

Table 24-5. Signature Row Addressing

Signature Byte	Z-Pointer Address
Device Signature Byte 1	0x0000
Device Signature Byte 2	0x0002
Device Signature Byte 3	0x0004
RC Oscillator Calibration Byte	0x0001

Note: All other addresses are reserved for future use.

24.8.11 Preventing Flash Corruption

During periods of low V_{CC} , the Flash program can be corrupted because the supply voltage is too low for the CPU and the Flash to operate properly. These issues are the same as for board level systems using the Flash, and the same design solutions should be applied.

A Flash program corruption can be caused by two situations when the voltage is too low. First, a regular write sequence to the Flash requires a minimum voltage to operate correctly. Secondly, the CPU itself can execute instructions incorrectly, if the supply voltage for executing instructions is too low.

Flash corruption can easily be avoided by following these design recommendations (one is sufficient):

1. If there is no need for a Boot Loader update in the system, program the Boot Loader Lock bits to prevent any Boot Loader software updates.
2. Keep the AVR RESET active (low) during periods of insufficient power supply voltage. This can be done by enabling the internal Brown-out Detector (BOD) if the operating voltage matches the detection level. If not, an external low V_{CC} reset protection circuit can be used. If a reset occurs while a write operation is in progress, the write operation will be completed provided that the power supply voltage is sufficient.
3. Keep the AVR core in Power-down sleep mode during periods of low V_{CC} . This will prevent the CPU from attempting to decode and execute instructions, effectively protecting the SPMCSR Register and thus the Flash from unintentional writes.

24.8.12 Programming Time for Flash when Using SPM

The calibrated RC Oscillator is used to time Flash accesses. [Table 24-6](#) shows the typical programming time for Flash accesses from the CPU.

Table 24-6. SPM Programming Time⁽¹⁾

Symbol	Min Programming Time	Max Programming Time
Flash write (Page Erase, Page Write, and write Lock bits by SPM)	3.7 ms	4.5 ms

Note: 1. Minimum and maximum programming time is per individual operation.

24.8.13 Simple Assembly Code Example for a Boot Loader

```
;-the routine writes one page of data from RAM to Flash
; the first data location in RAM is pointed to by the Y pointer
; the first data location in Flash is pointed to by the Z-pointer
;-error handling is not included
```