x40, 0x3E, 0x43, 0x52, 0x1C, 0x00, 0xD0, 0x01, 0x22,
0x16, 0x40, 0x33, 0x43, 0x03, 0xD0, 0x64, 0x1C, 0x08, 0x22, 0xA4, 0xB2, 0x15, 0x43, 0x40, 0x1C,
0x80, 0xB2, 0x20, 0x28, 0xD7, 0xD3, 0x49, 0x1C, 0x89, 0xB2, 0x00, 0x98, 0x81, 0x42, 0xCB, 0xD3,
0x19, 0xE0, 0xFF, 0xE7, 0x01, 0x26, 0x00, 0x21, 0x36, 0x07, 0x06, 0x27, 0x10, 0xE0, 0x00, 0x20,
0x4B, 0x01, 0x1A, 0x18, 0x92, 0x00, 0x92, 0x19, 0x12, 0x68, 0x00, 0x2A, 0x02, 0xD0, 0x64, 0x1C,
0xA4, 0xB2, 0x3D, 0x43, 0x40, 0x1C, 0x80, 0xB2, 0x20, 0x28, 0xF2, 0xD3, 0x49, 0x1C, 0x89, 0xB2,
0x00, 0x98, 0x81, 0x42, 0xEB, 0xD3, 0x64, 0x20, 0xFF, 0xF7, 0x69, 0xFD, 0x09, 0x49, 0x01, 0x20,
0x20, 0x39, 0x88, 0x80, 0x07, 0x49, 0x40, 0x39, 0x08, 0x80, 0xFF, 0x20, 0x2D, 0x30, 0xFF, 0xF7,
0x5E, 0xFD, 0x04, 0x49, 0x00, 0x20, 0x08, 0x82, 0x02, 0x49, 0x20, 0x31, 0x08, 0x80, 0x20, 0x04,
0x28, 0x43, 0xF8, 0xBD, 0x40, 0x5C, 0x00, 0x40, 0x00, 0x10, 0x00, 0x20, 0x07, 0x49, 0x08, 0x70,
0x70, 0x47, 0x06, 0x49, 0x08, 0x70, 0x00, 0x20, 0x70, 0x47, 0x00, 0x20, 0xC0, 0x43, 0x70, 0x47,
0x03, 0x49, 0x04, 0x20, 0x08, 0x74, 0x30, 0xBF, 0x70, 0x47, 0x00, 0x00, 0xF0, 0x13, 0x00, 0x20,
0xE0, 0x1F, 0x00, 0x20, 0x70, 0xB5, 0x00, 0x22, 0xD2, 0x43, 0x00, 0x24, 0x1D, 0x4D, 0x0B, 0xE0,
0x03, 0x5D, 0x5A, 0x40, 0x07, 0x23, 0xD6, 0x07, 0x02, 0xD0, 0x52, 0x08, 0x6A, 0x40, 0x00, 0xE0,
0x52, 0x08, 0x5B, 0x1E, 0xF7, 0xD5, 0x64, 0x1C, 0x8C, 0x42, 0xF1, 0xD3, 0xD0, 0x43, 0x70, 0xBD,
0x30, 0xB5, 0x14, 0x4B, 0x14, 0x4C, 0x00, 0x21, 0x08, 0x46, 0x07, 0x22, 0xC5, 0x07, 0x02, 0xD0,
0x40, 0x08, 0x58, 0x40, 0x00, 0xE0, 0x40, 0x08, 0x52, 0x1E, 0x52, 0xB2, 0x00, 0x2A, 0xF5, 0xDA,
0x8A, 0x00, 0x49, 0x1C, 0x89, 0xB2, 0xA0, 0x50, 0xFF, 0x29, 0xED, 0xD9, 0x30, 0xBD, 0x30, 0xB5,
0x00, 0x23, 0xDB, 0x43, 0x00, 0x22, 0x08, 0x4C, 0x07, 0xE0, 0x85, 0x5C, 0x5D, 0x40, 0x2D, 0x06,
0xAD, 0x0D, 0x65, 0x59, 0x1B, 0x0A, 0x6B, 0x40, 0x52, 0x1C, 0x8A, 0x42, 0xF5, 0xD3, 0xD8, 0x43,
0x30, 0xBD, 0x00, 0x00, 0x20, 0x83, 0xB8, 0xED, 0x00, 0x0C, 0x00, 0x20, 0x01, 0xE0, 0x04, 0xC0,
0x09, 0x1F, 0x04, 0x29, 0xFB, 0xD2, 0x8B, 0x07, 0x01, 0xD5, 0x02, 0x80, 0x80, 0x1C, 0xC9, 0x07,
0x00, 0xD0, 0x02, 0x70, 0x70, 0x47, 0x00, 0x29, 0x0B, 0xD0, 0xC3, 0x07, 0x02, 0xD0, 0x02, 0x70,
0x40, 0x1C, 0x49, 0x1E, 0x02, 0x29, 0x04, 0xD3, 0x83, 0x07, 0x02, 0xD5, 0x02, 0x80, 0x80, 0x1C,
0x89, 0x1E, 0xE3, 0xE7, 0x00, 0x22, 0xEE, 0xE7, 0x00, 0x22, 0xDF, 0xE7, 0x10, 0xB5, 0x04, 0x46,
0xC0, 0x46, 0xC0, 0x46, 0x20, 0x46, 0xFF, 0xF7, 0xC1, 0xFA, 0x10, 0xBD};

```

## 7.2 EEPROM Downloader Code for Powering RA9530 at VOUT

//this byte array needs to be loaded at RAM address 0x0000. This is the EEPROM downloader and it also verifies CRC.

// use this array with power supply connected to VOUT

//Do not modify this code

```
static byte[] EEPROMDownloaderRA9530 = {
```

```
0x00, 0x12, 0x00, 0x20, 0x05, 0x03, 0x00, 0x00, 0x25, 0x03, 0x00, 0x00, 0x27, 0x03, 0x00, 0x00,
0x06, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x29, 0x03, 0x00, 0x00,
0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x2B, 0x03, 0x00, 0x00, 0x2D, 0x03, 0x00, 0x00,
0xC9, 0x02, 0x00, 0x00, 0xCB, 0x02, 0x00, 0x00, 0xC0, 0x46, 0xC0, 0x46, 0x00, 0xF0, 0x04, 0xF8,
0x1F, 0xB5, 0x1F, 0xBD, 0x10, 0xB5, 0x10, 0xBD, 0x03, 0x48, 0x85, 0x46, 0xFF, 0xF7, 0xF8, 0xFF,
0x00, 0xF0, 0x0A, 0xF8, 0x00, 0xF0, 0x50, 0xFD, 0x00, 0x12, 0x00, 0x20, 0x03, 0xB4, 0xFF, 0xF7,
0xF1, 0xFF, 0x03, 0xBC, 0x00, 0xF0, 0xDA, 0xFC, 0x1C, 0xB5, 0x97, 0x4C, 0x5A, 0x20, 0x20, 0x80,
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 0x00, 0x21, 0x0A, 0x40, 0x01, 0x2C, 0x0B, 0xD0, 0x00, 0x21, 0x01, 0x40, 0x0A, 0x43, 0x09, 0xD0,  
 0x81, 0x00, 0xC9, 0x18, 0x0F, 0x60, 0x08, 0xE0, 0xFE, 0x26, 0xE6, 0xE7, 0x01, 0x21, 0xF0, 0xE7,  
 0x01, 0x21, 0xF2, 0xE7, 0x81, 0x00, 0xC9, 0x18, 0x0D, 0x60, 0x40, 0x1C, 0x80, 0xB2, 0x20, 0x28,  
 0xE1, 0xD3, 0x7F, 0x48, 0x5A, 0x21, 0x01, 0x82, 0x7D, 0x48, 0xA5, 0x21, 0x20, 0x30, 0x01, 0x80,  
 0xFF, 0xF7, 0x86, 0xFE, 0x7A, 0x48, 0x03, 0x21, 0x40, 0x38, 0x01, 0x80, 0x00, 0xBF, 0x25, 0x46,  
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 0x09, 0x20, 0xB8, 0x80, 0x02, 0x20, 0xFF, 0xF7, 0x97, 0xFE, 0x01, 0x20, 0xB8, 0x80, 0xFF, 0x20,  
 0xF5, 0x30, 0xFF, 0xF7, 0x32, 0xFE, 0xAD, 0x1C, 0xAD, 0xB2, 0xB5, 0x42, 0xEB, 0xD3, 0x64, 0x1C,  
 0xA4, 0xB2, 0x02, 0x2C, 0xB2, 0xD3, 0x64, 0x20, 0xFF, 0xF7, 0x27, 0xFE, 0x68, 0x48, 0x01, 0x21,  
 0x40, 0x38, 0x01, 0x80, 0xFF, 0x20, 0x2D, 0x30, 0xFF, 0xF7, 0x1F, 0xFE, 0x64, 0x49, 0x00, 0x20,  
 0x08, 0x82, 0x63, 0x49, 0x20, 0x31, 0x08, 0x80, 0xF0, 0xBD, 0xF8, 0xB5, 0x06, 0x46, 0x61, 0x48,  
 0x80, 0x78, 0x20, 0x28, 0x1B, 0xD0, 0x7E, 0x21, 0x00, 0x24, 0x00, 0x91, 0x5C, 0x48, 0x5A, 0x21,  
 0x25, 0x46, 0x01, 0x82, 0x5A, 0x48, 0xA5, 0x21, 0x20, 0x30, 0x01, 0x80, 0x58, 0x48, 0x20, 0x38,  
 0x84, 0x80, 0x57, 0x48, 0x02, 0x21, 0x40, 0x38, 0x01, 0x80, 0x64, 0x20, 0xFF, 0xF7, 0xFD, 0xFD,  
 0x00, 0x2E, 0x75, 0xD0, 0x02, 0x2E, 0x04, 0xD0, 0x03, 0x2E, 0x38, 0xD1, 0x38, 0xE0, 0xFE, 0x21,  
 0xE2, 0xE7, 0x00, 0x21, 0x30, 0xE0, 0xCA, 0x07, 0xD2, 0x17, 0x52, 0x1C, 0x00, 0x20, 0x94, 0x46,  
 0x4A, 0x01, 0x96, 0x46, 0x72, 0x46, 0x12, 0x18, 0x93, 0x00, 0x01, 0x22, 0x12, 0x07, 0x9A, 0x18,  
 0x12, 0x68, 0xC3, 0x07, 0xDE, 0x17, 0x76, 0x1C, 0x37, 0x46, 0x63, 0x46, 0x1E, 0x40, 0x03, 0x46,  
 0x0B, 0x40, 0x1E, 0x43, 0x00, 0x2A, 0x01, 0xD0, 0x01, 0x23, 0x00, 0xE0, 0x00, 0x23, 0x1E, 0x40,  
 0x63, 0x46, 0x03, 0x40, 0x0F, 0x40, 0x3B, 0x43, 0x52, 0x1C, 0x00, 0xD0, 0x01, 0x22, 0x13, 0x40,  
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 0x20, 0x28, 0xD7, 0xD3, 0x49, 0x1C, 0x89, 0xB2, 0x00, 0x98, 0x81, 0x42, 0xCB, 0xD3, 0x50, 0xE0,  
 0x00, 0x21, 0x30, 0xE0, 0xCA, 0x07, 0xD2, 0x17, 0x52, 0x1C, 0x00, 0x20, 0x94, 0x46, 0x4A, 0x01,  
 0x96, 0x46, 0x72, 0x46, 0x12, 0x18, 0x93, 0x00, 0x01, 0x22, 0x12, 0x07, 0x9A, 0x18, 0x12, 0x68,  
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 0x07, 0x46, 0x0F, 0x40, 0x3E, 0x43, 0x52, 0x1C, 0x00, 0xD0, 0x01, 0x22, 0x16, 0x40, 0x33, 0x43,  
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 0xD7, 0xD3, 0x49, 0x1C, 0x89, 0xB2, 0x00, 0x98, 0x81, 0x42, 0xCB, 0xD3, 0x19, 0xE0, 0xFF, 0xE7,  
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 0x92, 0x00, 0x92, 0x19, 0x12, 0x68, 0x00, 0x2A, 0x02, 0xD0, 0x64, 0x1C, 0xA4, 0xB2, 0x3D, 0x43,  
 0x40, 0x1C, 0x80, 0xB2, 0x20, 0x28, 0xF2, 0xD3, 0x49, 0x1C, 0x89, 0xB2, 0x00, 0x98, 0x81, 0x42,  
 0xEB, 0xD3, 0x64, 0x20, 0xFF, 0xF7, 0x69, 0xFD, 0x09, 0x49, 0x01, 0x20, 0x20, 0x39, 0x88, 0x80,  
 0x07, 0x49, 0x40, 0x39, 0x08, 0x80, 0xFF, 0x20, 0x2D, 0x30, 0xFF, 0xF7, 0x5E, 0xFD, 0x04, 0x49,  
 0x00, 0x20, 0x08, 0x82, 0x02, 0x49, 0x20, 0x31, 0x08, 0x80, 0x20, 0x04, 0x28, 0x43, 0xF8, 0xBD,  
 0x40, 0x5C, 0x00, 0x40, 0x00, 0x10, 0x00, 0x20, 0x07, 0x49, 0x08, 0x70, 0x47, 0x06, 0x49,  
 0x08, 0x70, 0x00, 0x20, 0x70, 0x47, 0x00, 0x20, 0xC0, 0x43, 0x70, 0x47, 0x03, 0x49, 0x04, 0x20,  
 0x08, 0x74, 0x30, 0xBF, 0x70, 0x47, 0x00, 0x00, 0xF0, 0x13, 0x00, 0x20, 0xE0, 0x1F, 0x00, 0x20,

```

0x70, 0xB5, 0x00, 0x22, 0xD2, 0x43, 0x00, 0x24, 0x1D, 0x4D, 0x0B, 0xE0, 0x03, 0x5D, 0x5A, 0x40,
0x07, 0x23, 0xD6, 0x07, 0x02, 0xD0, 0x52, 0x08, 0x6A, 0x40, 0x00, 0xE0, 0x52, 0x08, 0x5B, 0x1E,
0xF7, 0xD5, 0x64, 0x1C, 0x8C, 0x42, 0xF1, 0xD3, 0xD0, 0x43, 0x70, 0xBD, 0x30, 0xB5, 0x14, 0x4B,
0x14, 0x4C, 0x00, 0x21, 0x08, 0x46, 0x07, 0x22, 0xC5, 0x07, 0x02, 0xD0, 0x40, 0x08, 0x58, 0x40,
0x00, 0xE0, 0x40, 0x08, 0x52, 0x1E, 0x52, 0xB2, 0x00, 0x2A, 0xF5, 0xDA, 0x8A, 0x00, 0x49, 0x1C,
0x89, 0xB2, 0xA0, 0x50, 0xFF, 0x29, 0xED, 0xD9, 0x30, 0xBD, 0x30, 0xB5, 0x00, 0x23, 0xDB, 0x43,
0x00, 0x22, 0x08, 0x4C, 0x07, 0xE0, 0x85, 0x5C, 0x5D, 0x40, 0x2D, 0x06, 0xAD, 0x0D, 0x65, 0x59,
0x1B, 0x0A, 0x6B, 0x40, 0x52, 0x1C, 0x8A, 0x42, 0xF5, 0xD3, 0xD8, 0x43, 0x30, 0xBD, 0x00, 0x00,
0x20, 0x83, 0xB8, 0xED, 0x00, 0x0C, 0x00, 0x20, 0x01, 0xE0, 0x04, 0xC0, 0x09, 0x1F, 0x04, 0x29,
0xFB, 0xD2, 0x8B, 0x07, 0x01, 0xD5, 0x02, 0x80, 0x80, 0x1C, 0xC9, 0x07, 0x00, 0xD0, 0x02, 0x70,
0x70, 0x47, 0x00, 0x29, 0x0B, 0xD0, 0xC3, 0x07, 0x02, 0xD0, 0x02, 0x70, 0x40, 0x1C, 0x49, 0x1E,
0x02, 0x29, 0x04, 0xD3, 0x83, 0x07, 0x02, 0xD5, 0x02, 0x80, 0x80, 0x1C, 0x89, 0x1E, 0xE3, 0xE7,
0x00, 0x22, 0xEE, 0xE7, 0x00, 0x22, 0xDF, 0xE7, 0x10, 0xB5, 0x04, 0x46, 0xC0, 0x46, 0xC0, 0x46,
0x20, 0x46, 0xFF, 0xF7, 0xAB, 0xFA, 0x10, 0xBD};
    
```

## 8. Revision History

Revision	Date	Description
1.00	Sep 21, 2022	Initial release.



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