SMH Technologies®

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Driver v. 5.04

Diego Piccinin

Interfacing FlashRunner 2.0 with NXP NCF

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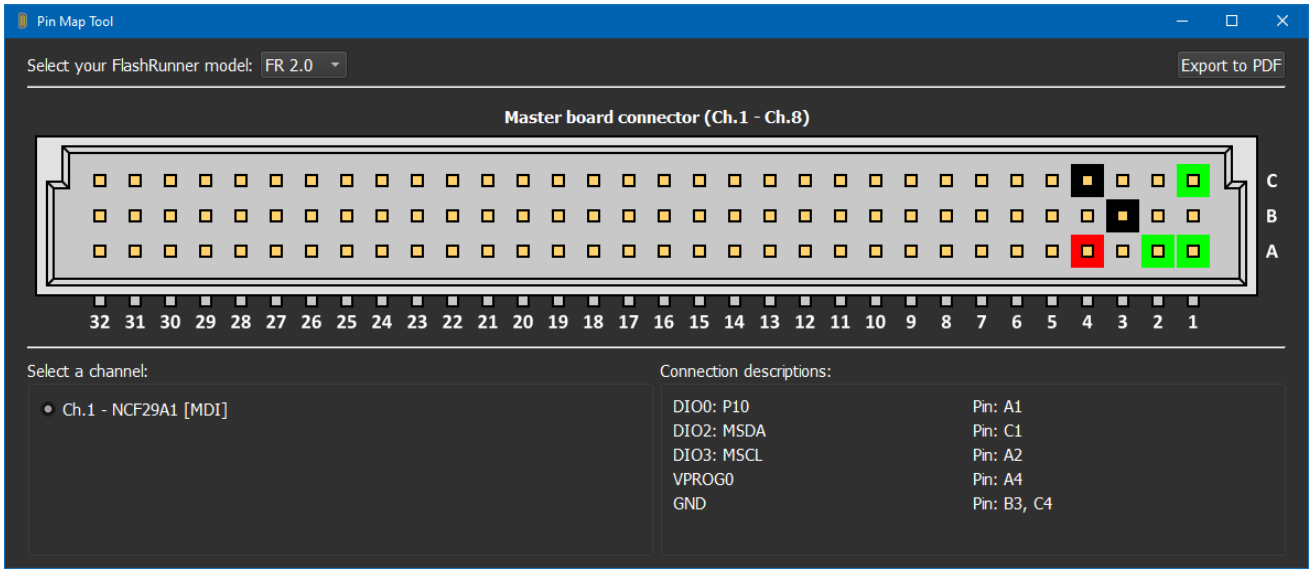
NXP NCF Protocol and PIN map

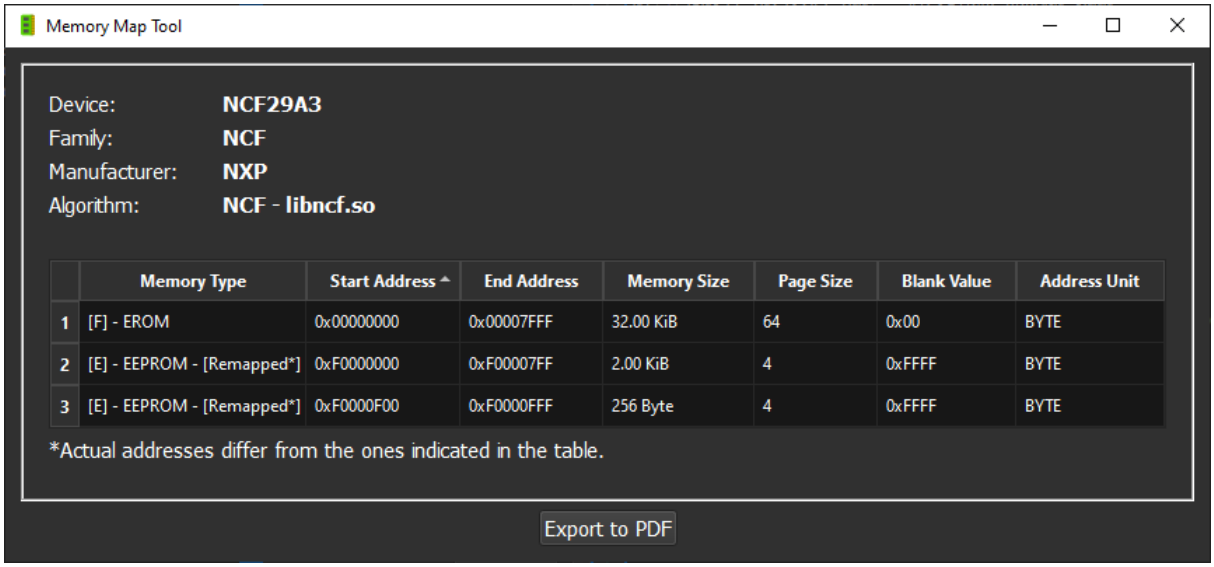
NCF devices support the MDI protocol.

```
#TCSETPAR CMODE <MDI>
```

NXP NCF PIN MAP



NXP NCF Memory Map



	Memory Type	Start Address	End Address	Memory Size	Page Size	Blank Value	Address Unit
1	[F] - EROM	0x00000000	0x00007FFF	32.00 KiB	64	0x00	BYTE
2	[E] - EEPROM - [Remapped*]	0xF0000000	0xF00007FF	2.00 KiB	4	0xFFFF	BYTE
3	[E] - EEPROM - [Remapped*]	0xF0000F00	0xF0000FFF	256 Byte	4	0xFFFF	BYTE

The EEprom is remapped to the address **0xF0000000** because in the NCF device EROM and EEprom have the same starting address **0x00000000**.

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NXP NCF Driver Parameters

The standard parameters are used to configure some specific options inside NCF driver.

#TCSETPAR SAMPLING_POINT

Syntax: `#TCSETPAR SAMPLING_POINT <Value>`

`<Value>` Accepted values are in the range 1-15

Description: Use this parameter to permanently set the sampling point of the FPGA
It is recommended to leave this parameter with the default value

Note: Default value 17

NXP NCF Internal Memory Check

There is a possibility that the internal memory of the NCF device is not what you would expect to find given the part number of the device.
This is a normal behavior as NXP sometimes decides to reduce the amount of memory for various reason.

The NCF driver already automatically checks the available memory in the `#TPCMD CONNECT` command.

If you load an FRB file that is larger than the memory actually present, the driver returns an error as in the image here:

```
---#TPCMD CONNECT
Protocol selected MDI.
Try to enter Monitor mode through MDI protocol at 125kBit/s:
 * Put MSDA signal low to enter Monitor Mode.
 * Put P10 signal low to enter Monitor Mode.
 * Device Status: 0x0003.
 * Device Program Counter: 0x0000.
 * Device enter correctly into Monitor Mode.
Current device status is 0x003:
 * CPU is currently in monitor mode.
 * CPU is currently in system mode.
 * CPU is currently in active mode.
 * Watchpoint 0 has not been hit.
 * Watchpoint 1 has not been hit.
 * Watchpoint 2 has not been hit.
 * Watchpoint 3 has not been hit.
 * Current device mode is Init.
Try to change MDI Baudrate to 1MBit/s:
 * MDI Baudrate set correctly to 1MBit/s.
Check real size of embedded memories:
 * Erom memory:
   * Erom memory size from SMH database: 32768 bytes.
   * Erom memory read from the device:   16384 bytes.
   * Updated Erom size from 32768 bytes to 16384 bytes (16 KBytes).
FRB Headers collected.
FRB size is bigger than Erom size. Please check your FRB file.
0800A1D0!|
01|ERR--0800A1D0|(null)|[file ../Code/NCF_1_API.c, line 464, funct CmdConnect()]
01|ERR--0800A1D0|(null)|[file ../Src/pi-algo.c, line 562, funct cmd_TPCMD()]
0800A1D0!|#1|RUN NCF2961.prj
```


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NXP NCF Driver Commands

Here you can find the complete list of all available commands for NCF driver.

```
F → EROM
E → EEprom
```

#TPCMD CONNECT

#TPCMD CONNECT

This function performs the entry and is the first command to be executed when starting the communication with the device.

```
Protocol selected MDI.
Try to enter Monitor mode through MDI protocol at 125kBit/s:
 * Put MSDA signal low to enter Monitor Mode.
 * Put P10 signal low to enter Monitor Mode.
 * Device Status: 0x0003.
 * Device Program Counter: 0x0000.
 * Device enter correctly into Monitor Mode.
Current device status is 0x003:
 * CPU is currently in monitor mode.
 * CPU is currently in system mode.
 * CPU is currently in active mode.
 * Watchpoint 0 has not been hit.
 * Watchpoint 1 has not been hit.
 * Watchpoint 2 has not been hit.
 * Watchpoint 3 has not been hit.
 * Current device mode is Init.
Try to change MDI Baudrate to 1MBit/s:
 * MDI Baudrate set correctly to 1MBit/s.
Check real size of embedded memories:
 * Erom memory:
   * Erom memory size from SMH database: 32768 bytes.
   * Erom memory read from the device: 24576 bytes.
   * Updated Erom size from 32768 bytes to 24576 bytes (24 KBytes).
 * EEprom memory:
   * EEprom memory size from SMH database: 2048 bytes.
   * EEprom memory read from the device: 2048 bytes.
   * EEprom size verified correctly 2048 bytes (2 KBytes).
Time for Connect: 0.208 s.
```

#TPCMD MASSERASE

#TPCMD MASSERASE <C>

This command performs a masserase for all memories of the device.

#TPCMD BLANKCHECK

#TPCMD BLANKCHECK <F|E>

Blankcheck is available for EROM and EEprom memory.
Verify if all memory is erased.

#TPCMD BLANKCHECK <F|E> <start address> <size>

Blankcheck is available for EROM and EEprom memory.
Verify if selected part of memory is erased.
Enter the Start Address and Size in hexadecimal format.

#TPCMD PROGRAM

#TPCMD PROGRAM <F|E>

Program is available for EROM and EEprom memory.
Programs all memory of the selected type based on the data in the FRB file.

#TPCMD PROGRAM <F|E> <start address> <size>

Program is available for EROM and EEprom memory.

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Programs selected part of memory of the selected type based on the data in the FRB file.
Enter the Start Address and Size in hexadecimal format.

#TPCMD VERIFY

`#TPCMD VERIFY <F|E> <R>`
R: Readout Mode.
Verify Readout is available for EROM and EEprom memory.
Verify all memory of the selected type based on the data in the FRB file.

`#TPCMD VERIFY <F|E> <R> <start address> <size>`
R: Readout Mode.
Verify Readout is available for EROM and EEprom memory.
Verify selected part of memory of the selected type based on the data in the FRB file.
Enter the Start Address and Size in hexadecimal format.

#TPCMD READ

`#TPCMD READ <F|E>`
Read is available for EROM and EEprom memory.
The result of the read command will be visible into the Terminal.

`#TPCMD READ <F|E> <start address> <size>`
Read is available for EROM and EEprom memory.
The result of the read command will be visible into the Terminal.
Enter the Start Address and Size in hexadecimal format.

#TPCMD DUMP

`#TPCMD DUMP <F|E>`
Dump is available for EROM and EEprom memory.
The result of the dump command will be stored in the FlashRunner 2.0 internal memory.

`#TPCMD DUMP <F|E> <start address> <size>`
Dump is available for EROM and EEprom memory.
The result of the dump command will be stored in the FlashRunner 2.0 internal memory.
Enter the Start Address and Size in hexadecimal format.

#TPCMD PROTECT

`#TPCMD PROTECT`
Put the device into protect mode.

```
Try to move the device state to Protected mode:
 * Perform the protect command.
 * Executed Set protect command.
 * Wait until device reboots.
 * Protected mode set correctly.
Time for Protect: 0.178 s
```

#TPCMD UNPROTECT

`#TPCMD UNPROTECT`
Put the device into unprotect mode.

```
---#TPCMD UNPROTECT
Try to erase the device and set Init mode:
 * Perform a chip erase command.
 * Executed chip erase command.
 * Wait until device reboots.
```


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```
 * Device erased and Init mode set correctly.
Time for UnProtect: 0.196 s
```

#TPCMD GET_INFORMATIONS

#TPCMD GET_INFORMATIONS

Get some device information.

```
---#TPCMD GET_INFORMATIONS
18 Version items read from target CPU:
 * Version item no. 00: ID 0000, Version 00.01 -
 The version of the hardware where the System ROM Library is running at.
 * Version item no. 01: ID 0001, Version 0C.00 - The product identifier.
 * Version item no. 02: ID 1000, Version 02.06 - The unique identifier for the entire ROM based software package.
 * Version item no. 03: ID 1001, Version 07.01 - The version of the boot loader.
 * Version item no. 04: ID 1002, Version 03.00 - The version of the Monitoring and Download Interface.
 * Version item no. 05: ID 1003, Version 05.03 - The version of the hardware abstraction layer module.
 * Version item no. 06: ID 1004, Version 05.02 - The version of the general functions library.
 * Version item no. 07: ID 1005, Version 02.00 - The version of the version module.
 * Version item no. 08: ID 1006, Version 03.01 - The version of the HITAG common module used by all HITAG.
 * Version item no. 09: ID 1008, Version 03.00 - The version of the HT2-Extended Immobilizer module.
 * Version item no. 10: ID 1009, Version 04.01 - The version of the HT-Pro2 Immobilizer module.
 * Version item no. 11: ID 100A, Version 03.00 - The version of the HT3 Immobilizer module.
 * Version item no. 12: ID 100C, Version 03.00 - The version of the HT-AES Immobilizer module.
 * Version item no. 13: ID 0002, Version 07.05 - The version of the MRKIII core.
 * Version item no. 14: ID 2000, Version C0.E6 - The least significant 16 bits of the 32 bit IDE.
 * Version item no. 15: ID 2001, Version 22.A4 - The most significant 16 bits of the 32 bit IDE.
 * Version item no. 16: ID 2002, Version 00.00 - The least significant 16 bits of the 32 bit EIDE.
 * Version item no. 17: ID 2003, Version 01.00 - The most significant 16 bits of the 32 bit EIDE.
Time for Get Informations: 0.003 s
```

#TPCMD DISCONNECT

#TPCMD DISCONNECT

Disconnect function. Power off and exit.

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NXP NCF Driver Examples

Here you can see a complete example of NXP NCF projects.

1 – NXP NCF NCF2961 16KB example Commands

```
#TCSETPAR PROTCLK 1000000
#TCSETPAR PWDOWN 100
#TCSETPAR PWUP 100
#TCSETPAR VPROG0 3300
#TCSETPAR CMODE MDI
#TPSETSRC 16KB.frb
#TPSTART
#TPCMD CONNECT
#TPCMD UNPROTECT
#TPCMD MASSERASE C
#TPCMD BLANKCHECK F
#TPCMD PROGRAM F
#TPCMD VERIFY F R
#TPCMD GET_INFORMATIONS
#TPCMD PROTECT
#TPCMD DISCONNECT
#TPEND
```

1 – NXP NCF NCF2961 16KB example Real Time Log

```
---#TPSTART
Load MDI FPGA version 0x09028121.
>|
---#TPCMD CONNECT
Protocol selected MDI.
Try to enter Monitor mode through MDI protocol at 125kBit/s:
 * Put MSDA signal low to enter Monitor Mode.
 * Put P10 signal low to enter Monitor Mode.
 * Device Status: 0x0003.
 * Device Program Counter: 0x0000.
 * Device enter correctly into Monitor Mode.
Current device status is 0x003:
 * CPU is currently in monitor mode.
 * CPU is currently in system mode.
 * CPU is currently in active mode.
 * Watchpoint 0 has not been hit.
 * Watchpoint 1 has not been hit.
 * Watchpoint 2 has not been hit.
 * Watchpoint 3 has not been hit.
 * Current device mode is Init.
Try to change MDI Baudrate to 1MBit/s:
 * MDI Baudrate set correctly to 1MBit/s.
Check real size of embedded memories:
 * Erom memory:
   * Erom memory size from SMH database: 32768 bytes.
   * Erom memory read from the device:   16384 bytes.
   * Updated Erom size from 32768 bytes to 16384 bytes (16 KBytes).
FRB CRC32 check passed.
FRB Headers collected.
Time for Connect: 0.195 s.
>|
---#TPCMD UNPROTECT
Try to erase the device and set Init mode:
 * Perform a chip erase command.
 * Executed chip erase command.
 * Wait until device reboots.
 * Device erased and Init mode set correctly.
Time for UnProtect: 0.196 s
>|
---#TPCMD MASSERASE C
Time for Masserase Chip: 0.196 s.
>|
---#TPCMD BLANKCHECK F
Time for Blankcheck F: 0.235 s.
>|
---#TPCMD PROGRAM F
Time for Program F: 1.093 s.
```


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```
>|
---#TPCMD VERIFY F R
Time for Verify Readout F: 0.296 s.
>|
---#TPCMD GET_INFORMATIONS
18 Version items read from target CPU:
 * Version item no. 00: ID 0000, Version 00.01 -
 The version of the hardware where the System ROM Library is running at.
 * Version item no. 01: ID 0001, Version 0C.00 - The product identifier.
 * Version item no. 02: ID 1000, Version 02.06 - The unique identifier for the entire ROM based software package.
 * Version item no. 03: ID 1001, Version 07.01 - The version of the boot loader.
 * Version item no. 04: ID 1002, Version 03.00 - The version of the Monitoring and Download Interface.
 * Version item no. 05: ID 1003, Version 05.03 - The version of the hardware abstraction layer module.
 * Version item no. 06: ID 1004, Version 05.02 - The version of the general functions library.
 * Version item no. 07: ID 1005, Version 02.00 - The version of the version module.
 * Version item no. 08: ID 1006, Version 03.01 - The version of the HITAG common module used by all HITAG.
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 * Version item no. 14: ID 2000, Version C0.E6 - The least significant 16 bits of the 32 bit IDE.
 * Version item no. 15: ID 2001, Version 22.A4 - The most significant 16 bits of the 32 bit IDE.
 * Version item no. 16: ID 2002, Version 00.00 - The least significant 16 bits of the 32 bit EIDE.
 * Version item no. 17: ID 2003, Version 01.00 - The most significant 16 bits of the 32 bit EIDE.
Time for Get Informations: 0.003 s
>|
---#TPCMD PROTECT
Try to move the device state to Protected mode:
 * Perform the protect command.
 * Executed Set protect command.
 * Wait until device reboots.
 * Protected mode set correctly.
Time for Protect: 0.177 s
>|
---#TPCMD DISCONNECT
>|
```

1 – NXP NCF NCF2961 16KB example Programming Times

Operation	Timings FlashRunner 2.0
Time for Connect	0.195 s
Unprotect	0.196 s
Masserase Chip	0.196 s
Blankcheck Flash	0.235 s
Program Flash	1.093 s
Verify Readout Flash	0.196 s
Get Informations	0.003 s
Protect	0.177 s
Cycle Time	**00:02.443 s**

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NXP NCF Driver Changelog

Info about driver versions prior to 5.00
All driver versions prior to 5.00 are to be considered obsolete, please update your driver to the latest version.

Info about driver version 5.00 - 11/07/2023
Supported NCF devices.

Info about driver version 5.01 - 09/10/2023
Internal driver update.

Info about driver version 5.02 - 08/05/2024
Updated NCF FPGA management for FlashRunner 2.0.
Internal driver update.

Info about driver version 5.03 - 25/03/2025
Internal driver update to manage Program EEprom with address and size inserted by the user.

Info about driver version 5.04 - 27/03/2025
Internal driver update for EEprom memory.

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