## EEPROM BIN Format v2

Description of the "EEPROM BIN format v2", which is a general data container storing calibration data and additional data blocks

| | | address | size [byte] | name | type | description |
|---|---|---|---|---|---|---|
| Header | | 0 | 6 | magic | string | magic = "PMDTEC" |
| | | 6 | 2 | version | uint16_t | version = 6 |
| | | 8 | 4 | CRC32 | uint32_t | crc32 |
| | | 12 | 4 | data size | uint32_t | size of Data* |
| Data | DataBlock 1 | 16 | 2 | dataBlock1Id | uint16_t | defines the data type |
| | | 18 | 4 | dataBlock1Size | uint32_t | size of dataBlockData* |
| | | 22 | dataBlock1Size | dataBlock1Data | char | data block |
| | | [...] | | | | |
| | DataBlock N | M | 2 | dataBlockNId | uint16_t | defines the data type |
| | | M+2 | 4 | dataBlockNSize | uint32_t | size of dataBlockData* |
| | | M+6 | dataBlockNSize | dataBlockNData | char | data block |

**Data block types**

| ID | Name | Comment |
|---|---|---|
| 0 | SPC aston | defined in spectre processing library |
| 1 | ProductCode v1 | defined in table "ProductCode" |
| 2 | LensData v1 | defined in table "LensData" |
| 3 | Efficiency v1 | defined in table "Efficiency" |

Byte order: little endian
*size always refers to the size of the data in bytes without header information.

## ProductCode v1 (DataBlockId 1)

| address | description |
|---|---|

| 0x00 | product code revision | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | product code version | | | | | | | |
| | 0000 0001 | version 1 | | | | | | |

| 0x01 | vendor id | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | vendor id | | | | | | | |
| | 0010 0001 | vendor 1 | | | | | | |
| | 0011 0001 | vendor 2 | | | | | | |

| 0x02 | VCSEL type | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | VCSEL vendor | | | | VCSEL power rating | | | |
| | 0001 | Princeton Optronics | | | 0001 | 0.5 W | | |
| | 0010 | Heptagon | | | 0010 | 1.0 W | | |

| 0x03 | VCSEL diffusor | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | VCSEL diffusor | | | | VCSEL reserved | | | |
| | 0001 | 60x45 | | | 0000 | | | |

| 0x04 | lens type | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | Lens type | | | | | | | |
| | 0000 0001 | K6 | | | | | | |
| | 0000 0010 | LITEON opt. K6 | | | | | | |

| 0x05 | project stage | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | Project Stage | | | | | | | |
| | 0000 0001 | EVB | | | | | | |
| | 0000 0010 | EVT | | | | | | |
| | 0000 0011 | DVT | | | | | | |
| | 0000 0100 | PVT | | | | | | |
| | 0000 0101 | MP | | | | | | |

| 0x06 | project revision | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
| | SubRevision | | | | SubSubRevision | | | |
| | 0001 | e.g. "1" | | | 0001 | e.g. "1" | | |
| | 0010 | e.g. "2" | | | 0010 | e.g. "2" | | |
| | ... | ... | | | ... | ... | | |

**LensData v1 (DataBlockId 2)**

| address | size [byte] | name | type | description |
|---|---|---|---|---|
| 0 | 4 | width | uint32_t | image width (e.g. 224) |
| 4 | 4 | height | uint32_t | image height (e.g. 172) |
| 8 | 4 | fx | 32 bit float | polynomal lens model |
| 12 | 4 | fy | 32 bit float | " |
| 16 | 4 | cx | 32 bit float | " |
| 20 | 4 | cy | 32 bit float | " |
| 24 | 4 | k1 | 32 bit float | " |
| 28 | 4 | k2 | 32 bit float | " |
| 32 | 4 | p1 | 32 bit float | " |
| 36 | 4 | p2 | 32 bit float | " |
| 40 | 4 | k3 | 32 bit float | " |

byte order: little endian

*polynomal lens model (k4 to k6 are not used)

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = R \begin{bmatrix} X \\ Y \\ Z \end{bmatrix} + t$$

$$x' = x/z$$

$$y' = y/z$$

$$x'' = x' \frac{1+k_1 r^2+k_2 r^4+k_3 r^6}{1+k_4 r^2+k_5 r^4+k_6 r^6} + 2p_1 x' y' + p_2(r^2+2x'^2)$$

$$y'' = y' \frac{1+k_1 r^2+k_2 r^4+k_3 r^6}{1+k_4 r^2+k_5 r^4+k_6 r^6} + p_1(r^2+2y'^2) + 2p_2 x' y'$$

where $r^2 = x'^2 + y'^2$

$$u = f_x * x'' + c_x$$

$$v = f_y * y'' + c_y$$

source: http://docs.opencv.org/2.4/modules/calib3d/doc/camera_calibration_and_3d_reconstruction.html

**Efficiency v1 (DataBlockId 3)**

| address | size [byte] | name | type | description |
|---|---|---|---|---|
| 0 | 4 | efficiency1 | 32 bit float | efficiency value of first modulation frequency (e.g. 80.32 MHz) |
| 4 | 4 | efficiency2 | 32 bit float | efficiency value of second modulation frequency (e.g. 60.24 MHz) |
| ... | 4 | efficiencyN | 32 bit float | efficiency value of Nth modulation frequency (optional)* |

byte order: little endian

*At the time of this writing, only two modulation frequencies are used.