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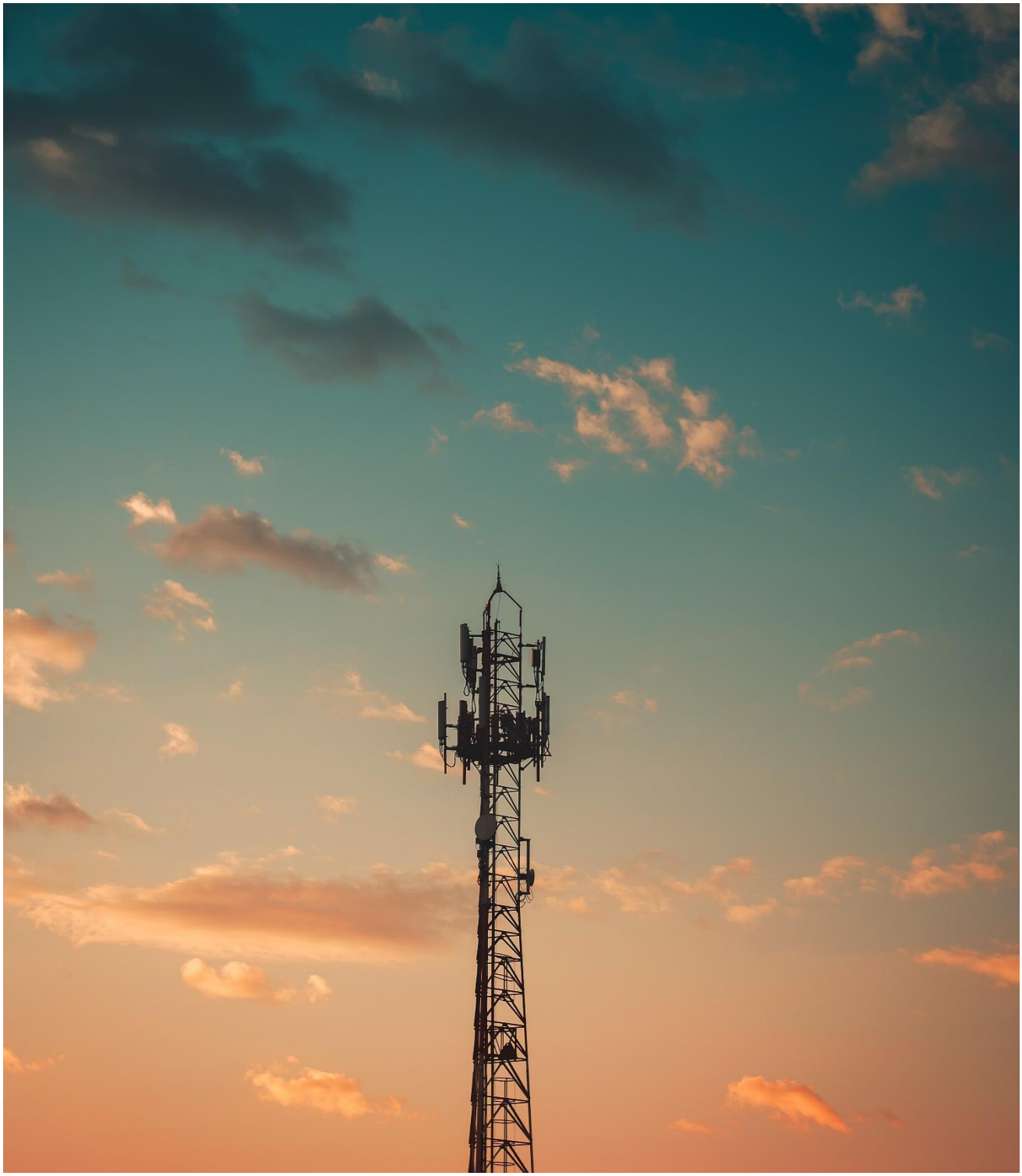
19/03/2025

Driver v. 5.06

Moreno Ortolan

Interfacing FlashRunner 2.0 with NXP NCJ29



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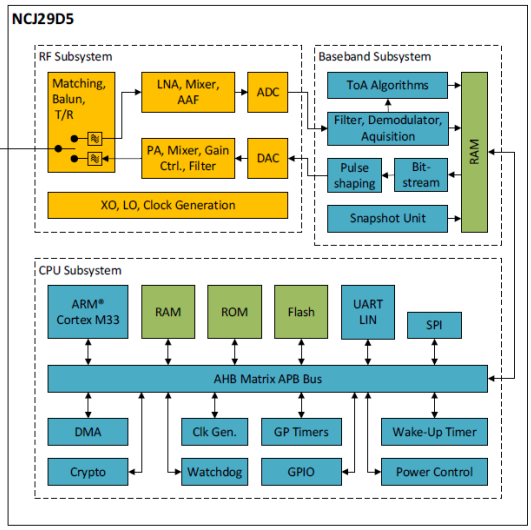
NXP NCJ29x Introduction

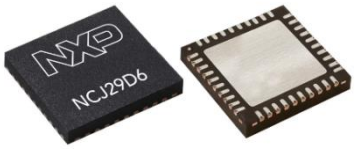
NCJ29D5 Ultra-Wideband ICs for Automotive Applications

NXP's NCJ29D5 is the first of a new generation of Ultra-Wideband (UWB) ICs designed specifically to meet the connectivity and safety needs of the global automotive industry. It enables a broad range of striking new use cases.
The UWB IC enables cars to know exactly where the users are.
For the first time, smartphone-based car access offers the same level of convenience as state-of-the-art key fobs. Users can open and start cars, while leaving their phones in their pockets or bags, and enjoy secure remote parking via smartphone. Furthermore, the new UWB IC brings maximum level of protection against car theft through relay attacks.

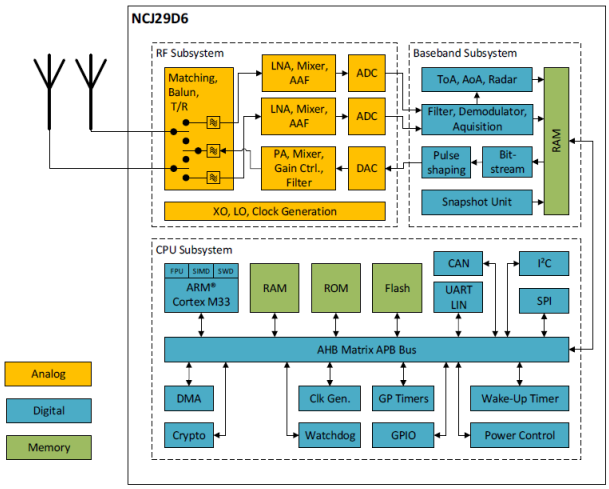


Trimension NCJ29D6: Secure UWB IC for Automotive Ranging and Radar Applications

Trimension NCJ29D6 is a fully integrated single chip impulse radio Ultra-Wideband low-energy transceiver. It is designed for secure ranging applications and radar applications in an automotive environment.



Besides supporting Digital Key functionality for secure truly hands-free car access, the NCJ29D6 enhances this feature with radar capabilities. This enables applications such as Child Presence Detection (CPD) and kick-sensing for easy trunk access.
With combined ranging and radar support, the NCJ29D6 maximizes system value and reduces system cost.



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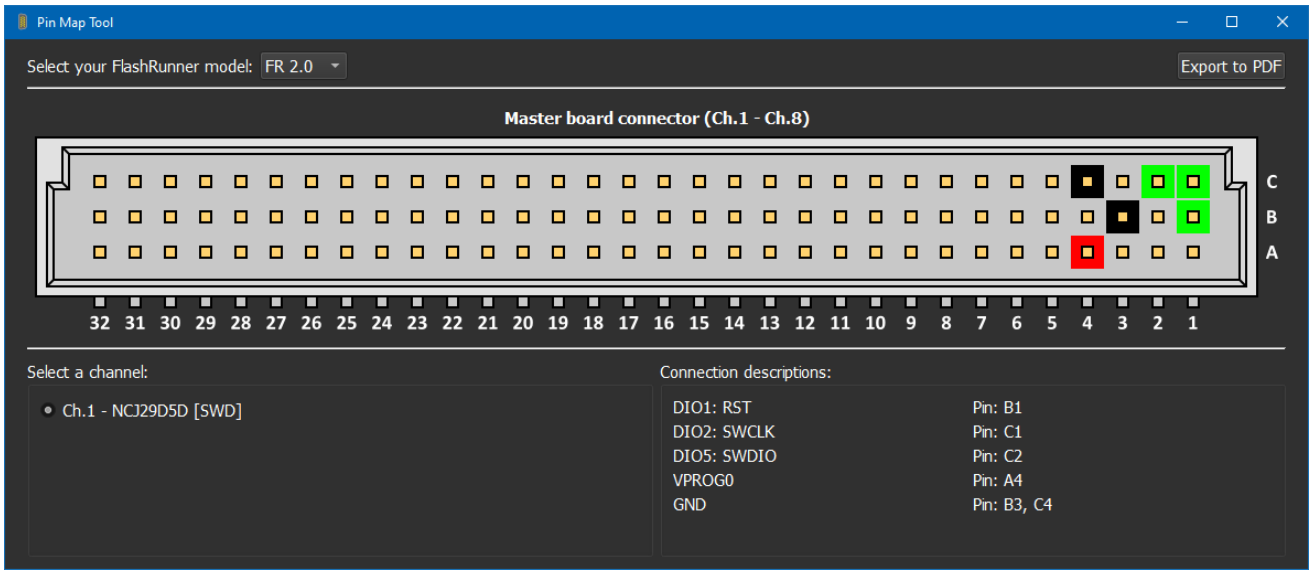
NXP NCJ29x Protocol and PIN map

NCJ29x devices support the SWD protocol.

```
#TCSETPAR CMODE <SWD>
```

NXP NCJ29x PIN MAP



NXP NCJ29x Memory Map

NCJ29D5

Memory Type	Start Address	End Address	Memory Size	Page Size	Blank Value	Address Unit
[A] - Application Flash	0x00200000	0x0021FFFF	128.00 KiB	512	0xDE	BYTE
[B] - Baseband DSP Firmware	0x00230000	0x002389FF	34.50 KiB	0	0x00	BYTE
[R] - Rx Radio Configurations	0x00238A00	0x0023A9FF	8.00 KiB	512	0x00	BYTE
[T] - Tx Radio Configurations	0x0023AA00	0x0023B9FF	4.00 KiB	256	0x00	BYTE
[C] - Customer Configurations Page	0x0023C000	0x0023C1FF	512 Byte	512	0x00	BYTE
[D] - Device Trimming Page	0x0023FC00	0x0023FDFF	512 Byte	512	0x00	BYTE
[S] - SWUP Software Update	0x05000000	0x05FFFFFF	16.00 MiB	512	0x00	BYTE
[X] - Application RAM	0x20000000	0x20009FFF	24.00 KiB	4	0xFF	BYTE

NCJ29D6

Memory Type	Start Address	End Address	Memory Size	Page Size	Blank Value	Address Unit
[A] - Application Flash	0x00400000	0x004BFFFF	768.00 KiB	16	0xDE	BYTE
[S] – SWUP Software Update	0x05000000	0x05FFFFFF	16.00 MiB	0	0x00	BYTE

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Device: **NCJ29D5D**
Family: **NCJ**
Manufacturer: **NXP**
Algorithm: **NCJ29 - libncj29.so**

	Memory Type	Start Address	End Address	Memory Size	Page Size	Blank Value	Address Unit
1	[A] - Application Flash	0x00200000	0x0021FFFF	128.00 KiB	512	0xDE	BYTE
2	[B] - Baseband DSP Firmware	0x00230000	0x002389FF	34.50 KiB	0	0x00	BYTE
3	[R] - Rx Radio Configurations	0x00238A00	0x0023A9FF	8.00 KiB	512	0x00	BYTE
4	[T] - Tx Radio Configurations	0x0023AA00	0x0023B9FF	4.00 KiB	256	0x00	BYTE
5	[C] - Customer Configurations Page	0x0023C000	0x0023C1FF	512 Byte	512	0x00	BYTE
6	[D] - Device Trimming Page	0x0023FC00	0x0023FDFF	512 Byte	512	0x00	BYTE
7	[S] - SWUP Software Update	0x05000000	0x05FFFFFF	16.00 MiB	512	0x00	BYTE
8	[X] - Application RAM	0x20004000	0x20009FFF	24.00 KiB	4	0xFF	BYTE

Export to PDF

Device: **NCJ29D6A**
Family: **NCJ**
Manufacturer: **NXP**
Algorithm: **NCJ29 - libncj29.so**

	Memory Type	Start Address	End Address	Memory Size	Page Size	Blank Value	Address Unit
1	[A] - Application Flash	0x00400000	0x004BFFFF	768.00 KiB	16	0xDE	BYTE
2	[S] - SWUP Software Update	0x05000000	0x05FFFFFF	16.00 MiB	0	0x00	BYTE

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NXP NCJ29x Driver Parameters

The standard parameters are used to configure some specific options inside NCJ29 driver.

#TCSETPAR ENTRY_CLOCK

Syntax: **#TCSETPAR** ENTRY_CLOCK <Frequency>

<Frequency> Accepted parameters 4000000, 2000000, 1000000, 500000, 100000 Hz

Description: Set the JTAG/SWD frequency used into Connect procedure before raising the PLL of the device, if device PLL is available

Note: Default value 4.00 MHz

#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

#TCSETPAR EXTERNAL_OSCILLATOR

Syntax: **#TCSETPAR** EXTERNAL_OSCILLATOR <Frequency MHz>

<Frequency MHz> Accepted parameters are 38.4Mhz, 55.0MHz and 55.2Mhz

Description: Used by TPCMD SET_PUBLIC_KEY_ECDSA, TPCMD SET_MCEK_KEY_AES, TPCMD SOFTWARE_UPDATE and TPCMD SET_DEVICE_PROTECTED commands
Set the external oscillator frequency mounted on your board used by NCJ29xx device

Note: Default value 55.2MHz

#TCSETPAR AES_KEY

Syntax: **#TCSETPAR** AES_KEY [000-031] [032-063] [064-095] [096-127]

Description: Software Update (SWUP) AES Key
Used by TPCMD SET_PUBLIC_KEY_ECDSA and TPCMD SOFTWARE_UPDATE commands
Please contact NXP or SMH to have informations regarding this AES Key

Note: **Only for NCJ29D5x**
All other information regarding this command is **Under NDA**

#TCSETPAR PUBLIC_KEY 1

Syntax: **#TCSETPAR** PUBLIC_KEY[000-127] [000-031] [032-063] [064-095] [096-127]

Description: Software Update (SWUP) Public Key
Used by TPCMD SET_PUBLIC_KEY_ECDSA and TPCMD SOFTWARE_UPDATE commands
Please contact NXP or SMH to have informations regarding this Public Key

Note: **Only for NCJ29D5x**
All other information regarding this command is **Under NDA**

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#TCSETPAR PUBLIC_KEY 2

Syntax: **#TCSETPAR** PUBLIC_KEY[128-255] [128-159] [160-191] [192-223] [224-255]

Description: Software Update (SWUP) Public Key
Used by TPCMD SET_PUBLIC_KEY_ECDSA and TPCMD SOFTWARE_UPDATE commands
Please contact NXP or SMH to have informations regarding this Public Key

Note: **Only for NCJ29D5x**
All other information regarding this command is **Under NDA**

#TCSETPAR PUBLIC_KEY 3

Syntax: **#TCSETPAR** PUBLIC_KEY[256-383] [256-287] [288-319] [320-351] [352-383]

Description: Software Update (SWUP) Public Key
Used by TPCMD SET_PUBLIC_KEY_ECDSA and TPCMD SOFTWARE_UPDATE commands
Please contact NXP or SMH to have informations regarding this Public Key

Note: **Only for NCJ29D5x**
All other information regarding this command is **Under NDA**

#TCSETPAR PUBLIC_KEY 4

Syntax: **#TCSETPAR** PUBLIC_KEY[384-511] [384-415] [416-447] [448-479] [480-511]

Description: Software Update (SWUP) Public Key
Used by TPCMD SET_PUBLIC_KEY_ECDSA and TPCMD SOFTWARE_UPDATE commands
Please contact NXP or SMH to have informations regarding this Public Key

Note: **Only for NCJ29D5x**
All other information regarding this command is **Under NDA**

#TCSETPAR HASH_PRE_IMAGE_KEY

Syntax: **#TCSETPAR** HASH_PRE_IMAGE_KEY [000-031] [032-063] [064-095] [096-127]

Description: Software Update (SWUP) Hash Pre Image-Key
Used by TPCMD SET_DEVICE_PROTECTED command
Please contact NXP or SMH to have informations regarding this AES Key

Note: **Only for NCJ29D5x**
All other information regarding this command is **Under NDA**

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NXP NCJ29x Driver Commands

Here you can find the complete list of all available commands for NCJ29 driver.

```
********** Available for all NCJ29xx devices **********

  #TPCMD CONNECT
  #TPCMD MASSERASE <A>
  #TPCMD PAGEERASE <A> <Start Address> <Size>
  #TPCMD BLANKCHECK <A>
  #TPCMD BLANKCHECK <A> <Start Address> <Size>
  #TPCMD PROGRAM <A>
  #TPCMD PROGRAM <A> <Start Address> <Size>
  #TPCMD VERIFY <A> <R>
  #TPCMD VERIFY <A> <R> <Start Address> <Size>
  #TPCMD VERIFY <A> <S>
  #TPCMD VERIFY <A> <S> <Start Address> <Size>
  #TPCMD READ <A>
  #TPCMD READ <A> <Start Address> <Size>
  #TPCMD DUMP <A>
  #TPCMD DUMP <A> <Start Address> <Size>
  #TPCMD DISCONNECT

********** Available for all NCJ29xx devices **********

  #TPCMD RUN
  #TPCMD RUN <Time [s]>

********** Available for all NCJ29xx devices **********

  #TPCMD READ_MEM8 <Start Address> <Number of bytes>
  #TPCMD READ_MEM16 <Start Address> <Number of 16-bit words>
  #TPCMD READ_MEM32 <Start Address> <Number of 32-bit words>

********** Available only for NCJ29D5 Ranger 4 devices **********

  #TPCMD PROGRAM <R|T|C|D|X>
  #TPCMD PROGRAM <R|T|C|D|X> <Start Address> <Size>
  #TPCMD VERIFY <R|T|C|D|X> <R>
  #TPCMD VERIFY <R|T|C|D|X> <R> <Start Address> <Size>
  #TPCMD MARGIN_VERIFY <A>
  #TPCMD MARGIN_VERIFY <A> <Start Address> <Size>
  #TPCMD READ <R|T|C|D|X>
  #TPCMD READ <R|T|C|D|X> <Start Address> <Size>
  #TPCMD DUMP <R|T|C|D|X>
  #TPCMD DUMP <R|T|C|D|X> <Start Address> <Size>

********** Available only for NCJ29D5 Ranger 4 devices **********

  #TPCMD GET_STATUS
  #TPCMD GET_VERSION
  #TPCMD GET_SERIAL_NUMBER
  #TPCMD SET_PUBLIC_KEY_ECDSA
  #TPCMD SET_MCEK_KEY_AES
  #TPCMD SET_DEVICE_PROTECTED <NXP_HASH|USER_HASH>
  #TPCMD SOFTWARE_UPDATE <SET_KEYS|SKIP_KEYS>
  #TPCMD EXECUTE <PC Address> <Wait Time [ms]>
  #TPCMD EXECUTE <PC Address> <Address Check> <Check Value> <Timeout [ms]>

********** Available only for NCJ29D5 Ranger 5 devices **********

  #TPCMD SOFTWARE_UPDATE
  #TPCMD SOFTWARE_UPDATE_HOSTIF
```


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NXP NCJ29x Driver Commands for Memory

A - Application Flash

```
#TPCMD MASSERASE <A>
#TPCMD PAGEERASE <A> <start address> <size>
#TPCMD BLANKCHECK <A>
#TPCMD BLANKCHECK <A> <start address> <size>
#TPCMD PROGRAM <A>
#TPCMD PROGRAM <A> <start address> <size>
#TPCMD VERIFY <A> <R>
#TPCMD VERIFY <A> <R> <start address> <size>
#TPCMD VERIFY <A> <S>
#TPCMD VERIFY <A> <S> <start address> <size>
#TPCMD MARGIN_VERIFY <A>
#TPCMD MARGIN_VERIFY <A> <start address> <size>
#TPCMD READ <A>
#TPCMD READ <A> <start address> <size>
#TPCMD DUMP <A>
#TPCMD DUMP <A> <start address> <size>
```

If the Application Flash memory is not programmed, read via SWD generates a fault error.

To prevent this situation, a sector blankcheck is performed.

If the Application Flash memory is in the erase state, then the Read/Dump command will return the value of blank (0xDE) instead of going into SWD fault.

B - Baseband DSP Firmware

No standard commands are available for this memory.

The Baseband DSP is flashed via an encrypted SWUP package (MCEK is used) to a secure area of the IC.
NCJ29 driver cannot read the secure area of the IC.

R - Rx Radio Configurations

```
#TPCMD PROGRAM <R>
#TPCMD PROGRAM <R> <start address> <size>
#TPCMD VERIFY <R> <R>
#TPCMD VERIFY <R> <R> <start address> <size>
#TPCMD READ <R>
#TPCMD READ <R> <start address> <size>
#TPCMD DUMP <R>
#TPCMD DUMP <R> <start address> <size>
```

T - Tx Radio Configurations

```
#TPCMD PROGRAM <T>
#TPCMD PROGRAM <T> <start address> <size>
#TPCMD VERIFY <T> <R>
#TPCMD VERIFY <T> <R> <start address> <size>
#TPCMD READ <T>
#TPCMD READ <T> <start address> <size>
#TPCMD DUMP <T>
#TPCMD DUMP <T> <start address> <size>
```

C - Customer Configurations Page

```
#TPCMD PROGRAM <C>
#TPCMD PROGRAM <C> <start address> <size>
#TPCMD VERIFY <C> <R>
#TPCMD VERIFY <C> <R> <start address> <size>
#TPCMD READ <C>
#TPCMD READ <C> <start address> <size>
#TPCMD DUMP <C>
#TPCMD DUMP <C> <start address> <size>
```


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D - Device Trimming Page

```
#TPCMD PROGRAM <D>
#TPCMD PROGRAM <D> <start address> <size>
#TPCMD VERIFY <D> <R>
#TPCMD VERIFY <D> <R> <start address> <size>
#TPCMD READ <D>
#TPCMD READ <D> <start address> <size>
#TPCMD DUMP <D>
#TPCMD DUMP <D> <start address> <size>
```

S - SWUP Software Update

No standard commands are available for this memory.

Use this imaginary memory to place the firmware to be programmed through the SWUP sequence.
Import the .pkg format file into the Workbench selecting .bin format.
The firmware must always be set starting from the initial address of this SWUP memory.

X - Application RAM

```
#TPCMD PROGRAM <X>
#TPCMD PROGRAM <X> <start address> <size>
#TPCMD VERIFY <X> <R>
#TPCMD VERIFY <X> <R> <start address> <size>
#TPCMD READ <X>
#TPCMD READ <X> <start address> <size>
#TPCMD DUMP <X>
#TPCMD DUMP <X> <start address> <size>
```

#TPCMD CONNECT

#TPCMD CONNECT

Connect function, power on target device and entry.
Example of Connect Procedure:

```
---#TPCMD CONNECT
Protocol selected SWD.
Entry Clock is 4.00 MHz.
Trying Breakpoint connect procedure.
IDCODE: 0x6BA02477.
Designer: 0x23B, Part Number: 0xBA02, Version: 0x6.
ID-Code read correctly at 4.00 MHz.
JTAG-SWD Debug Port enabled.
Scanning AP map to find all APs.
AP[0] IDR: 0x84770001, Type: AMBA AHB3 bus.
AP[1] IDR: 0x54770002, Type: AMBA APB2 or APB3 bus.
AP[0] ROM table base address 0xE00C0000.
CPUID: 0x410FD214.
Implementer Code: 0x41 - [ARM].
Found Cortex M33 revision r0p4.
Software Breakpoint enabled.
Cortex M33 Core halted [0.006 s].
Requested Clock is 37.50 MHz.
Generated Clock is 37.50 MHz.
Good samples: 3 [Range 4-6].
IDCODE: 0x6BA02477.
Designer: 0x23B, Part Number: 0xBA02, Version: 0x6.
ID-Code read correctly at 37.50 MHz.
Internal watchdog disabled.
Time for Connect: 0.119 s.
>|
```

#TPCMD MASSERASE

#TPCMD MASSERASE <A>

Masserase only available for Application Flash.

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With this command a Masserase of Application Flash will be performed.
If the Application Flash memory is not programmed, read via SWD generates a fault error.
To prevent this situation, a sector blankcheck is performed.
If the Application Flash memory is in the erase state, then the Read/Dump command will return the value of blank (0xDE) instead of going into SWD fault.

#TPCMD PAGEERASE

`#TPCMD PAGEERASE <A> <start address> <size>`
Page erase only available for Application Flash.
Erase selected part of Application Flash with page erase.
Enter the Start Address and Size in hexadecimal format.

#TPCMD BLANKCHECK

`#TPCMD BLANKCHECK <A>`
Blankcheck only available for Application Flash.
Verify if all Application Flash is erased.

`#TPCMD BLANKCHECK <A> <start address> <size>`
Blankcheck only available for Application Flash.
Verify if selected part of Application Flash is erased.
Enter the Start Address and Size in hexadecimal format.

#TPCMD PROGRAM

`#TPCMD PROGRAM <A|R|T|C|D|X>`
Program available for Application Flash, Rx Radio Configurations, Tx Radio Configurations, Customer Configurations Page and Device Trimming Page.
Programs all memory of the selected type based on the data in the FRB file.

`#TPCMD PROGRAM <A|R|T|C|D|X> <start address> <size>`
Program available for Application Flash, Rx Radio Configurations, Tx Radio Configurations, Customer Configurations Page and Device Trimming Page.
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 <A|R|T|C|D|X> <R>`
R: Readout Mode.
Verify Readout available for Application Flash, Rx Radio Configurations, Tx Radio Configurations, Customer Configurations Page and Device Trimming Page.
Verify all memory of the selected type based on the data in the FRB file.

`#TPCMD VERIFY <A|R|T|C|D|X> <R> <start address> <size>`
R: Readout Mode.
Verify Readout available for Application Flash, Rx Radio Configurations, Tx Radio Configurations, Customer Configurations Page and Device Trimming Page.
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 VERIFY <A> <S>`
S: Checksum 32 Bit Mode.
Verify Checksum available only for Application Flash.
Verify all of Application Flash based on the data in the FRB file.

`#TPCMD VERIFY <A> <S> <start address> <size>`
S: Checksum 32 Bit Mode.

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Verify Checksum available only for Application Flash.
Verify selected part of Application Flash based on the data in the FRB file.
Enter the Start Address and Size in hexadecimal format.

#TPCMD MARGIN_VERIFY.

`#TPCMD MARGIN_VERIFY <A>`
Margin Verify available only for Application Flash.
Verify Margin of all Application Flash.

`#TPCMD MARGIN_VERIFY <A> <start address> <size>`
Margin Verify available only for Application Flash.
Verify Margin selected part of Application Flash.
Enter the Start Address and Size in hexadecimal format.

#TPCMD READ

`#TPCMD READ <A|R|T|C|D|X>`
Read available for Application Flash, Rx Radio Configurations, Tx Radio Configurations, Customer Configurations Page and Device Trimming Page.
Read all memory of selected type.
If one of these memories is not programmed, reading the memory via SWD generates a fault error.
To avoid this situation, for Application Flash memory only, a sector blankcheck is performed before running Read command.
If the Application Flash memory is in an erase state the Read/Dump command will return the blank value (0xDE) instead of going into SWD fault error.

`#TPCMD READ <A|R|T|C|D|X> <start address> <size>`
Read available for Application Flash, Rx Radio Configurations, Tx Radio Configurations, Customer Configurations Page and Device Trimming Page.
Read selected part of memory of the selected type.
If one of these memories is not programmed, reading the memory via SWD generates a fault error.
To avoid this situation, for Application Flash memory only, a sector blankcheck is performed before running Read command.
If the Application Flash memory is in an erase state the Read/Dump command will return the blank value (0xDE) instead of going into SWD fault error.

#TPCMD DUMP

`#TPCMD DUMP <A|R|T|C|D|X>`
Dump available for Application Flash, Rx Radio Configurations, Tx Radio Configurations, Customer Configurations Page and Device Trimming Page.
Dump all memory of selected type.
If one of these memories is not programmed, reading the memory via SWD generates a fault error.
To avoid this situation, for Application Flash memory only, a sector blankcheck is performed before running Read command.
If the Application Flash memory is in an erase state the Read/Dump command will return the blank value (0xDE) instead of going into SWD fault error.

`#TPCMD DUMP <A|R|T|C|D|X> <start address> <size>`
Dump available for Application Flash, Rx Radio Configurations, Tx Radio Configurations, Customer Configurations Page and Device Trimming Page.
Dump selected part of memory of the selected type.
If one of these memories is not programmed, reading the memory via SWD generates a fault error.
To avoid this situation, for Application Flash memory only, a sector blankcheck is performed before running Read command.
If the Application Flash memory is in an erase state the Read/Dump command will return the blank value (0xDE) instead of going into SWD fault error.

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#TPCMD GET_STATUS

Syntax: `#TPCMD GET_STATUS`

Prerequisites: none

Description: Get current device status.

Note: This command prints into Terminal and Real Time Log
From driver version **5.02** this command prints also into Terminal

Examples: Correct command execution: 😊

```
---#TPCMD GET_STATUS
Device Status: Init Mode.
Time for Get Status: 0.004 s.
```

#TPCMD GET_VERSION

Syntax: `#TPCMD GET_VERSION`

Prerequisites: none

Description: Get device version of Hardware ID, Product, ROM and Typecheck.

Note: This command prints into Terminal and Real Time Log
From driver version **5.02** this command prints also into Terminal

Examples: Correct command execution: 😊

```
---#TPCMD GET_VERSION
Hardware ID: 4.
Product   > ID: 0x0001 - Major 0x16 - Minor 0x00 - Patch 0x00.
Rom       > ID: 0x1000 - Major 0x04 - Minor 0x00 - Patch 0x02.
Typecheck > ID: 0x1011 - Major 0x0D - Minor 0x00 - Patch 0x00.
Time for Get Version: 0.001 s
```

#TPCMD GET_SERIAL_NUMBER

Syntax: `#TPCMD GET_SERIAL_NUMBER`

Prerequisites: none

Description: Get device Serial Number

Note: This command prints into Terminal and Real Time Log
From driver version **5.02** this command prints also into Terminal

Examples: Correct command execution: 😊

```
---#TPCMD GET_SERIAL_NUMBER
Serial Number: 0xD1D34FD0.
Time for Get Serial Number: 0.001 s.
```

#TPCMD EXECUTE

Syntax:
`#TPCMD EXECUTE <Program Counter>`
`#TPCMD EXECUTE <Program Counter> <Wait Time [ms]>`
`#TPCMD EXECUTE <Program Counter> <Check Address> <Expected Value> <Timeout [ms]>`

<Program Counter> Program Counter in HEX format (i.e., 0x20004000)
<Wait Time [ms]> Wait time in decimal format (i.e., 2000 ms -> 2 s)

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<Check Address>	Check Address in HEX format (i.e., 0x20004000)
<Expected Value>	Expected Value in HEX format (i.e., 0xBADABADA)
<Timeout [ms]>	Timeout in decimal format (i.e., 2000 ms -> 2 s)

Prerequisites: none

Description: This command can be used in three different modes:

`#TPCMD EXECUTE <Program Counter>`

Set the Program Counter PC at inserted address and try to start the Cortex M33 core.
This command should be used in combination with #DELAY <time[ms]>, so that the core will run for that specific time. If other operations need to be executed, `#TPCMD CONNECT` should be placed after. This mode is particularly useful when the RAM application executed reset the device for some reasons and cut off SWD communication.

Examples: Correct command execution: 😊

```
02|1|Implementer Code: 0x41 - [ARM].
02|1|Found Cortex M33 revision r0p4.
02|1|Software Breakpoint enabled.
02|1|Cortex M33 Core halted [0.006 s].
02|2|Requested Clock is 10.00 MHz.
02|2|Generated Clock is 10.00 MHz.
02|2|Good samples: 11 [Range 0-10].
02|2|IDCODE: 0x6BA02477.
02|1|Designer: 0x23B, Part Number: 0xBA02, Version: 0x6.
02|2|ID-Code read correctly at 10.00 MHz.
02|2|Internal watchdog disabled.
02|2|Time for Connect: 0.119 s.
02|2|>|
02|2|---#TPCMD PROGRAM X
02|1|Time for Program X: 0.012 s.
02|2|>|
02|2|---#TPCMD VERIFY X R
02|1|Time for Verify Readout X: 0.027 s.
02|2|>|
02|2|---#TPCMD EXECUTE 0x20004000
02|1|Set Program Counter to address 0x20004000.
02|1|Start NCJ29D5D Cortex M33 core.
02|1|> Cortex M33 core started.
02|1|Time for Execute Application RAM firmware: 0.001 s.
02|2|>|
02|2|---#DELAY 10000
02|2|>|
02|2|---#TPCMD CONNECT
02|2|Protocol selected SWD.
02|2|Entry Clock is 4.00 MHz.
02|2|Trying Breakpoint connect procedure.
02|2|IDCODE: 0x6BA02477.
02|1|Designer: 0x23B, Part Number: 0xBA02, Version: 0x6.
02|2|ID-Code read correctly at 4.00 MHz.
02|1|JTAG-SWD Debug Port enabled.
02|1|Scanning AP map to find all APs.
02|1|AP[0] IDR: 0x84770001, Type: AMBA AHB3 bus.
02|1|AP[1] IDR: 0x54770002, Type: AMBA APB2 or APB3 bus.
02|1|AP[0] ROM table base address 0xE00C0000.
02|1|CPUID: 0x410FD214.
02|1|Implementer Code: 0x41 - [ARM].
02|1|Found Cortex M33 revision r0p4.
02|1|Software Breakpoint enabled.
02|1|Cortex M33 Core halted [0.006 s].
02|2|Requested Clock is 10.00 MHz.
02|2|Generated Clock is 10.00 MHz.
02|2|Good samples: 11 [Range 0-10].
02|2|IDCODE: 0x6BA02477.
02|1|Designer: 0x23B, Part Number: 0xBA02, Version: 0x6.
02|2|ID-Code read correctly at 10.00 MHz.
02|2|Internal watchdog disabled.
02|2|Time for Connect: 0.121 s.
02|2|>|
```


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#TPCMD EXECUTE <Program Counter> <Wait Time [ms]>

Set the Program Counter PC at inserted address and try to start the Cortex M33 core.
If core starts correctly, wait for inserted Time [ms] before continue with other commands.
This mode is useful when you need to execute code from RAM or Application Flash without the possibility to have feedback from the firmware running into NCJ29 device

#TPCMD EXECUTE <Program Counter> <Check Address> <Expected Value> <Timeout [ms]>

Set the Program Counter PC at inserted address and try to start the Cortex M33 core.
If core starts correctly, wait until Expected Value is present inside Check Address.
If the Timeout value expire before Expected Value is found, the command fails.
This mode is useful when you need to execute code from RAM or Application Flash with the possibility to have feedback from the firmware running into NCJ29 device

Note: #TPCMD EXECUTE <Program Counter> <Check Address> <Expected Value> <Timeout [ms]>
This mode is available from driver version **4.03**

#TPCMD EXECUTE <Program Counter> <Wait Time [ms]>
This mode is available from driver version **5.02**

TPCMD EXECUTE <Program Counter>
This mode is available from driver version **5.06.**

#TPCMD RUN

Syntax: #TPCMD RUN <Time [s]>

<Time [s]> Time in seconds (i.e., 2 s). This time is an optional parameter.

Prerequisites: none

Description: Move the Reset line up and down quickly if no parameter <Time [s]> is inserted.
#TPCMD RUN <Time [s]> instead moves the Reset line down and high, waits for the entered time.
This command typically can be used to execute the firmware programmed in the device.

#TPCMD SET_PUBLIC_KEY_ECDSA

Syntax: #TPCMD SET_PUBLIC_KEY_ECDSA

Prerequisites:
#TCSETPAR EXTERNAL_OSCILLATOR <Frequency MHz>
#TCSETPAR PUBLIC_KEY[000-127] [000-031] [032-063] [064-095] [096-127]
#TCSETPAR PUBLIC_KEY[128-255] [128-159] [160-191] [192-223] [224-255]
#TCSETPAR PUBLIC_KEY[256-383] [256-287] [288-319] [320-351] [352-383]
#TCSETPAR PUBLIC_KEY[384-511] [384-415] [416-447] [448-479] [480-511]

Description: Set the Public Key ECDSA inside target NCJ29xx device

Note: All other information regarding this command is **Under NDA**

#TPCMD SET_MCEK_KEY_AES

Syntax: #TPCMD SET_MCEK_KEY_AES

Prerequisites:
#TCSETPAR EXTERNAL_OSCILLATOR <Frequency MHz>
#TCSETPAR AES_KEY [000-031] [032-063] [064-095] [096-127]

Description: Set the MCEK Key AES inside target NCJ29xx device

Note: All other information regarding this command is **Under NDA**

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#TPCMD SET_DEVICE_PROTECTED

Syntax: `#TPCMD SET_DEVICE_PROTECTED <NXP_HASH|USER_HASH>`

Prerequisites:
`#TCSETPAR EXTERNAL_OSCILLATOR <Frequency MHz>`
`#TCSETPAR HASH_PRE_IMAGE_KEY [000-031] [032-063] [064-095] [096-127]`

Description: Set the device protected

Note: All other information regarding this command is **Under NDA**

#TPCMD SOFTWARE_UPDATE

#TPCMD SOFTWARE_UPDATE (NCJ29D5)

Syntax: `#TPCMD SOFTWARE_UPDATE <SET_KEYS|SKIP_KEYS>`

Prerequisites: FRB file into virtual memory [S] - SWUP Software Update [0x05000000 - 0x05FFFFFF]
`#TCSETPAR EXTERNAL_OSCILLATOR <Frequency MHz>`
If SET_KEYS selected:
`#TCSETPAR PUBLIC_KEY[000-127] [000-031] [032-063] [064-095] [096-127]`
`#TCSETPAR PUBLIC_KEY[128-255] [128-159] [160-191] [192-223] [224-255]`
`#TCSETPAR PUBLIC_KEY[256-383] [256-287] [288-319] [320-351] [352-383]`
`#TCSETPAR PUBLIC_KEY[384-511] [384-415] [416-447] [448-479] [480-511]`

Description: Execute the Software Update SWUP procedure

Note: All other information regarding this command is **Under NDA**

#TPCMD SOFTWARE_UPDATE (NCJ29D6)

Syntax: `#TPCMD SOFTWARE_UPDATE`

Prerequisites: FRB file into virtual memory [S] - SWUP Software Update [0x05000000 - 0x05FFFFFF]

Description: Execute the Software Update SWUP procedure

Note: All other information regarding this command is **Under NDA**

#TPCMD SOFTWARE_UPDATE_HOSTIF

Syntax: `#TPCMD SOFTWARE_UPDATE_HOSTIF`

Prerequisites: FRB file into virtual memory [S] - SWUP Software Update [0x05000000 - 0x05FFFFFF]

Description: Execute the Software Update SWUP procedure through Host Interface

Note: Only for NCJ29D6A. All other information regarding this command is **Under NDA**

#TPCMD READ_MEM8

Syntax: `#TPCMD READ_MEM8 <Address> <Byte Count>`

<Address>	Address in HEX format (i.e., 0x52002020)
<Byte Count>	Byte count in decimal format (i.e., 8 -> eight bytes)

Prerequisites: none

Description: Read memory byte per byte from target NCJ29 device

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Note: This command prints into Terminal and Real Time Log

Examples: Correct command execution: 😊

```
---#TPCMD READ_MEM8 0x52002020 8
Read[0x52002020]: 0xF0
Read[0x52002021]: 0xAA
Read[0x52002022]: 0x16
Read[0x52002023]: 0x14
Read[0x52002024]: 0x00
Read[0x52002025]: 0x00
Read[0x52002026]: 0x00
Read[0x52002027]: 0x00
```

#TPCMD READ_MEM16

Syntax: `#TPCMD READ_MEM16 <Address> <16-bit Word Count>`

<Address>	Address in HEX format (i.e., 0x52002020)
<16-bit Word Count>	16-bit Word count in decimal format (i.e., 4 -> four 16-bit words)

Prerequisites: none

Description: Read memory 16-bit word per 16-bit word from target NCJ29 device

Note: This command prints into Terminal and Real Time Log

Examples: Correct command execution: 😊

```
---#TPCMD READ_MEM16 0x52002020 2
Read[0x52002020]: 0xAAF0
Read[0x52002022]: 0x1416
```

#TPCMD READ_MEM32

Syntax: `#TPCMD READ_MEM32 <Address> <32-bit Word Count>`

<Address>	Address in HEX format (i.e., 0x52002020)
<32-bit Word Count>	32-bit Word count in decimal format (i.e., 2 -> two 32-bit words)

Prerequisites: none

Description: Read memory 32-bit word per 32-bit word from target NCJ29 device

Note: This command prints into Terminal and Real Time Log

Examples: Correct command execution: 😊

```
---#TPCMD READ_MEM32 0x52002020 2
Read[0x52002020]: 0x1416AAF0
Read[0x52002024]: 0x00000000
```

#TPCMD DISCONNECT

`#TPCMD DISCONNECT`

Disconnect function. Power off and exit.

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NXP NCJ29x Driver Examples

Here you can see a complete example of NXP NCJ29D5x project.

1 – NXP NCJ29x example Commands

```
#TCSETPAR ENTRY_CLOCK 4000000
#TCSETPAR EXTERNAL_OSCILLATOR 55.2MHz
#TCSETPAR PROTCLK 37500000
#TCSETPAR PWDOWN 100
#TCSETPAR PWUP 100
#TCSETPAR RSTDOWN 100
#TCSETPAR RSTDRV OPENDRAIN
#TCSETPAR RSTUP 100
#TCSETPAR VPROG0 3300
#TCSETPAR CMODE SWD
#TPSETSRC All_Files_Merged.frb
#TPSTART
#TPCMD CONNECT
; Get device informations
#TPCMD GET_STATUS
#TPCMD GET_VERSION
#TPCMD GET_SERIAL_NUMBER
; Application RAM [X]
#TPCMD PROGRAM X
#TPCMD VERIFY X R
#TPCMD EXECUTE 0x20004000 2000
; Application Flash [A]
#TPCMD MASSERASE A
#TPCMD BLANKCHECK A
#TPCMD PROGRAM A
#TPCMD VERIFY A R
#TPCMD VERIFY A S
; Rx Radio Configurations [R]
#TPCMD PROGRAM R
#TPCMD VERIFY R R
; Tx Radio Configurations [T]
#TPCMD PROGRAM T
#TPCMD VERIFY T R
; Software Update procedure
#TPCMD SOFTWARE_UPDATE SKIP_KEYS
#TPCMD DISCONNECT
```

1 – NXP NCJ29x example Real Time Log

```
---#TPCMD CONNECT
Protocol selected SWD.
Entry Clock is 4.00 MHz.
Trying Breakpoint connect procedure.
IDCODE: 0x6BA02477.
Designer: 0x23B, Part Number: 0xBA02, Version: 0x6.
ID-Code read correctly at 4.00 MHz.
JTAG-SWD Debug Port enabled.
Scanning AP map to find all APs.
AP[0] IDR: 0x84770001, Type: AMBA AHB3 bus.
AP[1] IDR: 0x54770002, Type: AMBA APB2 or APB3 bus.
AP[0] ROM table base address 0xE00C0000.
CPUID: 0x410FD214.
Implementer Code: 0x41 - [ARM].
Found Cortex M33 revision r0p4.
Software Breakpoint enabled.
Cortex M33 Core halted [0.006 s].
Requested Clock is 37.50 MHz.
Generated Clock is 37.50 MHz.
Good samples: 4 [Range 4-7].
IDCODE: 0x6BA02477.
Designer: 0x23B, Part Number: 0xBA02, Version: 0x6.
ID-Code read correctly at 37.50 MHz.
Internal watchdog disabled.
Time for Connect: 0.120 s.
>|
```


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```
---#TPCMD GET_STATUS
Device Status: Init Mode.
Time for Get Status: 0.003 s.
>|
---#TPCMD GET_VERSION
Hardware ID: 4.
Product   > ID: 0x0001 - Major 0x16 - Minor 0x00 - Patch 0x00.
Rom       > ID: 0x1000 - Major 0x04 - Minor 0x00 - Patch 0x02.
Typecheck > ID: 0x1011 - Major 0x0D - Minor 0x00 - Patch 0x00.
Time for Get Version: 0.002 s.
>|
---#TPCMD GET_SERIAL_NUMBER
Serial Number: 0x4EFA91D0.
Time for Get Serial Number: 0.002 s.
>|
---#TPCMD PROGRAM X
Time for Program X: 0.006 s.
>|
---#TPCMD VERIFY X R
Time for Verify Readout X: 0.008 s.
>|
---#TPCMD EXECUTE 0x20004000 2000
Set Program Counter to address 0x20004000.
Start NCJ29D5D Cortex M33 core.
> Cortex M33 core started.
Waiting for 2000 ms.
Time for Execute Application RAM firmware: 2.002 s.
>|
---#TPCMD MASSERASE A
Time for Masserase A: 0.494 s.
>|
---#TPCMD BLANKCHECK A
Time for Blankcheck A: 0.005 s.
>|
---#TPCMD PROGRAM A
Time for Program A: 0.591 s.
>|
---#TPCMD VERIFY A R
Time for Verify Readout A: 0.042 s.
>|
---#TPCMD VERIFY A S
Time for Verify Checksum 32bit A: 0.006 s.
>|
---#TPCMD PROGRAM R
Time for Program R: 0.055 s.
>|
---#TPCMD VERIFY R R
Time for Verify Readout R: 0.005 s.
>|
---#TPCMD PROGRAM T
Time for Program T: 0.054 s.
>|
---#TPCMD VERIFY T R
Time for Verify Readout T: 0.003 s.
>|
---#TPCMD SOFTWARE_UPDATE SKIP_KEYS
> Start Software Update SWUP procedure.
External oscillator selected 55.2MHz.
> Skip set PubKSW ECDSA and MCEK AES keys.
Check SWUP current state.
> SWUP state [0] -> INVALID.
Trigger the SWUP using NXP communication interface model.
> Activated Software Update procedure.
Issue an internal reset to reboot into SWUP mode.
> Reconnecting to NCJ29D5D device.
Trying Breakpoint connect procedure.
JTAG-SWD Debug Port enabled.
Software Breakpoint enabled.
Cortex M33 Core halted [0.008 s].
Internal watchdog disabled.
> Connected to NCJ29D5D device.
Loading NCJ29D5D SWUP kernel.
> SWUP state [2] -> ACTIVE.
> SWUP ID: 0x0000 - Major 0x04 - Minor 0x29 - Patch 0x00.
Processing SWUP Manifest from FRB file.
Processing component 1.
* Block addr 0x00230000.
* Block size 0x00008A00.
* Block for Secure code, firmware (NXP only).
* Block encryption enabled.
```


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```
> Process Manifest completed, found 1 component.
Transfer SWUP Manifest to NCJ29D5D device.
> Transfer SWUP Manifest completed.
Start update of SWUP Manifest.
> Completed update SWUP Manifest.
Process FRB file to send all components part.
* Process component 1, found 69 segments.
  Sent all data for component 1.
* Verify component 1.
  Completed verify component 1.
> All components have been sent and verified.
Verifies the current SWUP process, update the SWUP state and perform a reset.
> Reconnecting to NCJ29D5D device.
Trying Breakpoint connect procedure.
JTAG-SWD Debug Port enabled.
Software Breakpoint enabled.
Cortex M33 Core halted [0.008 s].
Internal watchdog disabled.
> Connected to NCJ29D5D device.
> Completed Software Update SWUP Procedure.
Time for Software Update SWUP: 1.451 s.
>|
---#TPCMD DISCONNECT
>|
```

1 – NXP NCJ29x example Programming Times

Operation	Timings FlashRunner 2.0
Time for Connect	0.120 s
Time for Get Status	0.003 s
Time for Get Version	0.002 s
Time for Get Serial Number	0.002 s
Time for Program Application RAM	0.006 s
Time for Verify Readout Application RAM	0.008 s
Time for Execute Application RAM for 2000ms	2.002 s
Time for Masserase Application Flash	0,494 s
Time for Blankcheck Application Flash	0,005 s
Time for Program Application Flash	0.591 s
Time for Verify Readout Application Flash	0.042 s
Time for Verify Checksum Application Flash	0.006 s
Time for Program Rx Radio Configurations	0.055 s
Time for Verify Readout Rx Radio Configurations	0.005 s
Time for Program Tx Radio Configurations	0.054 s
Time for Verify Readout Tx Radio Configurations	0.003 s
Time for SWUP Software Update	1.451 s
Cycle Time	**00:04.896 s**

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NXP NCJ29x Driver Changelog

Info about driver versions prior to 4.00
All driver versions prior to 4.00 are to be considered obsolete, please update your driver to the latest version.

Info about driver version 4.00 - 30/09/2021
Supported *NCJ29D5B*, *NCJ29D5C*, *NCJ29D5D* and *OL23D0* devices.

Info about driver version 4.01 - 25/10/2021
Minor changes, improved reset management to properly manage SHUFFLEDIO and WATCHDOGFEED.

Info about driver version 4.02 - 25/01/2022
Added commands:

- `#TPCMD READ_MEM8` <Address> <Byte Count>
- `#TPCMD READ_MEM16` <Address> <16-bit Word Count>
- `#TPCMD READ_MEM32` <Address> <32-bit Word Count>

Info about driver version 4.03 - 16/02/2022
Added Application RAM memory [X]
Added commands:

- `#TPCMD PROGRAM X`
- `#TPCMD VERIFY X R`
- `#TPCMD READ X`
- `#TPCMD DUMP X`
- `#TPCMD EXECUTE` <Program Counter> <Check Address> <Expected Value> <Timeout [ms]>

Info about driver version 4.04 - 14/03/2022
Internal upgrade of the algorithm, no change to the operations it performs.

Info about driver version 4.05 - 16/06/2022
Print current FPGA version loaded into TPSTART command.
Upgraded internal code to align all drivers.

Info about driver version 5.00 - 28/07/2022
Added FPGA for new FlashRunner 2.0 models.

Info about driver version 5.01 - 23/05/2023
Fixed Read/Dump for Application RAM Memory.

Info about driver version 5.02 – 23/08/2023
Added command: `#TPCMD EXECUTE` <Program Counter> <Wait Time [ms]>
Updated commands: `#TPCMD GET_STATUS`, `#TPCMD GET_VERSION` and `#TPCMD GET_SERIAL_NUMBER` now prints into Terminal and Real Time Log.

Info about driver version 5.03 – 28/06/2024
Supported device NCJ29D6A. Added command: `#TPCMD SOFTWARE_UPDATE_HOSTIF`

Info about driver version 5.04 – 08/01/2025
Changed padding value for Application Flash from 0xDE to 0x00 to manage correctly firmware integrity check.

Info about driver version 5.06 – 19/03/2025
Added mode to EXECUTE command.

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