

RN00003

PN5190 B1 firmware release 02.07

Rev. 1.3 — 12 September 2023

Release notes

Document information

Information	Content
Keywords	PN5190, PN5190 B1, NFC frontend controller
Abstract	Contains information about a specific release product and component information



1 Revision history

Revision history

Rev	Date	Description
1.3	20230912	PN5190 B1 firmware v02.07 release.
1.2	20230117	PN5190 B1 firmware v02.06 release.
1.1	20220627	PN5190 B1 firmware v02.05 release.
1.0	20210907	PN5190 B1 firmware v02.03 release.

2 Document purpose

This document describes the tested functionality and limitations of the firmware PN5190 B1 FW v02.07.

It also describes the release summary, release history, known issues, work-arounds, limitations, and recommendations.

The functionality and limitations of the hardware and product support material (e.g. customer development board and support software) is described in separate documents.

3 PN5190 B1 firmware version information

PN5190 B1 software package version (including host utilities): v02.07

PN5190 B1 secure firmware version: v02.07

Note: *This firmware version is meant only for PN5190 B1 IC. This firmware cannot be used in PN5190 B2 IC version.*

For new designs, it is recommended to use always the latest available firmware version.

4 Features supported in this release

This section provides the features supported in this firmware/software version release.

4.1 RF protocols

Table 1. RF protocols

Feature/functionality
Reader mode A (106/212/424/848 kbit/s)
Reader mode B (106/212/424/848 kbit/s)
Reader mode FeliCa (212/424 kbit/s)
Reader mode ISO/IEC15693 (26/53/106/212Kbps) - all data rates as specified in the data sheet
Reader mode ISO/IEC18000 3M3 - all data rates as specified in the data sheet
Host card emulation / Card mode ISO/IEC 14443 A-106, A-212, A-424, A-848
Peer-Peer passive communication (ISO18092, PI106, PI212, PI424, PT106, PT212, PT424)
Peer-Peer passive communication with proprietary baud rates (PI212, PI424, PI848, PT212, PT424, PT848)

4.2 Other system features/functionality protocols

Table 2. Other system features

Feature/functionality
Low-power card detection (LPCD) and ultra low-power card detection (ULPCD)
Dynamic power control
Automatic waveshape control
Automatic receiver control
Internal DC-DC for TX driver
Over temperature protection (automatic shutdown of TX drivers and entering low-power mode (Standby), over temperature event on GPIO)
Current limiter (automatic shutdown of TX drivers and event notification to host)
Supported to route analog and digital signals on AUX1(analog) and GPIO0 (digital).
Trimming of RF parameters (TX_NOV, current sensor, NFCLD, RFLD).

4.3 Compliancy with this firmware and PNEV5190B hardware (customer development board)

Table 3. Compliancy with this firmware and PNEV5190B hardware (customer development board)

Feature/Functionality
EMVCo L1 digital compliance
ISO 10373-PCD digital compliance
ISO 10373-PICC digital compliance
NFC Forum CR11 analog and digital compliance. NFC Forum CR13 internally qualified.
ISO 23917 Peer-Peer Passive compliance

5 Version history

This section contains the firmware release version history only for PN5190 B1 based device firmware.

Table 4. Firmware updates from v02.06 to v02.07

SI No.	Function/feature update
1	Fixed an issue where in commands UPDATE_RF_CONFIGRUATION and GET_RF_CONFIGURATION commands when used for TX index 0x0F (ISO180003m3_TARI_18.88us) and 0x10 (ISO180003m3_TARI_9.44us).
2	Fixed an issue of not-restoring the analog TX settings when switching from reader mode to card mode. Removing of type-b detection during Autocoll. Supporting only Type-A and Type-F detection as part of Autocoll procedure.
3	Introduced a new EEPROM configuration: ENABLE_ULFO_TRIM_CALIBRATION (0xCEC). This configuration enables/disables the calibration of wake-up counter value based on the ULFO accuracy measured with frequency meter with Xtal as reference. Note: This feature must be used only when Xtal is available and configured for use
4	Deprecated the P2P active communication target mode functionality.

Table 5. Firmware updates from v02.05 to v02.06

SI No.	Function/feature update
1	Added new command:GET_CRC_USER_AREA[0x29]: This command is used to calculate the CRC for the complete User area including Protocol area. This command helps customer to ensure the integrity of their RF and analog settings by detecting manipulation of this area.
2	Modified SOF timing: In this FW version, we have modified protocol settings of TypeB106 such that it supports SOF timing adjustment, and provide better results during EMVCo L1 analog test.

Table 6. Firmware updates from v02.03 to v02.05

SI No.	Function/feature update
1	If there is Xtal error during Boot, the error notification is sent as Xtal START ERROR bit as part of General Error event in BootStatus.
2	Added support to route analog and digital signals on AUX1(Analog) and GPIO0(Digital). This is done as part of AnalogTestbus Instruction in Combined mode. Therefore, we configured Combined_Mode Signal payload field with value 2 (Analog and Digital combined) then analog and digital test bus is routed on AUX1(Analog Signal) and GPIO0(Digital Signal). The signals to be routed are configured in the EEPROM offset address as mentioned below: "DigitalTBSignalIndex" Offset="0xCE9" Value="0x9B" "DigitalTBSignalBit" Offset="0xCEA" Value="0x04" "AnalogTBSignal" Offset="0xCEB" Value="0x78" Refer to Instruction: CONFIGURE_TESTBUS_ANALOG (CMD ID: 0x13) Introduced new instruction to configure Signals from two test bus at once. Refer to: Command CONFIGURE_MULTIPLE_TESTBUS_DIGITAL (CMD ID: 0x2A)
3	Added FastFieldON as a configuration at Bit 4 position in SYSTEM_CONFIG(Addr: 0x00) Register. If this bit is set, TXLDO/DCDC is not disabled during RF OFF instruction. Only TX_DRIVER is disabled as part of RF OFF and in RF ON TX_DRIVER is enabled.

Table 6. Firmware updates from v02.03 to v02.05...continued

SI No.	Function/feature update
4	New CLIF Registers CLIF_TIMER0_OUTPUT, CLIF_TIMER1_OUTPUT, CLIF_TIMER2_CONFIG, CLIF_TIMER2_RELOAD and CLIF_TIMER2_OUTPUT are provided for user configuration.
5	Modified value of bGuardTimeBeforeTx to 0xFF: During PN5190 dynamic stability analysis with Type A-106 tags, there were errors such as parity/integrity/protocol error observed. Therefore, it is decided to change the value of bGuardTimeBeforeTx to 0xFF, which corresponds to 255us guard time before TX.

Table 7. Firmware updates from v02.01 to v02.03

SI No.	Function/feature update
1	The GPIO1 (general-purpose input/output) pin can be enabled to wake up an external DC-DC from power down for the VDDPA supply during LPCD.
2	Updated Type-A 106 Antenna-specific Protocol register settings for EMVCo to solve few EMVCo Card activation failures during fast card movement within the Field.
3	Update to handle SWITCH_MODE_NORMAL (Abort) scenarios even when Functional CMD and SWITCH_MODE_NORMAL CMD are sent to back within 10 micro sec
4	Introduced a new DPC_CONFIG register to handle Dynamic Enable/Disable of DPC without depending on the DPC setting from EEPROM User Area.
5	Card Mode (SWITCH_MODE_AUTOCOLL Command) support with Ultra Low-Power standby feature (in Autonomous mode with Standby mode) along with the existing Low-Power standby configuration using EEPROM settings.
6	Update to indicate Length Error when received FeliCa response is greater than 28 Bytes when RX_MULTIPLE is Enabled
7	Update to indicate the correct numbers of received bytes when RETRIEVE_RF_DATA is used to retrieve FeliCa response packets received when RX_MULTIPLE is Enabled.
8	Update to fix the issue of EXCHANGE_RF_DATA returning with success even before Receiving RF Response on few ICs upon POR.
9	Update to clear all pending Interrupt Status bits before performing RF Exchange to fix TX Failure observed when FeliCa response is received around FDT timeout.
10	Added a new feature to extend RX Guard Timer in Integer multiple of 'dwRXIRQ_GuardTime' EEPROM timeout configuration in order to extend RX Guard Timeout beyond 1.048 sec.

Table 8. Firmware updates from v02.00 to v02.01

SI No.	Function/feature update
1	NFCLD_ON threshold setting update to PASS NFC Forum Power ON/OFF test. With the new setting, the NFCLD wake-up H-Field strength was changed from 100mA/m to 150mA/m.
2	Clearing the general error status register on read, ensuring the General Error status register is cleared when READ is performed.
3	RF-Setting Update to pass NFC Forum analog, updated the default rise and fall times for Type B.
4	Communication failure due to DCO. In the CLIF_DGRM_CONFIG_REG, the bit field DGRM_DCO_TRACK_TH_SEL was updated to value '3'. This was the stable setting found to solve far-distance communication problems.
5	TXLDO_ERROR in GENERAL_ERROR_STATUS set to 1 when communication fail.

Table 8. Firmware updates from v02.00 to v02.01...continued

SI No.	Function/feature update
	Ensuring the delay for DC-DC shutdown is sufficient to ensure proper shutdown of DC-DC. The TXLDO error was getting set as part of the next RF ON since the LDO would not start
6	Update: Dynamic Boost Setting to avoid the sporadic boost noise. Updated the duty cycle for specific boost setting to resolve the sporadic boost noise.

Table 9. Firmware updates from v01.07 to v02.00

SI No.	Function/feature update
1	<p>Update of RF settings</p> <ul style="list-style-type: none"> • TypeB waveshape settings improvements to pass EMVCo analog with external compliance tool resolved the Undershoot failures with EMVCo PICC2 • IIR filter settings update in ARC table for 45x45 antenna. Enable IIR filter for A106, which takes effect at close distance only. Enabling IIR filter reduces the swing of the received ADC data, therefore avoid clipping and give benefit of using the static BBA gain • PLL settings update for P2P Active communication to pass interoperability with mobile phones. Updated PLL setting ANA_PLL_CTRL_XTAL value to 0xA6EA8A00. • Updated settings for DPC with RDON feature to pass NFC Forum analog compliance. The DPC settings with RDON were not changed, instead DPC target current was reduced from 306 mA to 286 mA due to limit power within maximum limit for Listener-3 and 6. This was in specific changed for 45x45 antenna and only for NFC Forum. • Updated register setting of RM_PREAMBLE_SC_TRIGGER set to 0x08 for F212 and F424.
2	Fix for 3 failing test cases in NFC Forum CR11 digital compliance for card mode. This fix is related to an incorrect mapping of a handler for a Register bit in the SystemConfig register.
3	Fixed an issue of graceful entry into standby due to temperature error. In this fix, we are Turning RF OFF before entering standby due to temperature error.
4	Updated ARC implementation to refer to the correct ARC_106_FDT table during FDT for TypeA106. Fix in the ARC algorithm to apply the ARC_106_FDT values during FDT.

Note: Note that default settings had been worked out based on the customer development board with default 45x45mm antenna and default matching. A custom antenna or modified matching require a verification and potentially a modification of these default settings.

6 Recommendations, known limitations, and precautions

This section provides the known limitations in the FW/HW recommendations.

6.1 Known limitations

With the default FDT settings for ISO18000 (dwFDT_18000_DefVal parameter, which is 1.26 ms), performance @ -40C is reduced for only when TARI=18.88 μs.

This shall be appropriately adjusted for better performance.

6.2 Recommendations

Following clock parameters for Xtal are recommended for active communication on the customer development board PNEV5190B and 45 mm x 45 mm antenna.

Table 10. Recommendations for v02.00 to v02.01 and above

Address	Parameter name	Default value	Value for active communication
1	ANA_PLL_CTRL_XTAL	0x00	0xC1
2	ANA_PLL_CTRL_XTAL	0x8A	0x13
3	ANA_PLL_CTRL_XTAL	0xEA	0xE8
4	ANA_PLL_CTRL_XTAL	0xA6	0xA6

6.3 Precautionary notes

1. Do not disable the DPC and activate the RF field for IC's connected to antennas matched "Symmetric" (e.g. customer development board antenna). Possible damage of the transmitter drivers due to overcurrent over a long period might occur.
2. PN5190 B1 samples cannot be upgraded with the PN5190 B2 FW. However, PN5190 B1 samples can be updated with this FW version.
3. FW v2.00 or FW V01.xx samples can be upgraded to the latest version of PN5190 FW via Secure firmware download. However, samples after upgrading to FW v02.xx, cannot be reverted to FW v01.xx.
4. The ULPCD requires a specific power configuration with no DC-DC active and requires modifications to both the customer development board PNEV5190B EEPROM settings as described in the application notes.

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