



CAN Tools

In-Application-Programming

AT90CAN32/64/128



10 05 2007



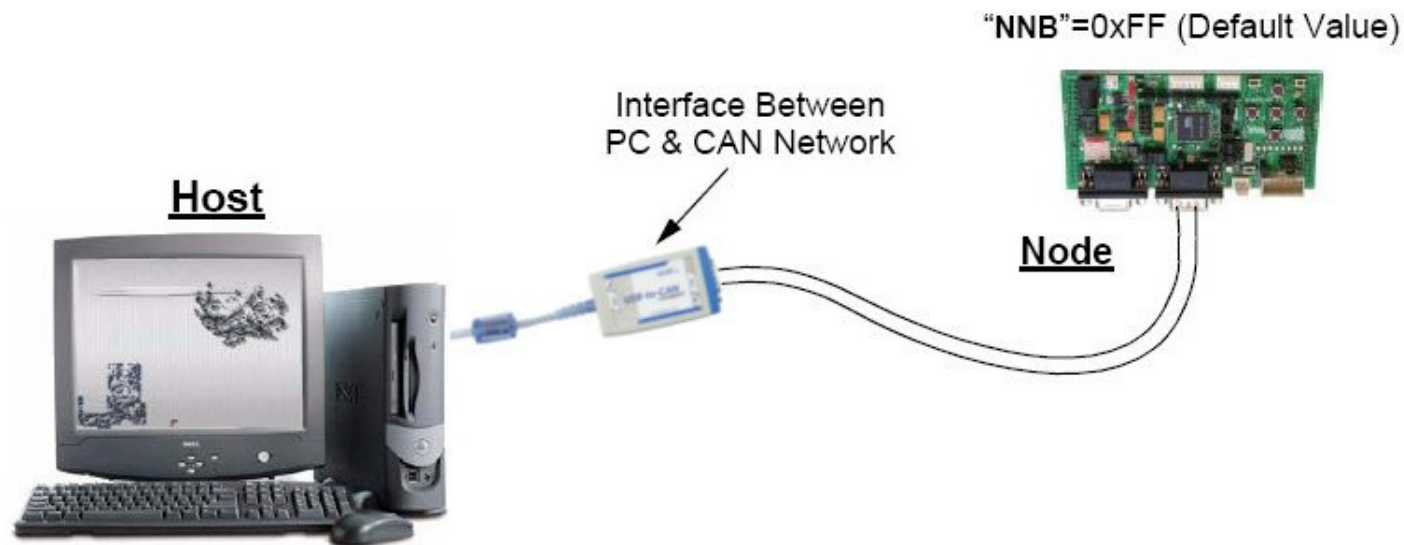
Welcome



Reminder (1)

■ ISP: In System Programming

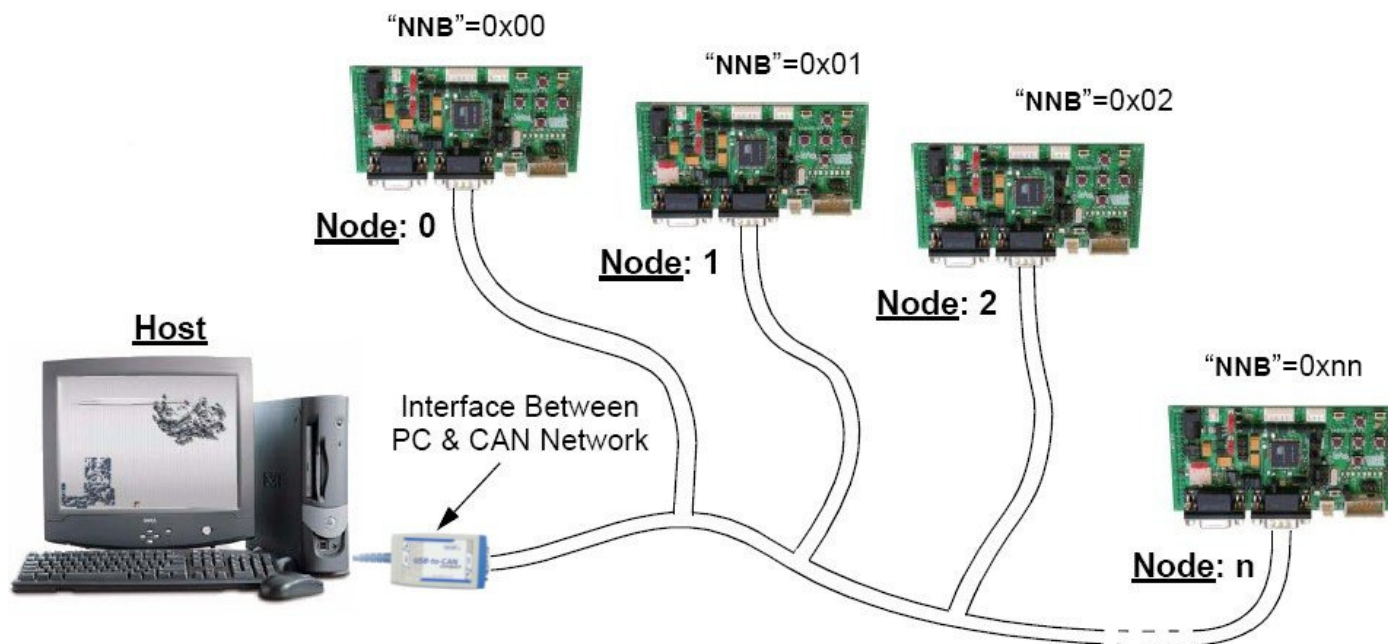
- Programming an AVR device using CAN medium.
- «Hardware» point to point communication.



Reminder (2)

■ IAP: In Application Programming

- ✚ IAP is not “Institute of Applied Physics”.
- ✚ IAP is not API (“Application Programming Interface”) .
- **Using CAN medium to program **one** AVR CAN device of CAN (complex) network **while** the application is **running**.**
- **«Software» point to point communication**



CAN Bootloader (1)

■ Features

- **CRIS:**

CAN Re-locatable ID Segment: 7 ID's – Default = 0x00

- **NNB:**

Node NumBer: From 0x00 up to 0xFE – Default = 0xFF (full acceptance)

- **Bit rate:**

- Initialization (ISP): **Auto bit rate**
- In application (IAP): **Fixed bit rate**

- **Programming / Reading/ Erasing / Blank checking**

- Flash
- E²Prom
- Bootloader configuration

- **Only reading**


- Bootloader version, device ID
- All device registers, especially bit rate configuration registers

- **“`void flash_api_wr_block(char* src, int dest, int byte_nb)`”**



CAN Bootloader (2)

■ Version

- Compiled with **GCC**
 - ≈ **5.5** Kbytes of Flash
 - ≈ **320** bytes of SRAM
- Available for **AT90CAN128, 64 & 32**
- Documented:  'GCC_CAN_bootloader-rev-1.1.0.pdf'



■ Ready to use

- «main» + libraries
- Sources are available & free

■ Device configuration

- Set Boot size to **8** Kbytes
- Enable Reset vector to **Bootloader Reset**
- External Crystal (from **2** up to **16** MHz)

IAP Enabling

■ A preliminary «hardware» point-to-point connection is necessary to set:

- CRIS (depends on application ID range) ,
- NNB (1 by node) ,
- BSB (Boot Status Byte) ,
- BTC[1..3] (application bit rate) ,
- EB (Extra Byte) .



■ Switching from application to bootloader (IAP) is the responsibility of customer application:

- On the recognition of a key-code, a “ `jump_to`(bootloader)” must be done.
- Example: enter in IAP mode on the recognition of a frame in the range defined by CRIS.



CAN Tools - IAP

"Illustration by example"

**Develop an application on
an AVR CAN is:**

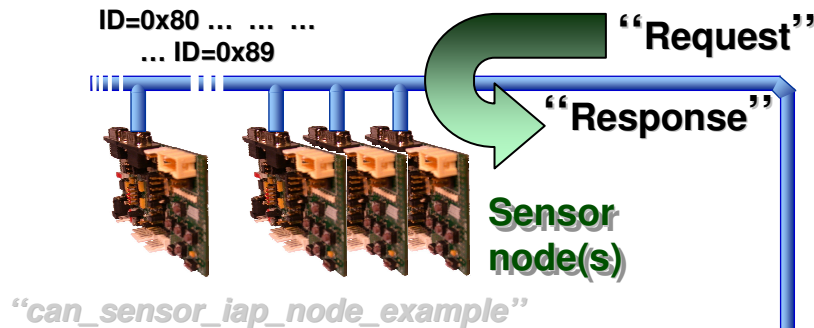
- easy,**
- fast &**
- powerful.**

IAP - Demonstration

Principal

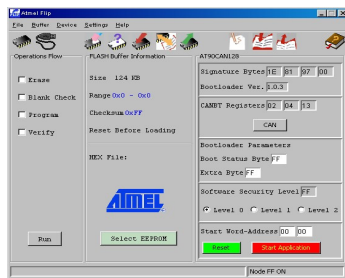
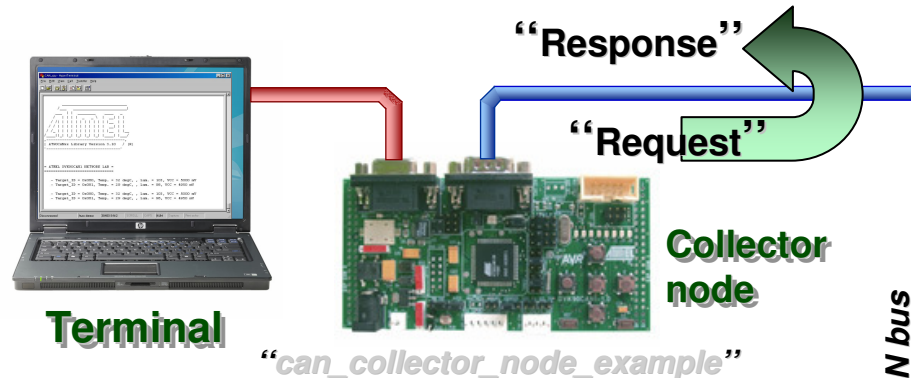
In the set of examples:

"can_sensor_network_example"



Sensor - IAP:

- **IAP:** In Application Programming
- The application behavior is the same that "Sensor".
- Sensor node has to load on board a CAN - Bootloader.
- The node can be re-programmed while the network is working
- Flip3 is dedicated to allow this task, ex: changing the attributed ID₁₁.



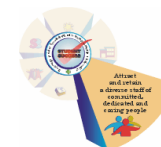
Flip3

Collector:

- Resquest frames are periodically send (ID₁₁ 0x80 up to 0x89).
- If a response exists, it is re- sent to the Terminal.
- The Terminal displays sensor data of the requested board:
 - Local temperature
 - Local luminosity
 - Local power-supplying

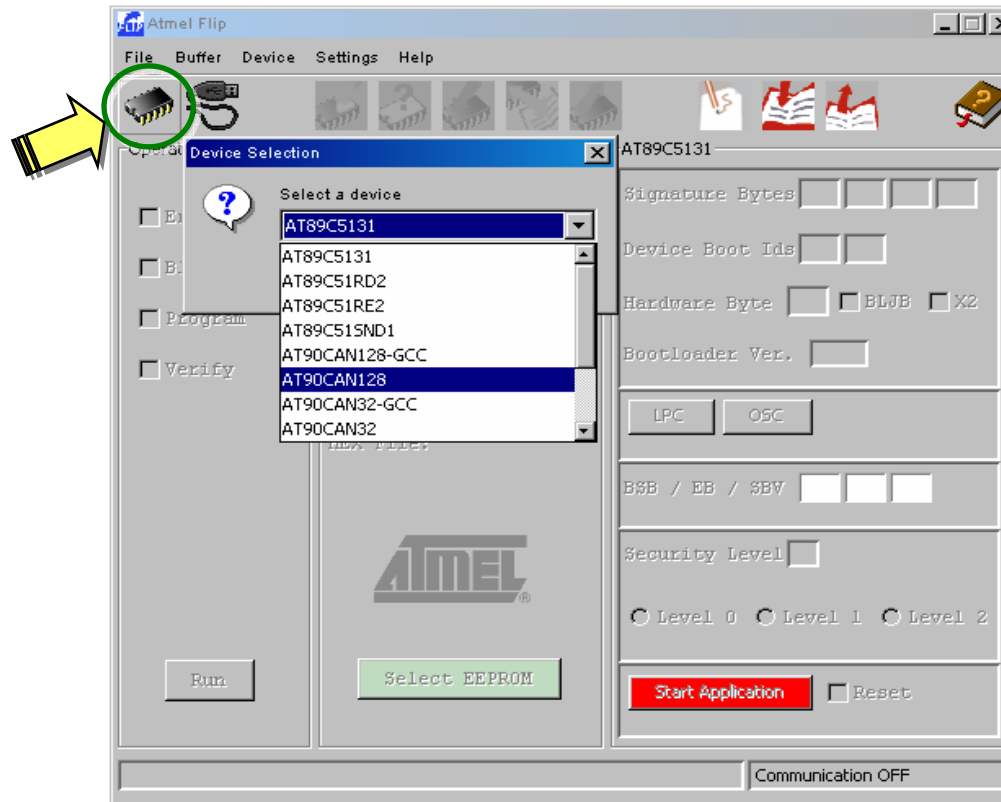
IAP - Application (2)

- **Goal for board 1**
 - **Current setting**
 - NNB = 0x01
 - CRIS = 0x00
 - Bitrate: 250 kBd
 - Application: " *can_sensor_iap_node_0x81_example_gcc.hex* "
 - **Changing ID 0x081 by ID 0x082**
 - Download " *can_sensor_iap_node_0x82_example_gcc.hex* "
- **Goal for**
- **Goal for board 7**
 - **Current setting**
 - NNB = 0x07
 - CRIS = 0x00
 - Bitrate: 250 kBd
 - Application: " *can_sensor_iap_node_0x87_example_gcc.hex* "
 - **Changing ID 0x087 by ID 0x088**
 - Download " *can_sensor_iap_node_0x88_example_gcc.hex* "



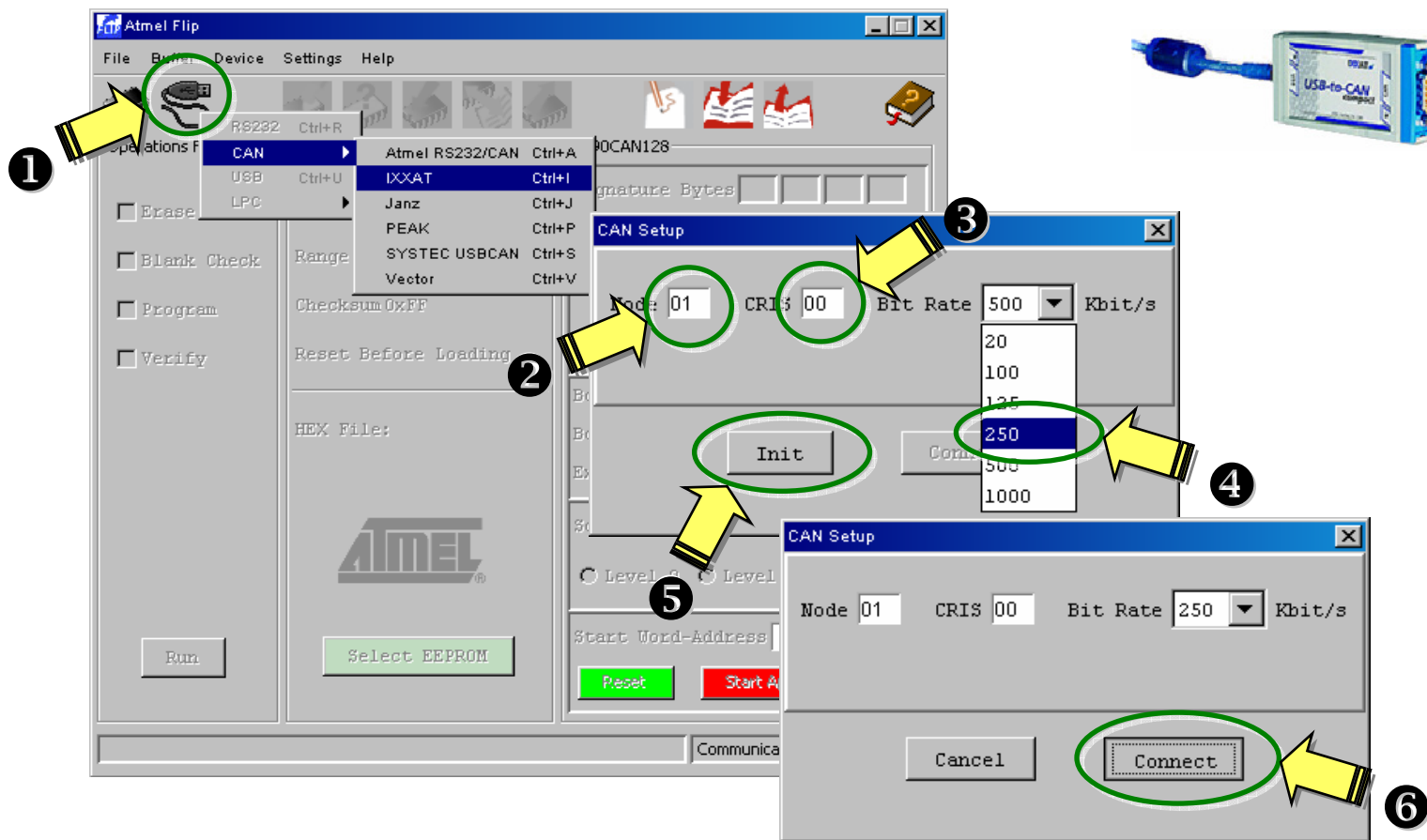
IAP - Flip 3 (1)

- Flip 3
 - Targeted device



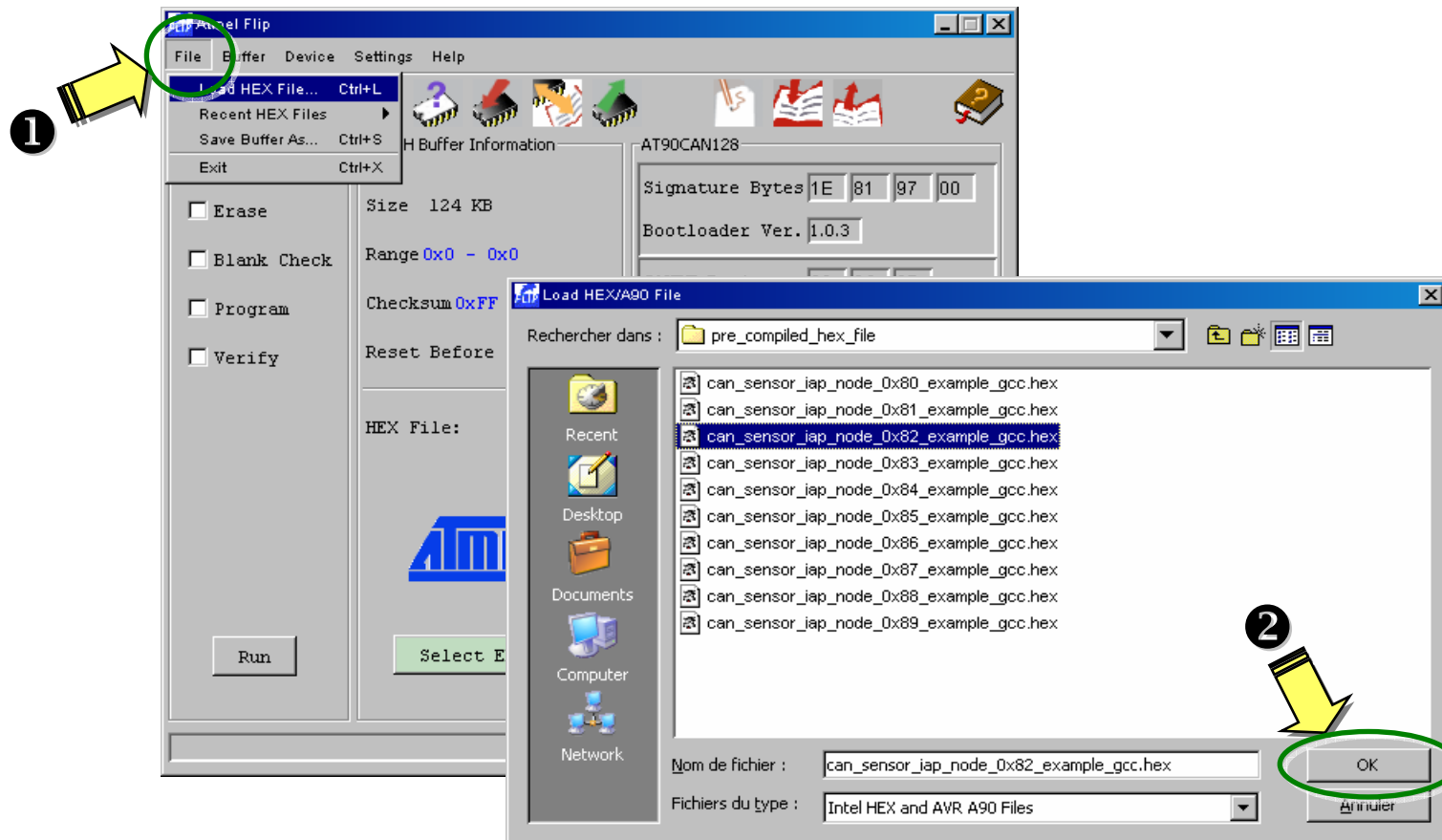
IAP - Flip 3 (2)

Communication medium



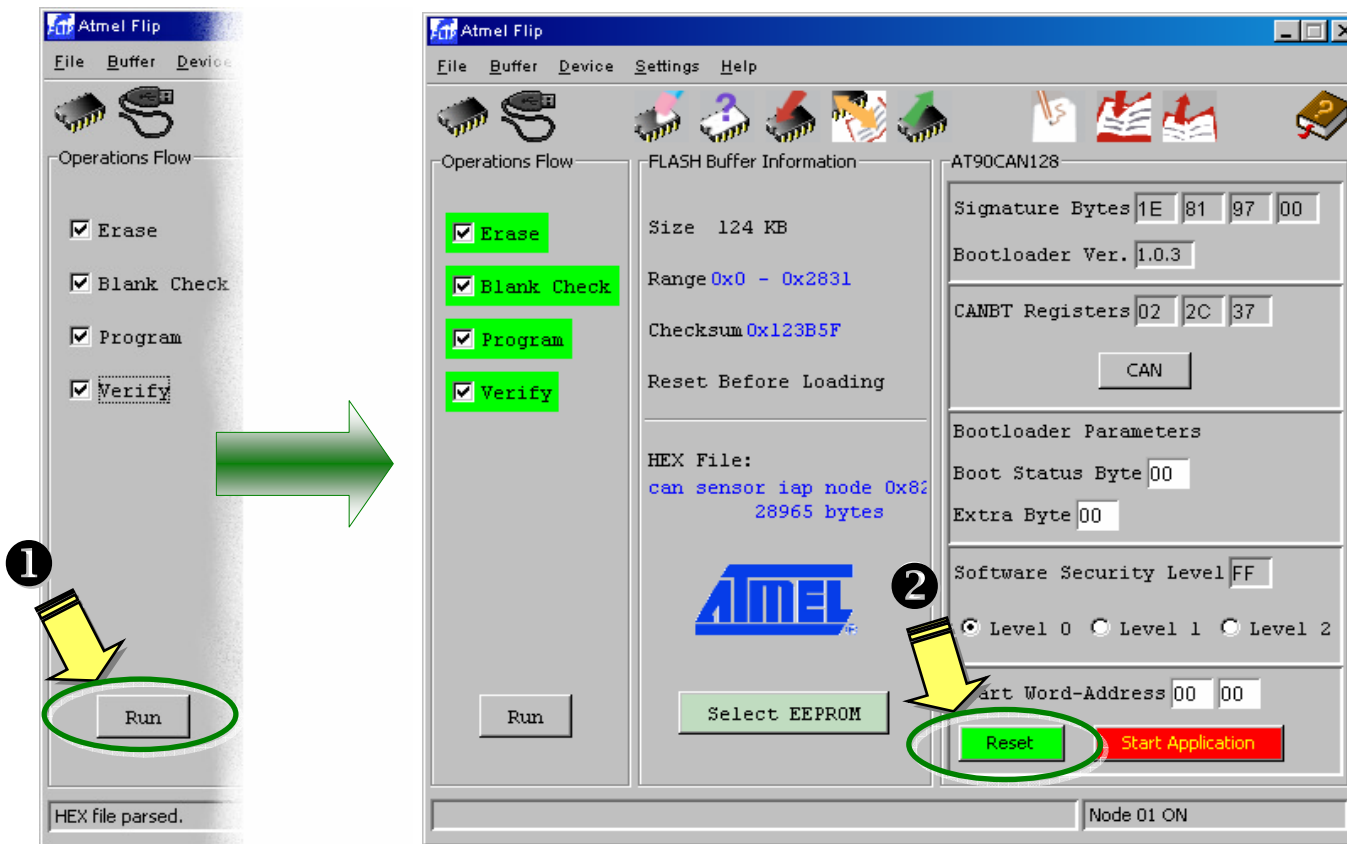
IAP - Flip 3 (3)

- Download the new program



IAP - Flip 3 (4)

- Program the targeted device





***Thank
you***





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