



Voyantic

Application Note

How to check and change parameters of EPC's Protocol Control word

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1 Protocol Control word (PC)

Protocol Control word (StoredPC and PacketPC) is the 2nd word of the EPC memory bank, 10_h-1F_h. Protocol Control word holds the information of the EPC length, User Memory indicator, Extended protocol control, Numbering system identifier, and Application Family Identifier.

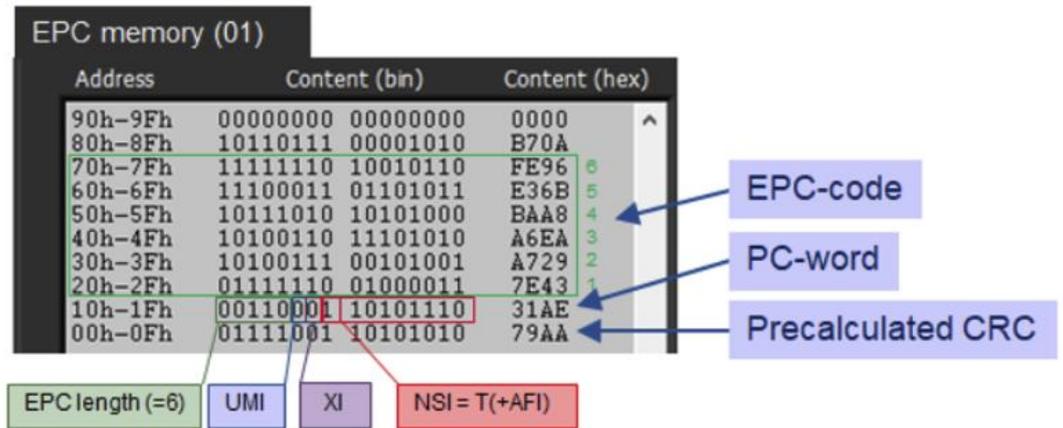


Figure 1 EPC Memory Bank

In this example the IC on the tag used is Impinj M781 which default Protocol Control word is 3400_h -> 0011 0100 0000 0000_b

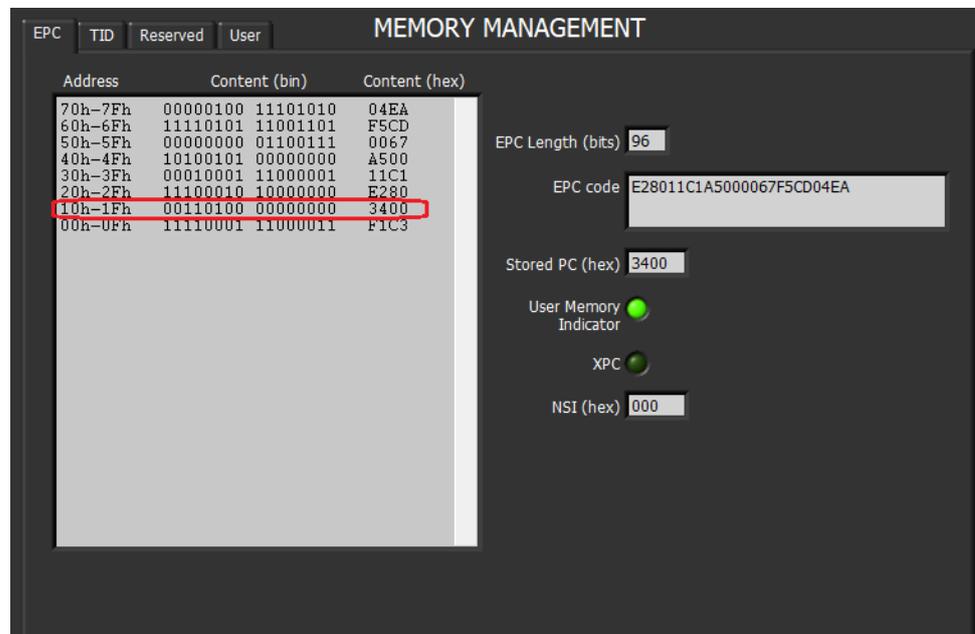


Figure 2 Memory Management - EPC

1.1 EPC Length (10_h-14_h)

The first 5 bits (10_h-14_h) of the Protocol Control word defines the length of the EPC code that a Tag backscatters in response to an *ACK* command. In this example the EPC length is 6 words, because the first 5 bits of the Protocol Control word are 00110_b i.e. 6_{dec}

3400_h -> 0011 0100 0000 0000_b

To change the EPC length e.g. to be 8 words.

- 8_{dec} = 01000_b
- 0100 0100 0000 0000 = 4400_h
- Encode the PC word to 4400_h

1.2 User Memory Indicator (15_h)

M781 has 512bit of User Memory, so the bit 15_h is 1.

0011 0100 0000 0000_b

User Memory Indicator may be fixed or computed, so it can't be manually changed.

1.3 Extended Protocol Control (16_h)

Chips may have one or two extended Protocol Control words. W1 210_h-21F_h and W2 220_h-22F_h. These optional data words add features beyond basic identification, like sensor data (battery status, alarms, temperature) or custom data flags, extending the tag's functionality for advanced management.

M781 doesn't have Extended Protocol Control words, so the bit 16_h is 0.

0011 0100 0000 0000_b

Extended Protocol Control bit is computed, so it can't be manually changed.

1.4 Numbering System Identifier (17_h)

Numbering System Identifier defines if the chip is programmed for GS1 EPCglobal application or non-GS1 EPCglobal application.

Default programming of the M781 is 0 -> GS1 EPCglobal

0011 0100 0000 0000_b

To change the setting, bit 17_h must be changed to 1

- 0011 0100 0000 0000_b -> 0011 0101 0000 0000_b
- 0011 0101 0000 0000_b = 3500_h
- Encode the PC word to 3500

1.5 Application Family Identifier (18_h-1F_h)

If the Numbering System Identifier is programmed for GS1 EPCglobal application the Application Family Identifier is reserved for future use and bits 18_h-1F_h are set to zero.

If the Numbering System Identifier is programmed for non-GS1 EPCglobal application the Application Family Identifier is used to classify and select groups of tags for different applications preventing data clashes and enabling efficient communication by telling readers which tags to 'listen' to or ignore, often functioning as a single-byte marker in the tag's memory.

Default programming of the M781 is 0 -> GS1 EPCglobal
0011 0100 0000 0000_b
Therefore, Application Family Identifier bits are all zeros.
0011 0100 0000 0000_b

To change Application Family Identifier bits, Numbering System Identifier should be changed to 1, and then the Application Family Identifier bits are set as specified in ISO/IEC 16961.

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