2018-01-16

Next Generation Beacons

Alternative Atmel Programmer

Overview | VCO-PLL | DDS | GPS reference | Distribution amplifiers | Service management | Sequence | PI4 | Software

This page describes how to program the Next Generation Beacon units, i.e. VCO-PLL and DDS, using an alternative to Atmel Studio and an Atmel programmer. Instead the eXtreme Burner software and an USBasp programmer, available on eBay for less than 3 EUR, are used.

Programming hardware - USBasp

The USBasp programmer is available from eBay for less than 3 EUR.

Atmel USBasp programmer with 3,3 V/5 V target voltage jumper.

Because most of the USBasp programmers have a JTAG 10 pin connector you will also need a JTAG 10 pin to 6 pin adapter. They are also available from eBay typically for 1 EUR.

Atmel JTAG 10 pin to 6 pin adapter.

Please be aware that some USBasp programmers have the target voltage fixed at 3,3 V or 5 V. Some are fitted with a jumper that allows easy switching between the target voltages. Others have a couple of small solder pads where one must be open and the other one shorted to provide the correct target voltage. In any case when programming a Next Generation Beacons unit the programmer must be set for a target voltage of 3,3 V. Failure to do so may cause problems.

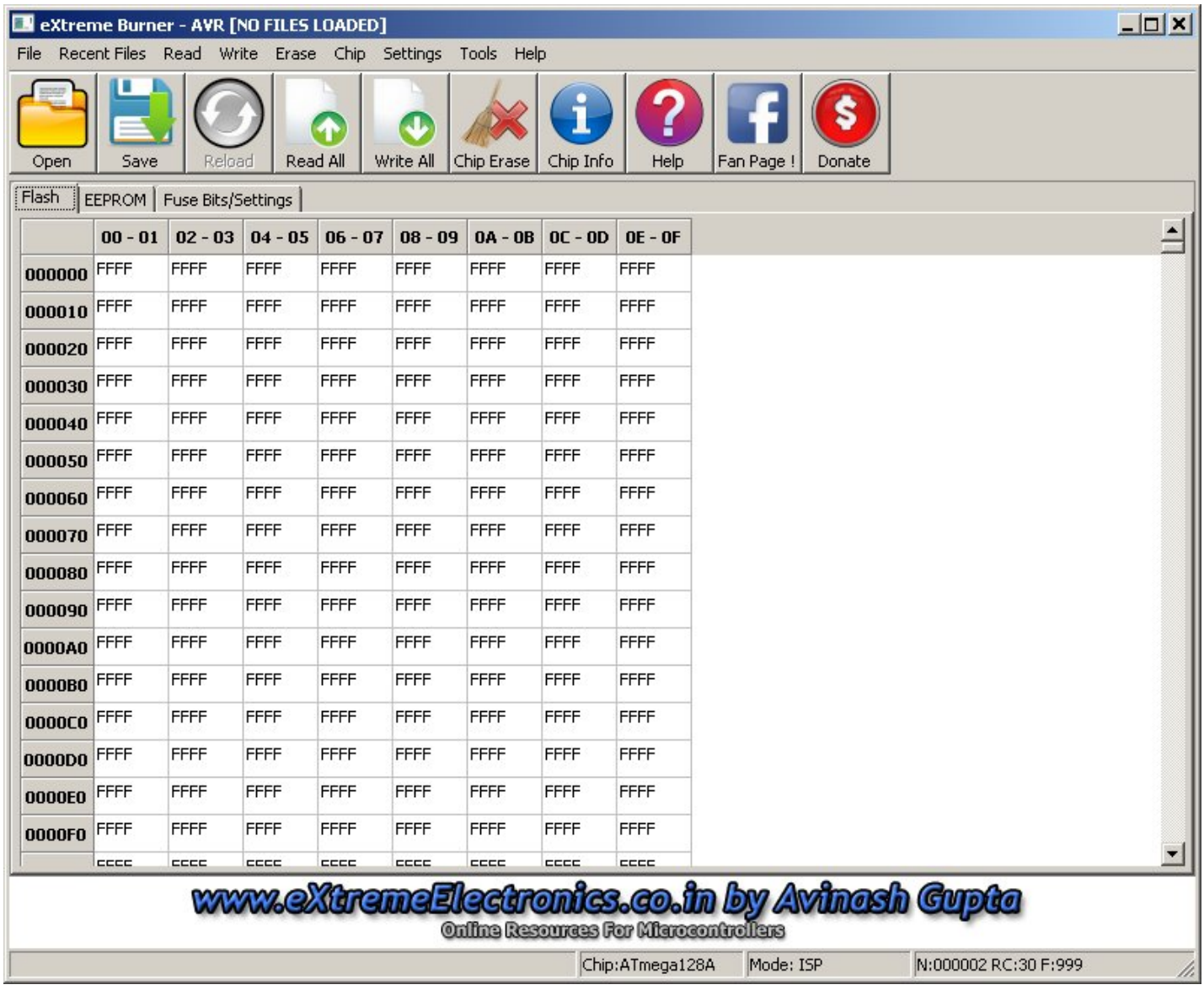
Programming software - eXtreme Burner

To program the relevant .hex file to the Atmel MCU the free eXtreme Burner is used.

- Download it from the eXtreme Burner home page (Windows and Linux) or directly here extreme_burner.zip (Windows)
- On Windows you may have to use Zadig to install the libusb0.dll driver because of increasing security in Windows it may not install the driver itself so Zadig is needed

Once eXtreme Burner is downloaded please unzip and execute the relevant installation program.

eXtreme Burner - AVR main screen.



By default eXtreme Burner does not have the MCU data for the ATmega328 (VCO-PLL unit) and the ATmega128A (DDS unit). Therefore you will need to replace the existing chips.xml file with the one that is included in the extreme_burner.zip file. Chips.xml is located in the Data directory which is a subdirectory in the directory where you installed eXtreme Burner, typically C:\Program Files\eXtremeBurner\Data on a Windows PC. Alternatively you will have to edit the chips.xml file adding the data for the ATmega328 and ATmega128A.

ATmega328 data for the chips.xml file.

```
<CHIP>
   <NAME>ATmega328</NAME>
```

```
   <FLASH>32768</FLASH>
   <EEPROM>1024</EEPROM>
   <SIG>0x0014951E</SIG>
   <PAGE>64</PAGE>
   <LFUSE layout="2">YES</LFUSE>
   <HFUSE layout="5">YES</HFUSE>
   <EFUSE layout="4">YES</EFUSE>
   <LOCK>YES</LOCK>
   <CALIB>YES</CALIB>
   <PLACEMENT>.\Images\Placements\ZIF_DIP_40.bmp</PLACEMENT>
</CHIP>
```

ATmega328P data for the chips.xml file. The ATmega328P is used in the Arduino Uno and Arduino Nano.

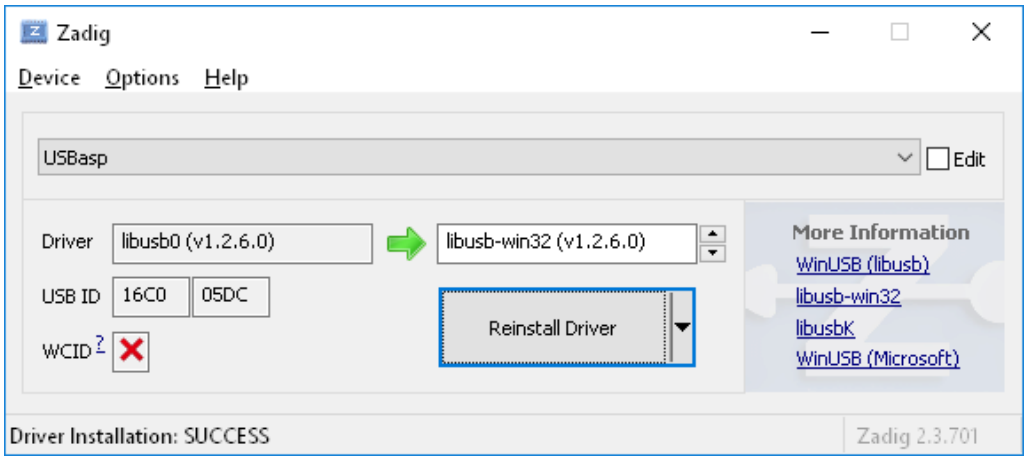
```
<CHIP>
   <NAME>ATmega328P</NAME>
   <FLASH>32768</FLASH>
   <EEPROM>1024</EEPROM>
   <SIG>0x000F951E</SIG>
   <PAGE>64</PAGE>
   <LFUSE layout="2">YES</LFUSE>
   <HFUSE layout="5">YES</HFUSE>
   <EFUSE layout="4">YES</EFUSE>
   <LOCK>YES</LOCK>
   <CALIB>YES</CALIB>
   <PLACEMENT>.\Images\Placements\ZIF_DIP_40.bmp</PLACEMENT>
</CHIP>
```

ATmega128A data for the chips.xml file.

```
<CHIP>
   <NAME>ATmega128A</NAME>
   <FLASH>131072</FLASH>
   <EEPROM>4096</EEPROM>
   <SIG>0x0002971E</SIG>
   <PAGE>128</PAGE>
   <LFUSE layout="1">YES</LFUSE>
   <HFUSE layout="2">YES</HFUSE>
   <EFUSE layout="3">YES</EFUSE>
   <LOCK>YES</LOCK>
   <CALIB>YES</CALIB>
   <PLACEMENT>.\Images\Placements\ZIF_DIP_40.bmp</PLACEMENT>
</CHIP>
```

If eXtreme Burner says that it cannot find the libusb0.dll file please install, execute and use Zidag to install the driver.

The Zadig screen to load libusb0.dll driver.



Programming the VCO-PLL unit

Please ensure that the USBasp programmer is set for a 3,3 V target voltage.

Plug the USBasp programmer into the computer and connect it to the VCO-PLL using the JTAG to 6 pin adapter and apply voltage to the VCO-PLL unit.

Launch the eXtreme Burner program and select Menu | Chip | ATmega328.

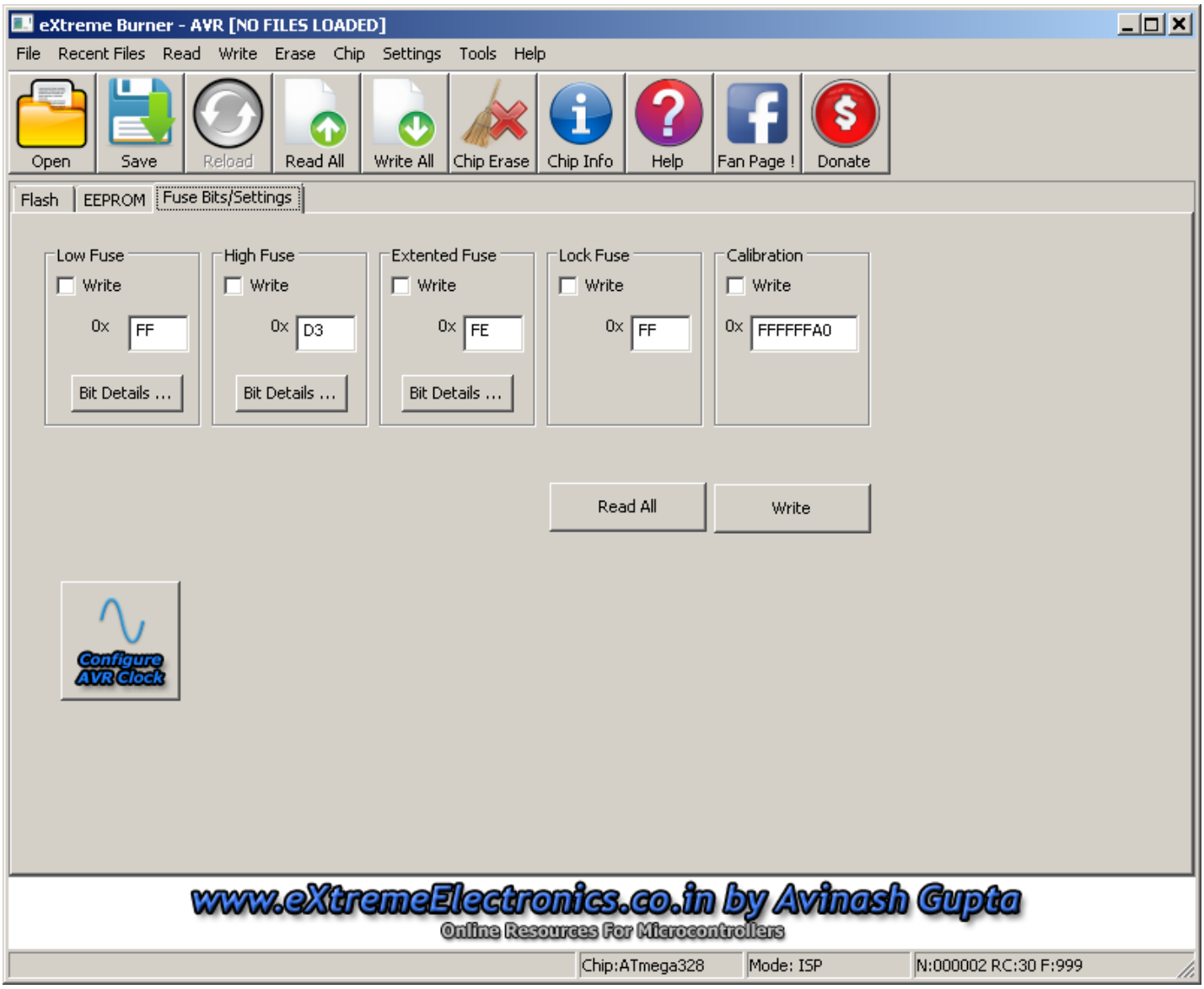
Setting the fuses

This is only relevant if you have assembled the VCO-PLL unit yourself or want to change the "factory defaults." Select the Fuse Bits/Settings tabsheet and set/verify the fuses accordingly.

Fuses	Hex value
Low Fuse	FF
High Fuse	D3
Extended Fuse	FE
Lock Fuse	FF
Calibration	FFFFFFA0

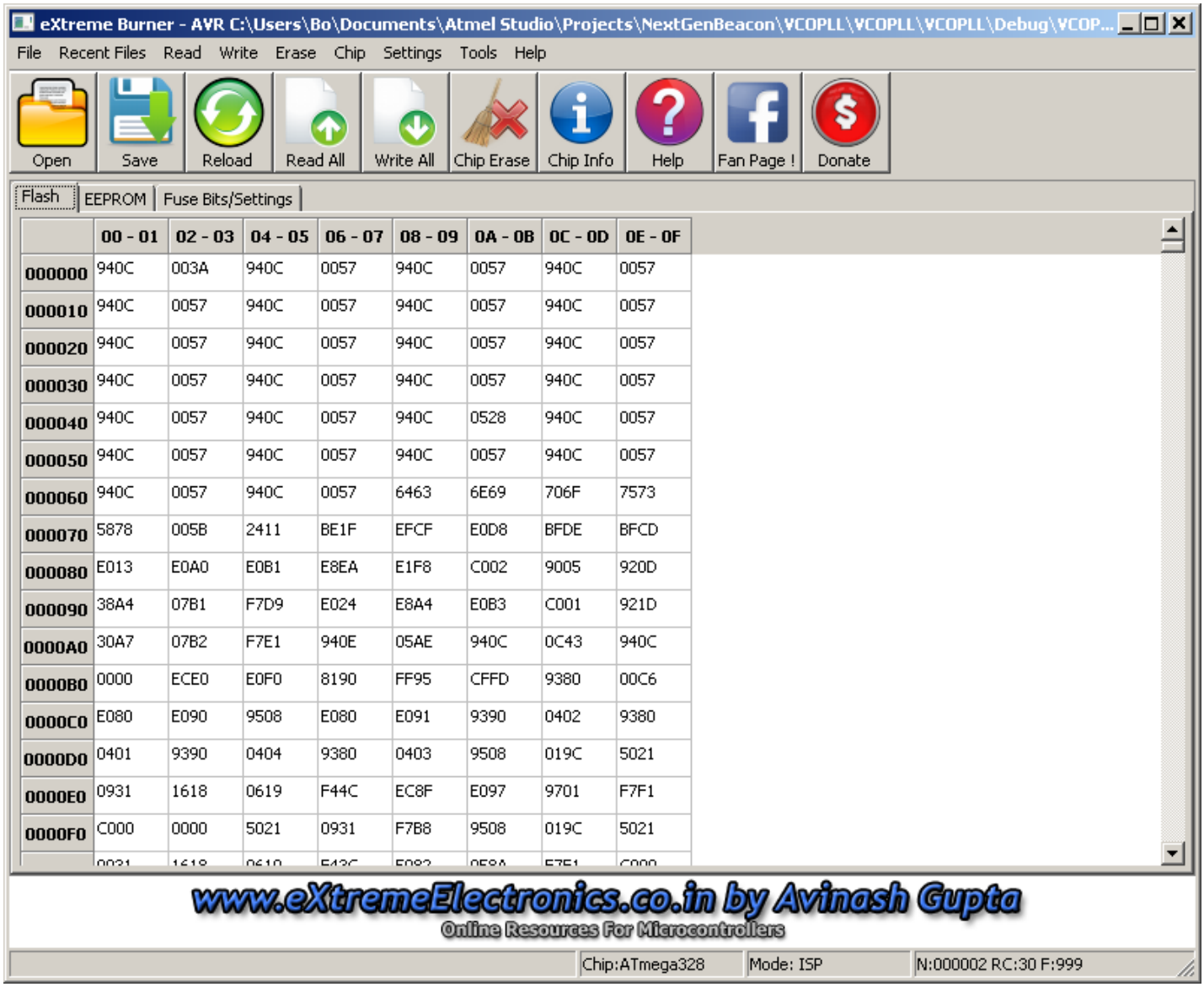
If you want to write a new set of fuses check the relevant Write checkboxes and select Menu | Write | Fuse Bits and Lock Bits.

eXtreme Burner and the VCO-PLL fuse settings.



Programming the VCO-PLL software

To program the VCOPLL.hex file to the VCO-PLL unit select the file from Menu | File | Open Flash then navigate to the file and select VCOPLL.hex and click the Open button. Then select Menu | Write | Flash.



After programming the new VCOPLL.hex file to the VCO-PLL unit it may be relevant to perform some configuration of the VCO-PLL unit. Please see the revision history for more details.

Programming the DDS unit

Please ensure that the USBasp programmer is set for a 3,3 V target voltage.

Plug the USBasp programmer into the computer and connect it to the DDS using the JTAG to 6 pin adapter and apply voltage to the DDS unit.

Launch the eXtreme Burner program and select Menu | Chip | ATmega128A.

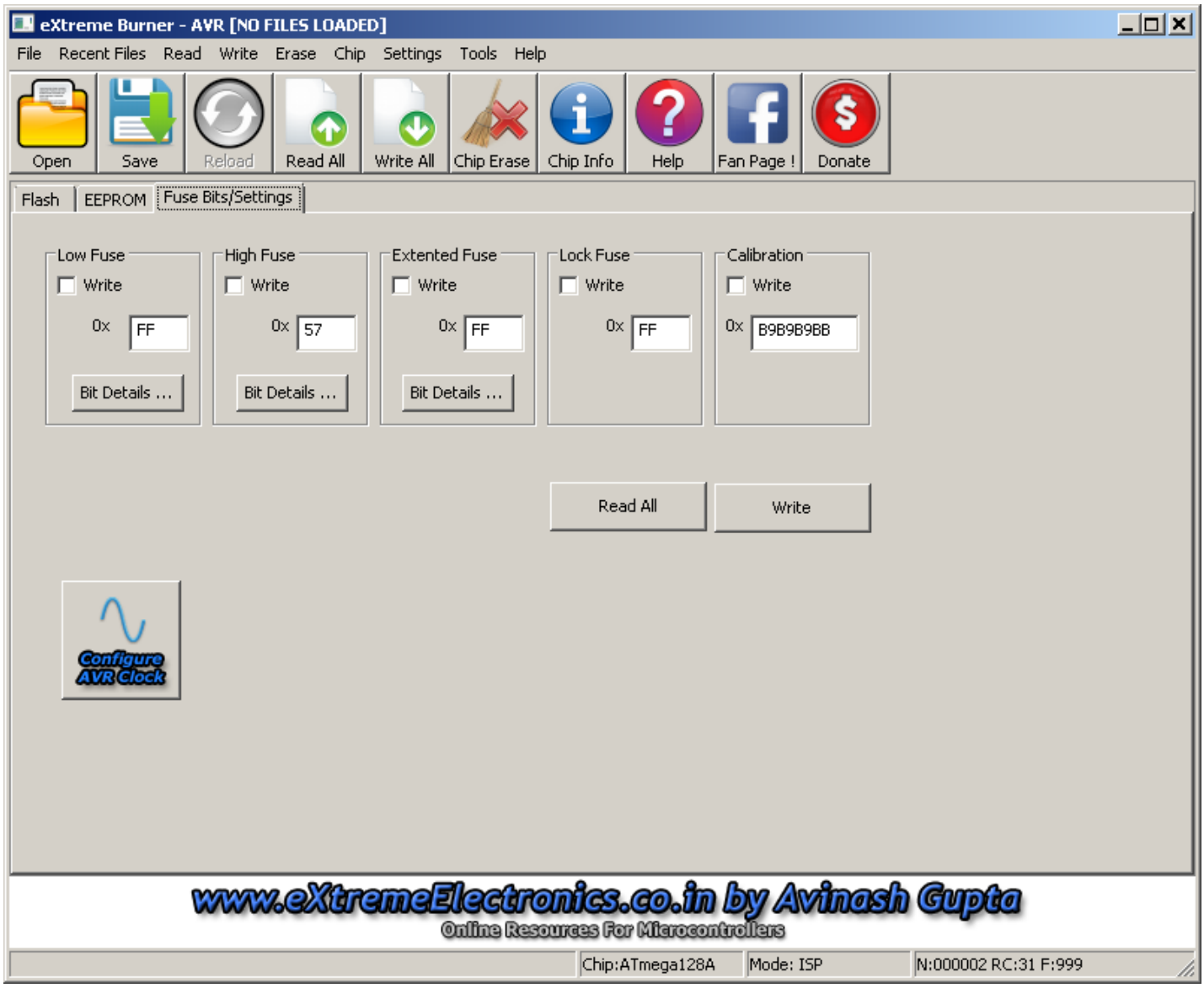
Setting the fuses

This is only relevant if you have assembled the DDS unit yourself or want to change the "factory defaults." Select the Fuse Bits/Settings tabsheet and set/verify the fuses accordingly.

Fuses	Hex value
Low Fuse	FF
High Fuse	57
Extended Fuse	FF
Lock Fuse	FF
Calibration	B9B9B9BB

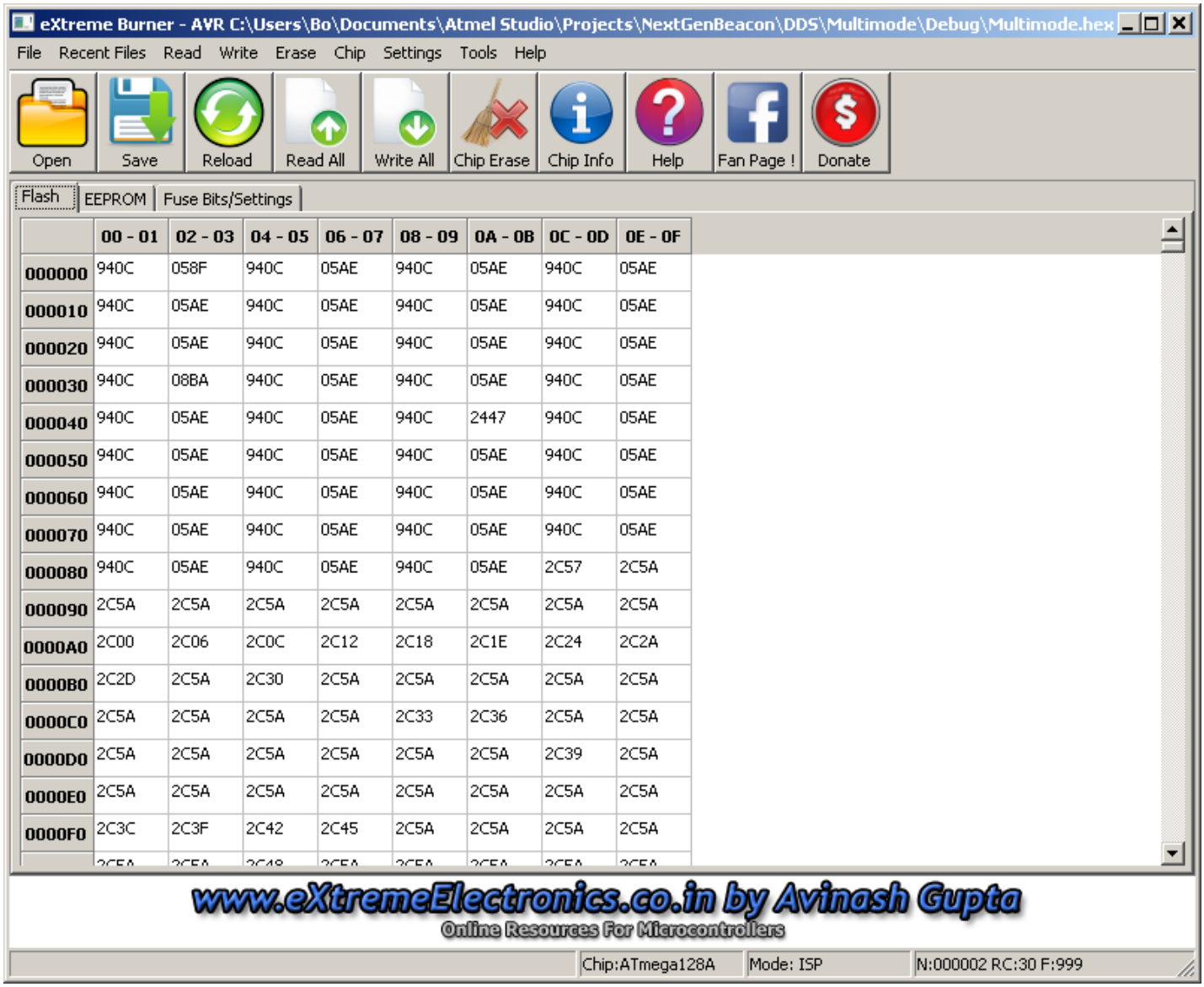
If you want to write a new set of fuses check the relevant Write checkboxes and select Menu | Write | Fuse Bits and Lock Bits.

eXtreme Burner and the DDS fuse settings.



Programming the DDS software

To program the Multimode.hex file to the DDS unit select the file from Menu | File | Open Flash then navigate to the file and select Multimode.hex and click the Open button. Then select Menu | Write | Flash.



	00 - 01	02 - 03	04 - 05	06 - 07	08 - 09	0A - 0B	0C - 0D	0E - 0F
000000	940C	058F	940C	05AE	940C	05AE	940C	05AE
000010	940C	05AE	940C	05AE	940C	05AE	940C	05AE
000020	940C	05AE	940C	05AE	940C	05AE	940C	05AE
000030	940C	08BA	940C	05AE	940C	05AE	940C	05AE
000040	940C	05AE	940C	05AE	940C	2447	940C	05AE
000050	940C	05AE	940C	05AE	940C	05AE	940C	05AE
000060	940C	05AE	940C	05AE	940C	05AE	940C	05AE
000070	940C	05AE	940C	05AE	940C	05AE	940C	05AE
000080	940C	05AE	940C	05AE	940C	05AE	2C57	2C5A
000090	2C5A	2C5A	2C5A	2C5A	2C5A	2C5A	2C5A	2C5A
0000A0	2C00	2C06	2C0C	2C12	2C18	2C1E	2C24	2C2A
0000B0	2C2D	2C5A	2C30	2C5A	2C5A	2C5A	2C5A	2C5A
0000C0	2C5A	2C5A	2C5A	2C5A	2C33	2C36	2C5A	2C5A
0000D0	2C5A	2C5A	2C5A	2C5A	2C5A	2C5A	2C39	2C5A
0000E0	2C5A	2C5A	2C5A	2C5A	2C5A	2C5A	2C5A	2C5A
0000F0	2C3C	2C3F	2C42	2C45	2C5A	2C5A	2C5A	2C5A

After programming the new Multimode.hex file to the DDS unit it may be relevant to perform some configuration of the DDS unit. Please see the revision history for more details.

Bo, OZ2M, www.rudius.net/oz2m