

SP 800-90B Non-Proprietary Public Use Document  
NPCT7xx TPM2.0 Entropy Source  
Version 1.0

Hardware version: LAG019  
Firmware versions: 7.2.3.0, 7.2.3.1, 7.2.4.0

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## Revision History

Version	Date	Description
1.0	December 21, 2022	First version.
1.1	January 23, 2023	Added more information to Section 10.
1.2	December 11, 2023	Added Firmware version 7.2.4.0 and refined the Firmware and Hardware description in Section 1 (Description).

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## 1. Description

The NPCT7xx chip is a Trusted Platform Module (TPM) consisting of both Hardware and Firmware (version 7.2.3.0, 7.2.3.1 or 7.2.4.0) as follows:

Component	Identification Field <sup>1</sup>	Value
Hardware (LAG019)	Device ID (DID)	00FCh
Firmware 7.2.3.0	TPM_PT_FIRMWARE_VERSION_1	00070002h
	TPM_PT_FIRMWARE_VERSION_2	00030000h
Firmware 7.2.3.1	TPM_PT_FIRMWARE_VERSION_1	00070002h
	TPM_PT_FIRMWARE_VERSION_2	00030001h
Firmware 7.2.4.0	TPM_PT_FIRMWARE_VERSION_1	00070002h
	TPM_PT_FIRMWARE_VERSION_2	00040000h

The NPCT7xx chip is certified as part of the NPCT7xx Common Criteria EAL4+ certification (Firmware versions 7.2.3.0/1 Certificate IDs: ANSSI-CC-2022/24 - ANSSI-CC-2022/31).

The physical (P) Entropy Source module is part of NPCT7xx; it is compliant with SP 800-90B and seeds a Deterministic Random Bit Generator (DRBG) compliant with SP 800-90A.

The noise source was tested under the assumption that its output is non-IID.

## 2. Security Boundary

The following block diagram describes the building blocks and security boundary of the Entropy Source.

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<sup>1</sup> For more information, see *TCG PC Client Platform TPM Profile (PTP) Specification, Family 2.0 Version 1.05 Revision 14, September 4, 2020*, or later.

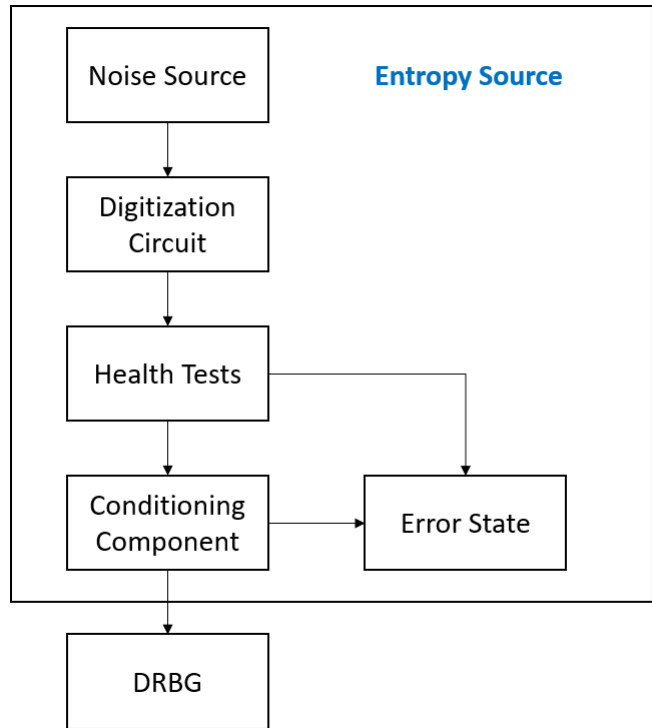


Figure 1: Entropy Source Building Blocks and Security Boundary

### 3. Operating Conditions

The operating conditions of the Entropy Source are derived from the NPCT7xx operating conditions and summarized in the following table:

Parameter \ Value	Min	Max	Unit
Supply Voltage, option 1	3.135	3.465	V
Supply Voltage, option 2	1.71	1.89	V
Operating Temperature	-40	+85	°C

### 4. Configuration Settings

There are no configuration settings for the Entropy Source.

### 5. Physical Security Mechanisms

The Entropy Source is part of the NPCT7xx, which meets the FIPS 140-2/3 Physical Security Level 3 requirements and provides hardness, opacity and tamper-evidence protection.

## 6. Conceptual Interfaces

The Entropy Source provides an interface to seed the DRBG. In addition, for testing purposes, it provides two interfaces, which are not available in the production state of the NPCT7xx, as follows:

1. Extraction of bits from the Digitization Circuit; this is used for the Validation of the Entropy Source according to Section 3 in SP 800-90B.
2. Insertion/Extraction of bits to/from the Conditioning Component; this is used for FIPS Cryptographic Algorithm Validation Program (CAVP) testing (Certificate numbers A1961 and A4792).

## 7. Min-Entropy Rate

The SP800-90A CTR\_DRBG is seeded by the vetted conditioning component Block\_Cipher\_df, defined in SP800-90B. Its input is 1024 bits extracted from the Entropy Source with entropy of 512 bits (derived from the min-entropy, which is 0.5 per bit). The result is that the DRBG is initialized at its full security strength of 256 bits.

## 8. Health Tests

The Entropy Source implements the Repetition Count Test (RCT) and Adaptive Proportion Test (APT) from SP 800-90B.

The estimated false positive of the Health Tests is  $2^{-20}$ .

## 9. Maintenance

There are no maintenance requirements related to the Entropy Source.

## 10. Required Testing

The Entropy Source compliance to SP 800-90B was validated using the testing interface (not available outside of test units, as mentioned in Section 6), the CAVP and the SP 800-90B entropy assessment tool. Both the theoretical assessment and the test results predicted a higher min-entropy than the conservative min-entropy claimed (0.5).

To validate the theoretical assumptions about the noise source, the following tests were performed. Data was collected from the device in its designated operational range; the tests were performed according to Section 3 of SP 800-90B:

- Raw Noise samples comprising of at least 1,000,000 bits were collected via the raw noise source interface and processed by the NIST SP800-90B tool. The entropy rate must be at least the min-entropy rate defined in Section 7.
- Restart data must be collected in accordance with the procedure specified in SP800-90B (in the format of 1,000 samples from 1,000 restarts) through the raw noise source interface and processed by the NIST SP800-90B tool. The restart sanity tests must all pass and the minimum of the row-wise and column-wise entropy rate should not be less than half of the entropy rate obtained from the raw noise data test, described above.

No further testing is required on the Entropy Source.