



S3N-F03

IO-Link® parameters
v1.7

PHYSICAL LAYER

| Description | |
|-----------------------|--|
| IO-Link Revision | 1.1 |
| SIO Modus | YES |
| Min Cycle Time | 2.3 ms |
| Transmission Rate | 38,4 kbit/s (COM2) |
| Process Data Length | PDInput: 8 Bit configurable |
| M-Sequence Capability | PREOPERATE: TYPE_0 OPERATE: TYPE_2_1 ISDU: supported |

FEATURES

| Description | |
|------------------------|--|
| Block Parameter | YES |
| Data Storage | YES |
| Supported Access Locks | Data Storage |
| Profile Characteristic | Device Profile: Smart Sensor Function Class: Device Identification Function Class: Switching Signal Channel Function Class: Process Data Variable Function Class: Device Diagnosis Function Class: Teach Channel Function Class: Teach-in Single Value |

SERVICE DATA

The following ISDUs will not be saved via Data Storage: Device Access Locks (index 0xC), TISelect (index 0x3A)

| System Parameters | | | | | | | |
|-------------------|-------------------------------|--|-------------------|--|---|-------------------------|---------|
| Index (dec) | Parameter Object Name | Length | Subindex (offset) | Value/Range | Description | Data Type | Access* |
| 0x000C (12) | Device Access Locks | 2 octets | | Bit 1: Data Storage (0=unlocked, 1=locked) | Standardized Device locking functions: Bit 0: Parameter (write) access (Not used) Bit 1: Data Storage Bit 2: Local parameterization (Not used) Bit 3: Local user interface (Not used) Bit 4-15: Reserved | RecordT | R/W |
| 0x000D (13) | Profile Characteristic | 2 octets 2 octets 2 octets 2 octets 2 octets 2 octets | | 0x0001 0x8000 0x8001 0x8002 0x8003 0x8004 0x8007 | Smart Sensor Profile Device Identification Switching Signal Channel (SSC) Process Data Variable (PDV) Device Diagnosis Teach Channel Teach-in single value | ArrayT of UIntegerT16 | RO |
| 0x000E (14) | Process Data Input Descriptor | 3 octets 3 octets 3 octets 3 octets 3 octets | | 0x01.0x01.0x00 0x01.0x01.0x01 0x01.0x01.0x02 0x01.0x01.0x03 0x01.0x01.0x04 0x01.0x01.0x05 | SSC1 (OUT0, C/Q pin) SSC2 (OUT1, DO pin) PDV1 (STABILITY) PDV2 (NOISE LEVEL) PDV3 (COUNTER EXCEDEED THRESHOLD) PDV4 (TIME STAMP BIT) | ArrayT of OctetStringT3 | RO |

| Identification Parameters | | | | | | | | |
|---------------------------|--------------------------|-----------|-------------------|--|---|-----------|---------|------------------------------|
| Index (dec) | Parameter Object Name | Length | Subindex (offset) | Value/Range | Description | Data Type | Access* | Remark |
| 0x0010 (16) | Vendor Name | 18 octets | | Datasensing S.r.l. | Informative | StringT | RO | |
| 0x0011 (17) | Vendor Text | 28 octets | | Easing automation challenges | Informative | StringT | RO | |
| 0x0012 (18) | Product Name | 16 octets | | S3N-PR-5-FG03-OZ (F03 LED) S3N-PH-5-FG03-OZ (F03 Laser) | Detailed product name | StringT | RO | |
| 0x0013 (19) | Product ID | 5 octets | | 10810 (F03 LED) 10890 (F03 Laser) | Product identification | StringT | RO | |
| 0x0014 (20) | Product Text | 21 octets | | Through beam receiver | Optical function | StringT | RO | |
| 0x0015 (21) | Serial Number | 9 octets | | | Unique serial number | StringT | RO | |
| 0x0016 (22) | Hardware Version | 5 octets | | RevAE | | StringT | RO | |
| 0x0017 (23) | Firmware Version | 5 octets | | e.g. 1.1.0 | | StringT | RO | |
| 0x0018 (24) | Application Specific Tag | 32 octets | | *** (default) | Tag application defined by user | StringT | RW | Saved in non-volatile memory |
| 0x0019 (25) | Function Tag | 32 octets | | *** (default) | Additional tag for device function identification | StringT | RW | Saved in non-volatile memory |
| 0x001A (26) | Location Tag | 32 octets | | *** (default) | Additional tag for device function identification | StringT | RW | Saved in non-volatile memory |

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| Observation/Diagnostic | | | | | | | | |
|------------------------|------------------------------|----------|-------------------|--|---|-----------------|---------|--|
| Index (dec) | Parameter Object Name | Length | Subindex (offset) | Value/Range | Description | Data Type | Access* | Remark |
| 0x0024 (36) | Device Status | 1 octet | | 0x00 → Device is ok 0x01 → Maintenance Required 0x02 → Out of specification 0x03 → Functional Check 0x04 → Failure | Contains current status of device | UIntegerT | RO | |
| 0x0025 (37) | Detailed Device Status | 3 octets | | | Information about currently pending Event. Implemented as dynamic list | ArrayT | RO | |
| 0x0028(40) | Process Data (configurable) | 1 octet | | | Read last valid Process Data Input from PDin channel | Device specific | RO | |
| 0x0041(65) | Light Received | 2 octets | | 0-4095 | Normalized value of received light | UIntegerT | RO | |
| 0x0043(67) | Active teach | 1 octet | | 0x01: Standard Teach active (Maximum Sensitivity) 0x02: Fine Teach active | | UIntegerT | RO | |
| 0x0052 (82) | Device Temperature | 2 octets | 1(64) | [°C] | Temperature actual | IntegerT | RO | Max and min temperature during lifetime are saved in non-volatile memory every hour. |
| | | 2 octets | 2(48) | [°C] | Temperature minimum Power Up | IntegerT | RO | |
| | | 2 octets | 3(32) | [°C] | Temperature maximum Power Up | IntegerT | RO | |
| | | 2 octets | 4(16) | [°C] | Temperature minimum during lifetime | IntegerT | RO | |
| | | 2 octets | 5(0) | [°C] | Temperature maximum during lifetime | IntegerT | RO | |
| 0x0053 (83) | Device Temperature Threshold | 2 octets | 1(16) | -40 [°C] (default) | Temperature minimum threshold | IntegerT | RW | Saved in non-volatile memory every hour. Events are generated if the device temperature exceeds the thresholds |
| | | 2 octets | 2(0) | 130 [°C] (default) | Temperature maximum threshold | IntegerT | RW | |
| 0x0057 (87) | Operating Hours counter | 4 octets | 1(64) | 0...(2^32)-1 | Operating Hours: device operating hours. Not resettable by user. | UIntegerT | RO | Saved in non-volatile memory Saved in non-volatile memory |
| | | 4 octets | 2(32) | | Operating Hours Maintenance: device operating hours, reset on system command "Confirm Maintenance". | UIntegerT | RO | |
| | | 4 octets | 3(0) | | Operating Hours Power Up: Time in hours since power up. | UIntegerT | RO | |
| 0x00BE (190) | Excess gain | 2 octets | | 100...900 | Excess gain (EG) = 0 if signal is under threshold | UIntegerT | RO | |

| Teach-in Parameters | | | | | | | | |
|---------------------|-----------------------|----------|-------------------|---|---|------------------------|---------|--|
| Index (dec) | Parameter Object Name | Length | Subindex (offset) | Value/Range | Description | Data Type | Access* | Remark |
| 0x003A (58) | TI Select | 1 octet | | 0x00 = SSC1 (default, C/Q pin and DO pin) | Selection for Teach-in channel (volatile) | UIntegerT | R/W | C/Q and DO outputs are antivalent. Teach SSC1 equals to teach SSC2 |
| 0x003B (59) | TI Result | 1 octet | 1(0) 2(4) | Teach-in State Teach-in Flags SP | See IO-Link Smart Sensor Profile | UIntegerT4 BooleanT | RO | |
| 0x003C(60) | SSC1 Param | 2 octets | 1 (16) | 113-3983 | Sensitivity, default value 3983. | UIntegerT | R/W | Saved in non-volatile memory. |
| | | 2 octets | 2(0) | Not Used | | UIntegerT | R/W | |
| 0x003D(61) | SSC1 Config | 1 octet | 1(24) | 0x00: High Active 0x01: Low Active (default) | C/Q pin configuration | UIntegerT | R/W | Saved in non-volatile memory. |
| | | 1 octet | 2(16) | 0x01: Single Point (default) | | UIntegerT | | |
| | | 2 octets | 3(0) | 0x00: Hysteresis min (default) | | UIntegerT | | |
| 0x003E (62) | SSC2 Param | 2 octets | 1 (16) | 113-3983 | Sensitivity, default value 3983. | UIntegerT | R/W | Saved in non-volatile memory |
| | | 2 octets | 2(0) | Not Used | | UIntegerT | R/W | |
| 0x003F (63) | SSC2 Config | 1 octet | 1(24) | 0x00: High Active (default) 0x01: Low Active | DO pin configuration | UIntegerT | R/W | Saved in non-volatile memory. |
| | | 1 octet | 2(16) | 0x01: Single Point (default) | | UIntegerT | | |
| | | 2 octets | 3(0) | 0x00: Hysteresis min (default) | | UIntegerT | | |

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| Device Specific Parameters | | | | | | | | |
|----------------------------|-----------------------------|---------|----------------------|--|---|-----------|---------|------------------------------|
| Index (dec) | Parameter Object Name | Length | Subindex (offset) | Value/Range | Description | Data Type | Access* | Remark |
| 0x0049(73) | PDInput configuration | 1 octet | 1(24) | 0x00: disabled (default) 0x01: enabled | STABILITY bit | UIntegerT | R/W | Saved in non-volatile memory |
| | | 1 octet | 2(16) | | NOISE LEVEL bit | UIntegerT | | |
| | | 1 octet | 3(8) | | COUNTER bit | UIntegerT | | |
| | | 1 octet | 4(0) | | TIME STAMP bit | UIntegerT | | |
| 0x0058 (88) | Keylock | 1 octet | | 0x00: Inactive (default) 0x01: Active | Enable/disable push button | Boolean | R/W | Saved in non-volatile memory |
| 0x00B4 (180) | Output type | 1 octet | 1 (8) | 0x1 = PNP (default) 0x3= Push Pull | Output type of C/Q pin when in SIO mode | UIntegerT | R/W | Saved in non-volatile memory |
| | | 1 octet | 2(0) | 0x1 = PNP (default) 0x2 = NPN | Output type of DO pin | UIntegerT | R/W | |
| | | | | 0x3= Push Pull | | | | |
| | | | | | | | | |
| 0x00B5 (181) | Anti-interference filter | 1 octet | | 0x0 = Factory filter configuration (default) 0x1= Filter configuration 1 Active 0x2 = Filter configuration 2 Active | Select anti-interference filter. If Filter Configuration X is set on F-model, the same filter shall be applied to the G-model | UIntegerT | R/W | Saved in non-volatile memory |

| Standard Command | | | | | | |
|------------------|--------------------------|---------|-------------|---|---------|--|
| Index (dec) | Command Name | Length | Value (dec) | Description | Access* | |
| 0x0002 (2) | Standard Teach | 1 octet | 0x41 (65) | Teach Set Point with maximum sensitivity (Transmitter and receiver shall be aligned) | WO | |
| 0x0002 (2) | Fine Teach | 1 octet | 0x4B (75) | Teach to detect small object (Transmitter and receiver shall be aligned)* | WO | |
| 0x0002 (2) | Teach CANCEL | 1 octet | 0x4F (79) | Exit from FAIL condition** | WO | |
| 0x0002 (2) | Restore Factory Settings | 1 octet | 0x82 (130) | Restore factory settings (Device Access Locks, Application Specific Tag, Function Tag, Location Tag, Active teach, Device Temperature Threshold, TI Result, SSC1 Param, SSC2 Param, SSC1 Config, SSC2 Config, Delay Settings, Output Type, Keylock, Anti-interference filter, Process Data configuration, Switch counter settings, Switch counter value, Time stamp trigger, Time stamp List, Time Stamp Synch Value) | WO | |
| 0x0002 (2) | Confirm Maintenance | 1 octet | 0xA5 (165) | Reset Maintenance parameters (Operating Hours Maintenance, Minimum device temperature since power up, Maximum device temperature since power up, Device Status, Detailed Device Status) | WO | |
| 0x0002 (2) | Start / Stop Ping | 1 octet | 0xAF (175) | Feature to identify the sensor by yellow led blinking | WO | |

*if transmitter and receiver are not aligned and Fine Teach is performed through push button, GREEN led remains in OFF state until the two units are aligned. Then FAIL conditions arises.

**FAIL condition is signaled through YELLOW led only if transmitter and receiver are aligned.

| Events | | | | | |
|------------------|------------------------------------|----------------------|------------|----------------------|---------|
| Event code (dec) | Event name | Event mode | Event type | Device status | Remarks |
| 0x4220 (16928) | Temperature underrun | Appears / Disappears | Warning | Out of specification | |
| 0x4210 (16912) | Temperature overrun | Appears / Disappears | Warning | Out of specification | |
| 0x5100 (20736) | General power supply fault | Appears / Disappears | Error | Failure | |
| 0x7710 (30480) | Short circuit - Check installation | Appears / Disappears | Error | Failure | |

PROCESS DATA INPUT

| Bit 7 | Bit 6 | Bit 5 TIME STAMP EVENT | Bit 4 COUNTER EXCEED THRESHOLDS | Bit 3 NOISE LEVEL | Bit 2 STABILITY | Bit 1 SSC2 (DO Pin) | Bit 0 SSC1 (C/Q Pin) |
|-------|-------|---------------------------|---------------------------------------|----------------------|--------------------|------------------------|-------------------------|
| | | | | | | | |

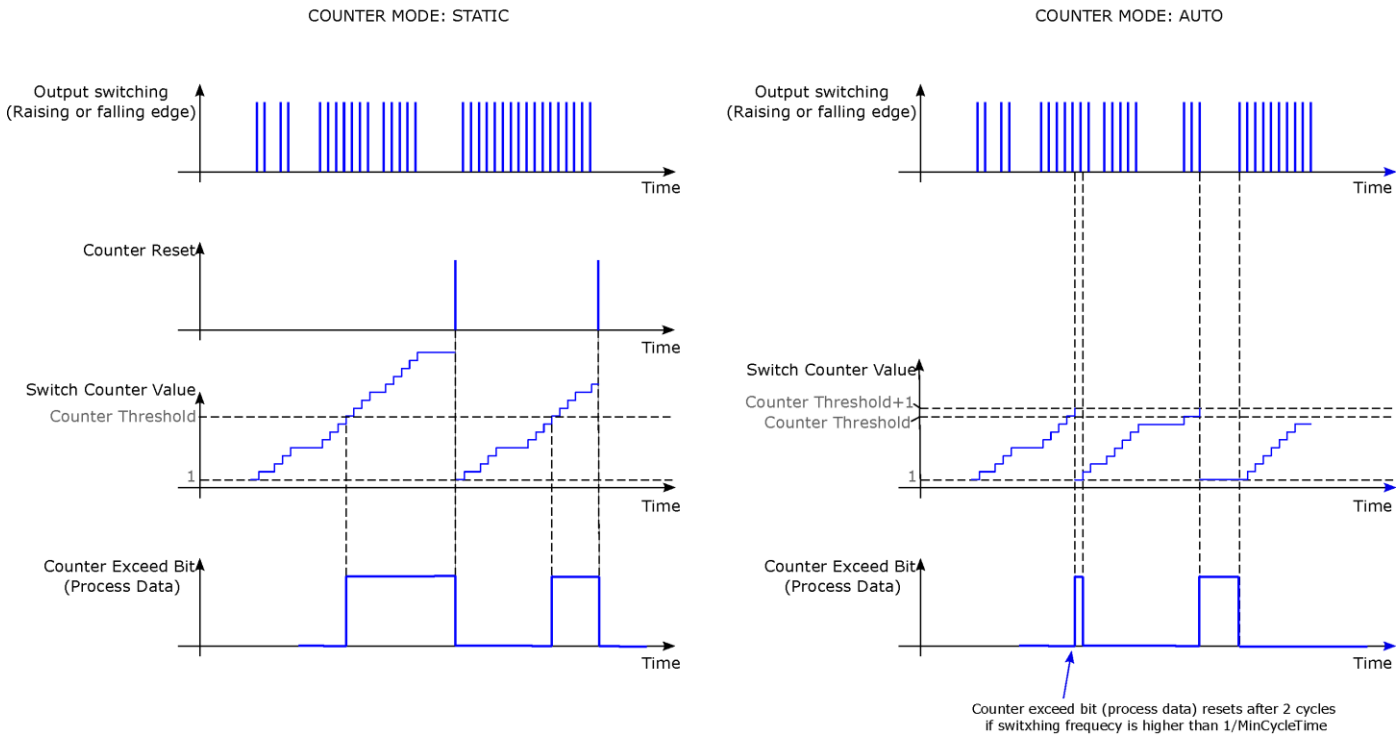
*RO = read only, WO = write only, R/W = read/write

EXTENDED PARAMETERS (ADVANCED FUNCTIONS)

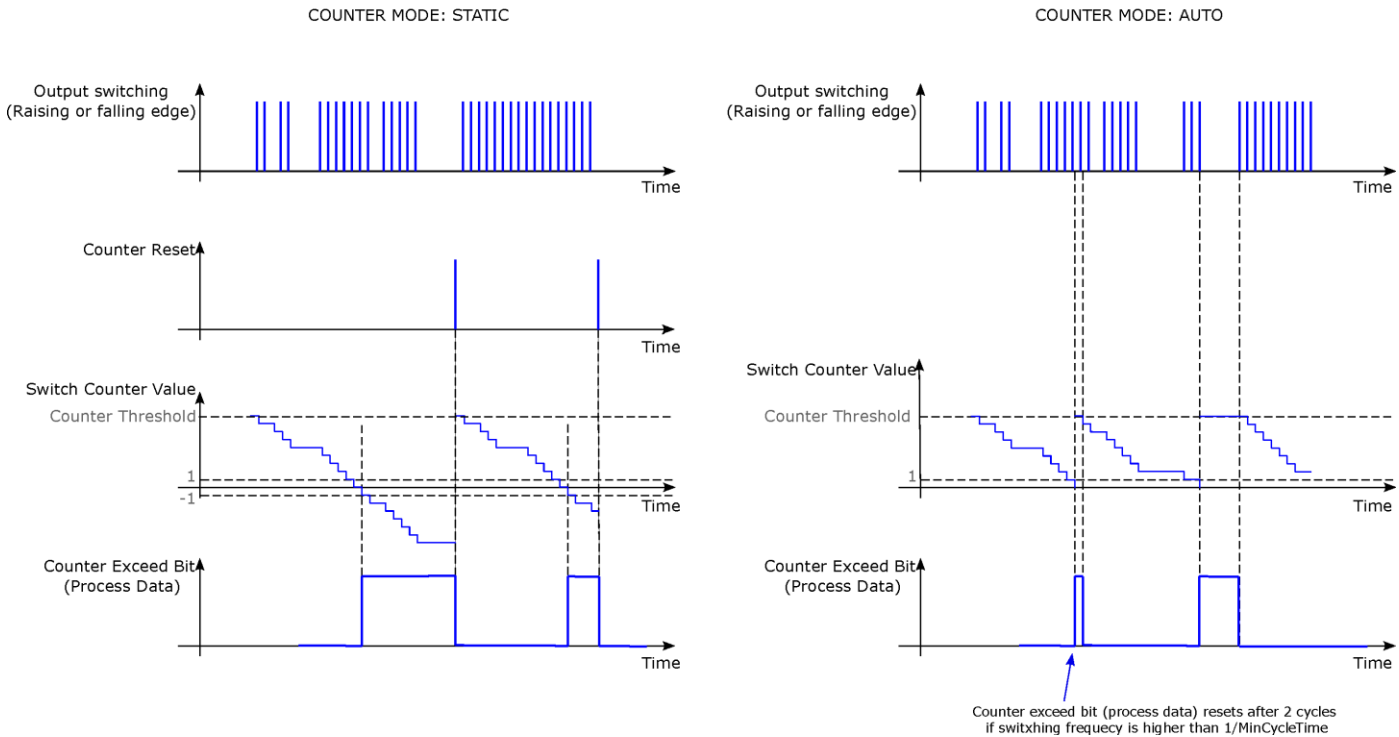
| COUNTER | | | | | | | | |
|------------------|----------------------------|----------|-------------------|--|-------------------------|-----------|--------|---|
| Index (dec) | Parameter Object Name | Length | Subindex (offset) | Value/Range | Description | Data Type | Access | Remark |
| 0x00B6 (182) | Switch counter settings | 1 octet | 1(24) | 0: Counter OFF (default) 1: Counter STATIC 2: Counter AUTO | Mode | UIntegerT | RW | Saved in non-volatile memory. |
| | | 1 octet | 2(16) | 0: Output Rising edge 1: Output Falling edge | Trigger counter | UIntegerT | RW | Stop or reset the running counter before change configuration and then re-enable the counter with |
| | | 2 octets | 3(0) | 0-32767 | Threshold counter | UIntegerT | RW | Set counter commands. *Rising and falling edge are referred to DO pin |
| 0x00B7 (183) | Switch counter value | 1 octet | 1(16) | 0: counting UP 1: counting DOWN 2: counting INACTIVE | Counting direction | UIntegerT | RO | |
| | | 2 octets | 2(0) | -32768 ... 32767 | Value of switch counter | IntegerT | RO | |
| Standard Command | | | | | | | | |
| Index (dec) | Command Name | Length | Value (dec) | Description | | | | Access |
| 0x0002 (2) | Reset Counter | 1 octet | 0xA0(160) | Reset counter value (only if STATIC counter mode is selected) and PD bit | | | | WO |
| 0x0002 (2) | Set Counter Direction UP | 1 octet | 0xA1(161) | Enable counter and start count UP (counter value is not reset. Reset counter command to zero the value)* | | | | WO |
| 0x0002 (2) | Set Counter Direction DOWN | 1 octet | 0xA2(162) | Enable counter and start count DOWN (counter value is not reset. Reset counter command to zero the value)* | | | | WO |
| 0x0002 (2) | Stop Counter | 1 octet | 0xA3(163) | Freeze the counting functions (all commutations are neglected, counting INACTIVE). Enable counter to restart the counting function from the last value before freezing.* | | | | WO |

* It is recommended not to switch between Counter UP and counter DOWN. It is not possible to switch from Counter UP to DOWN keeping the value of the switch counter and maintain PD bit consistency.

COUNTING DIRECTION: UP



COUNTING DIRECTION: DOWN



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| TIMESTAMP | | | | | | | | |
|--------------|------------------------------|-----------|-------------------|---|--|-----------|--------|---|
| Index (dec) | Parameter Object Name | Length | Subindex (offset) | Value/Range | Description | Data Type | Access | Remark |
| 0x00B8 (184) | Time stamp trigger | 1 octet | 1(32) | 0x00: disabled (default) 0x01: enabled | EVENT_1 (ID=0x01):Counter Threshold Exceeded | UIntegerT | RW | Event that generates a time stamp |
| | | 1 octet | 2(24) | | EVENT_2 (ID=0x02): Temperature underrun (Event mode APPEARS) | UIntegerT | | |
| | | 1 octet | 3(16) | | EVENT_3 (ID=0x03): Temperature overrun (Event mode APPEARS) | UIntegerT | | |
| | | 1 octet | 4(8) | | EVENT_4 (ID=0x04): Short circuit | UIntegerT | | |
| | | 1 octet | 5(0) | | EVENT_5 (ID=5): Power fault | UIntegerT | | |
| 0x00B9 (185) | Time Stamp settings | 1 octet | 1(8) | 3 [ms] | Maximum time stamp latency time | UIntegerT | RO | Latency between event and time stamp (hardware dependent). Typically 3ms. |
| | | 1 octet | 2(0) | 1 [ms] | Time stamp resolution | UIntegerT | RO | |
| 0x00BA (186) | Time Stamp List | 70 octets | | *see format in Time Stamp Table | | UIntegerT | RO | Last time stamp trigger starts counting from Power Up, from Time Stamp Synch Value or from 0 (after Restore Factory Settings) |
| 0x00BB (187) | Time Stamp Synch Value | 2 octets | 1(32) | 0...999 | milliseconds | UIntegerT | RW | Reset value for time stamp synchronization |
| | | 1 octet | 2(24) | 0..59 | seconds | | | |
| | | 1 octet | 3(16) | 0...59 | minutes | | | |
| | | 1 octet | 4(8) | 0..23 | hours | | | |
| | | 1 octet | 5(0) | 0...255 | days | | | |
| Index (dec) | Command Name | Length | Value (dec) | Description | | | | Access |
| 0x0002 (2) | Reset Time Stamp Application | 1 octet | 0xB1(177) | Reset Time Stamp application (Time Stamp trigger, Time Stamp List and Time Stamp PD bit) | | | | WO |
| 0x0002 (2) | Reset Time Stamp | 1 octet | 0xB2(178) | Reset clock counter | | | | WO |
| 0x0002 (2) | Time Stamp Synchronization | 1 octet | 0xB3(179) | Start counting from the Time Stamp Synch Value (index 187). This command clear the Time Stamp List and reset the Time Stamp PD bit. | | | | WO |
| 0x0002 (2) | Reset Time Stamp PD bit | 1 octet | 0xB4(180) | Reset the Time Stamp PD bit | | | | WO |

Time Stamp Table

| | | <i>ID event</i> | <i>day</i> | <i>hours</i> | <i>minutes</i> | <i>seconds</i> | <i>milliseconds</i> |
|------------------------|--------|-----------------|------------|--------------|----------------|----------------|---------------------|
| Last EVENT_X occurred | Byte1 | Byte2 | Byte3 | Byte4 | Byte5 | Byte6 | Byte7 |
| | Byte8 | Byte9 | Byte10 | Byte11 | Byte12 | Byte13 | Byte14 |
| | Byte15 | Byte16 | Byte17 | Byte18 | Byte19 | Byte20 | Byte21 |
| | ... | ... | ... | ... | ... | ... | ... |
| | ... | ... | ... | ... | ... | ... | ... |
| First EVENT_X occurred | Byte64 | Byte65 | Byte66 | Byte67 | Byte68 | Byte69 | Byte70 |

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