



S3N-M03

IO-Link® parameters
v1.9

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 Function Class: Teach-in Two Values

SERVICE DATA

The following ISDUs will not be saved via Data Storage: Device Access Locks (index 0xC), TISelect (index 0x3A), Energy Filtering (0x40)

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		0x0001	Smart Sensor Profile	ArrayT of UIntegerT16	RO
		2 octets		0x8000	Device Identification		
		2 octets		0x8001	Switching Signal Channel (SSC)		
		2 octets		0x8002	Process Data Variable (PDV)		
		2 octets		0x8003	Device Diagnosis		
		2 octets		0x8004	Teach Channel		
		2 octets		0x8007	Teach-in single value		
0x000E (14)	Process Data Input Descriptor	3 octets		0x01.0x01.0x00	SSC1 (OUT0, C/Q pin)	ArrayT of OctetStringT3	RO
		3 octets		0x01.0x01.0x01	SSC2 (OUT1, DO pin)		
		3 octets		0x01.0x01.0x02	PDV1 (EMITTED LIGHT MIRRORED)		
		3 octets		0x01.0x01.0x03	PDV2 (NOISE LEVEL)		
		3 octets		0x01.0x01.0x04	PDV3 (COUNTER EXCEDEED THRESHOLD)		
		3 octets		0x01.0x01.0x05	PDV4 (TIME STAMP BIT)		

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	15 octets		S3N-PR-5-M03-OZ (M03 LED) S3N-PH-5-M03-OZ (M03 Laser)	Detailed product name	StringT	RO	
0x0013 (19)	Product ID	5 octets		10820 (M03 LED) 10900 (M03 Laser)	Product identification	StringT	RO	
0x0014 (20)	Product Text	22 octets 28 octets		Background suppression (M03 LED) Background suppression laser (M03 Laser)	Optical function	StringT	RO	
0x0015 (21)	Serial Number	9 octets			Unique serial number	StringT	RO	
0x0016 (22)	Hardware Version	5 octets		RevAD		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

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

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)	Normalized Distance	2 octets		[mm]	Distance	UIntegerT	RO	Normalized distance values are valid only if the target is within the operating range.
0x0043(67)	Active teach	1 octet		0x01: Standard Teach active 0x02: Teach Transparent/Shiny Object active 0x03: Teach Conveyor active (M03 LED) 0x04: Teach Dynamic Conveyor active (M03 LED)		UIntegerT	RO	
0x0051(81)	Emission Status	1 octet		0x00: Emission OFF 0x01: Emission ON	Read emission status	Boolean	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
		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	

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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)	30-180[mm] (M03 LED) 30-140[mm] (M03 LASER)	Distance SP1	UIntegerT	R/W	Saved in non-volatile memory. Used only in Standard Teach. Enable Window mode in SSC1/ SSC2 config parameter. In Single Point mode, SP2 is not used.
		2 octets	2(0)	30-180[mm] (M03 LED) 30-140[mm] (M03 LASER)	Distance SP2 (used in Window mode only, SP2 must be greater than SP1)	UIntegerT	R/W	
0x003D(61)	SSC1 Config	1 octet	1(24)	0x00: High Active (default)	C/Q pin configuration	UIntegerT	R/W	Saved in non-volatile memory. Window mode available in Standard Teach only (otherwise Invalid Parameter Set error). Window mode is allowed only if SP1<SP2 (otherwise Invalid Parameter Set Error is sent).
		1 octet	2(16)	0x01: Low Active 0x01: Single Point (default) 0x02: Window*		UIntegerT		
		2 octets	3(0)	0x00: Hysteresis min (default) 0x01: Hysteresis mean 0x02: Hysteresis max		UIntegerT		
0x003E (62)	SSC2 Param	2 octets	1 (16)	30-180[mm] (M03 LED) 30-140[mm] (M03 LASER)	Distance SP1	UIntegerT	R/W	Saved in non-volatile memory. Used only in Standard Teach. Enable Window mode in SSC1/ SSC2 config parameter. In Single Point mode, SP2 is not used.
		2 octets	2(0)	30-180[mm] (M03 LED) 30-140[mm] (M03 LASER)	Distance SP2 (used in Window mode only, SP2 must be greater than SP1)	UIntegerT	R/W	
0x003F (63)	SSC2 Config	1 octet	1(24)	0x00: High Active	DO pin configuration	UIntegerT	R/W	Saved in non-volatile memory. Window mode available in Standard Teach only (otherwise Invalid Parameter Set error). Window mode is allowed only if SP1<SP2 (otherwise Invalid Parameter Set Error is sent).
		1 octet	2(16)	0x01: Low Active (default) 0x01: Single Point (default) 0x02: Window*		UIntegerT		
		2 octets	3(0)	0x00: Hysteresis min (default) 0x01: Hysteresis mean 0x02: Hysteresis max		UIntegerT		
0x0040 (64)	Energy Filtering	1 octet		0x00: Low filtering 0x01: Middle filtering 0x02: High filtering	Only for applications with a background (not available for Standard Teach). Set the energy filter level around the background signal. Increase the filter for a more precise detection. Decrease it for a more stable detection. Every teach reset the default value. Default values: Conveyor Teach → 0x01 Middle filtering Transparent/Shiny Object Teach → 0x02 High filtering Conveyor Dynamic Teach → 0x02 High filtering	UIntegerT	R/W	Saved in non-volatile memory. Not available for Standard Teach (Invalid Parameter Set error) or after power cycle. Change energy filter only after performing Transparent/Shiny Object Teach, Conveyor Teach, Dynamic Conveyor Teach.
0x0042(66)	Digital Filter on Position	1 octet		0x00: disabled 0x01: enabled	(M03 LED) Only for applications with a background (not available for Standard Teach). It enables a digital filter on background position. If enabled, background recognition is more reliable. Every teach reset the default value. Default value: 0x00 disabled for Standard teach / Conveyor Teach / Conveyor Dynamic Teach 0x01 enabled for Transparent/Shiny Object Teach	UIntegerT	R/W	

*Data storage is allowed only between consistent configuration (single point vs single point, window mode vs window mode). It is not possible to download a single point configuration to a sensor with window mode configuration and viceversa. First, change the configuration accordingly to assure correct sensor replacement.

Device Specific Parameters								
Index (dec)	Parameter Object Name	Length	Subindex (offset)	Value/Range	Description	Data Type	Access*	Remark
0x0048 (72)	Delay Settings	1 octet	1 (32)	0x0 = no delay (default) 0x2= Delay ON 0x3 = One Shot 0x4= Delay OFF	Select Delay mode (ON / OFF/ ONE SHOT)	UIntegerT	R/W	Saved in non-volatile memory
		4 octets	2(0)	0...(2^32)-1	Delay value [ms] ¹	UIntegerT	R/W	
0x0049(73)	PDInput configuration	1 octet	1(24)		LIGHT MIRRORED bit	UIntegerT	R/W	Saved in non-volatile memory
		1 octet	2(16)	0x00: disabled (default)	NOISE LEVEL bit	UIntegerT		
		1 octet	3(8)	0x01: enabled	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	UIntegerT	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 0x3= Push Pull	Output type of DO pin	UIntegerT	R/W	

¹Temporal accuracy is higher for delay values <60s.

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Standard Command					
Index (dec)	Command Name	Length	Value (dec)	Description	Access*
0x0002 (2)	Standard Teach	1 octet	0x41 (65)	Teach Set Point	WO
0x0002 (2)	Transparent/Shiny Object Teach	1 octet	0x4B (75)	Teach Fixed Background (Transparent/Shiny Object)	WO
0x0002 (2)	Conveyor Teach	1 octet	0x4C (76)	Teach conveyor application (M03 LED)	WO
0x0002 (2)	Conveyor Dynamic Teach	1 octet	0x4D (77)	Advanced dynamic conveyor teach (M03 LED) – optimized for the detection of transparent/semi-transparent packages on conveyor	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, Process Data configuration, Energy Filtering, Advanced Teach Position, 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
0x0002 (2)	Emission Toggle	1 octet	0xB0(176)	Toggle emission (see Emitter Status parameter to check the current status) (M03 LED)	WO

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	
0x8CA0 (36000)	Laser fault	Appears / Disappears	Error	Failure	(M03 Laser)

PROCESS DATA INPUT

Bit 7	Bit 6	Bit 5 TIME STAMP EVENT	Bit 4 COUNTER EXCEED THRESHOLDS	Bit 3 NOISE LEVEL	Bit 2 EMITTED LIGHT MIRRORED*	Bit 1 SSC2 (DO Pin)	Bit 0 SSC1 (C/Q Pin)
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*if 1, reflex from conveyor (action: tilt the sensor).

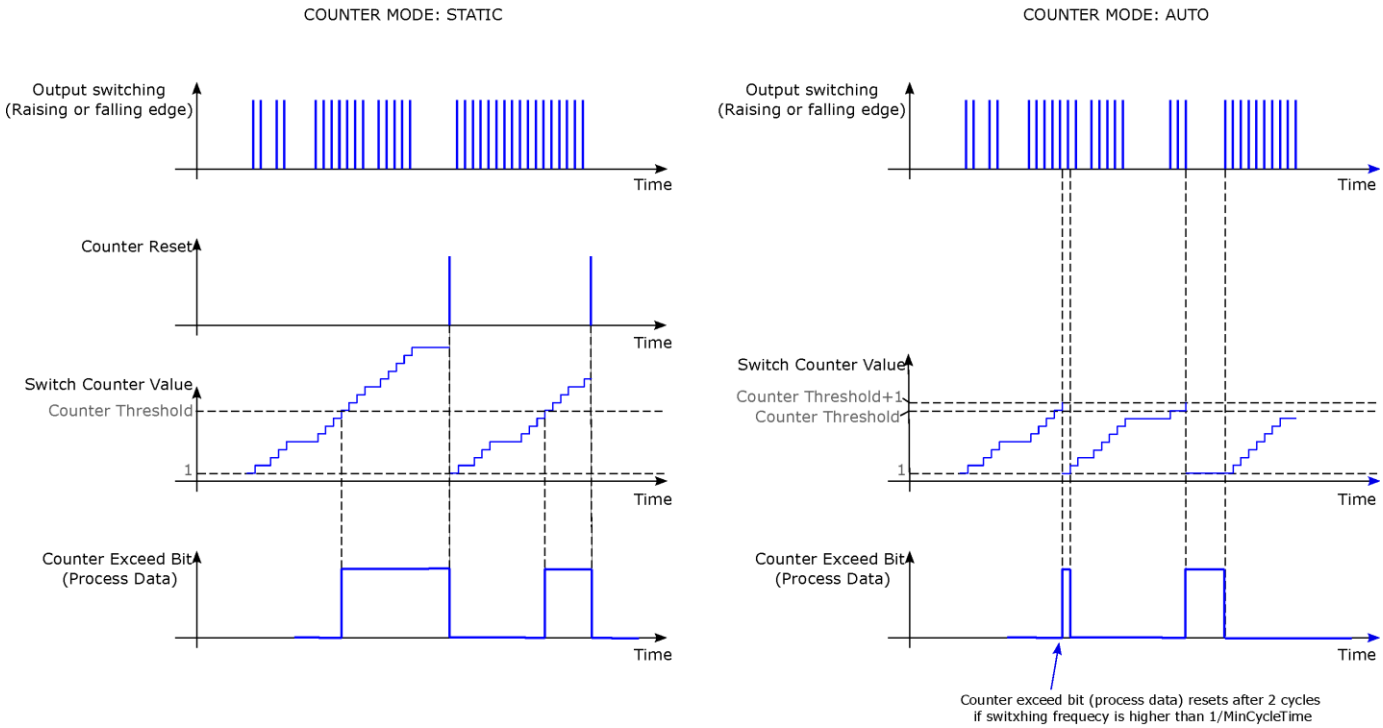
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EXTENDED PARAMETERS (ADVANCED FUNCTIONS)

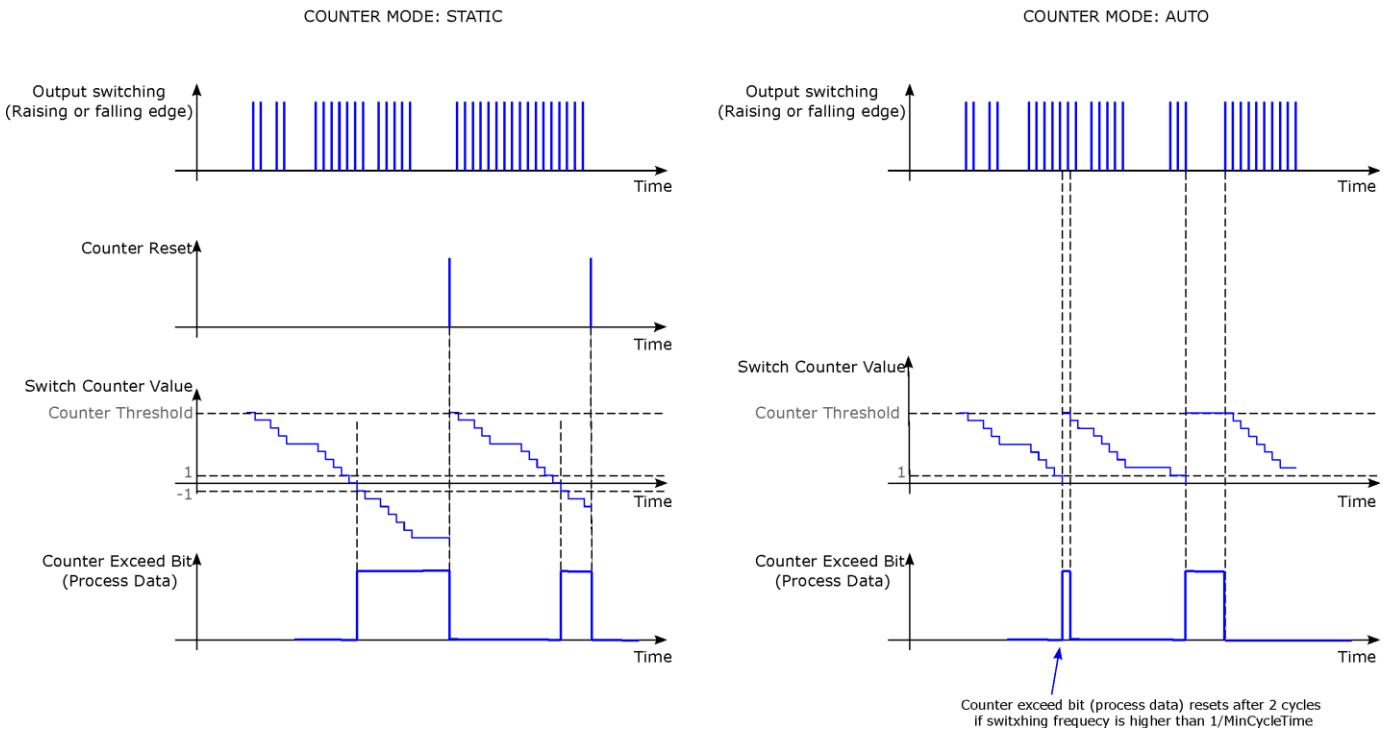
COUNTER								
Index (dec)	Parameter Object Name	Length	Subindex (offset)	Value/Range	Description	Data Type	Access	Remark
0x00B6 (182)	Switch counter settings	1 octet	1(24)	0: Counter OFF (default) 1: Counter STATIC 2: Counter AUTO	Mode	UIntegerT	RW	Saved in non-volatile memory.
		1 octet	2(16)	0: Output 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 reset unless if Stop Counter command is sent)*				WO
0x0002 (2)	Set Counter Direction DOWN	1 octet	0xA2(162)	Enable counter and start count DOWN (counter value is not reset unless if Stop Counter command is sent)*				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

		ID event	day	hours	minutes	seconds	milliseconds
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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