

RS232 interface-protocol PC ↔ L-LAS-LT-...-MA Sensor - Firmware Version 3.14-TSD

- Standard RS232 serial interface, no hardware handshake
- 3-line connection: GND, TxD, RxD
- Speed: 19200 baud, 8 data-Bits, no parity-bit, 1 stop-bit, binary-mode

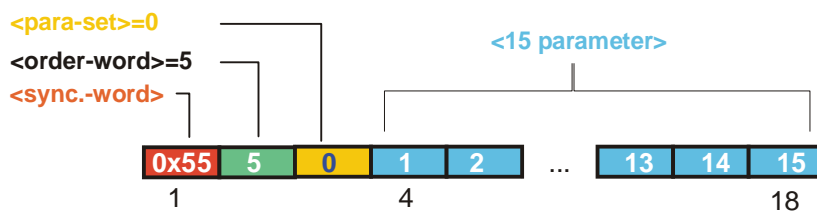
The control device (PC or PLC) must send a data frame consisting of 18-words (1 word = 2 byte = 16 bit) to the L-LAS-LT-...-MASTER control unit. All words in the data frame must be transferred in binary format. The higher-order byte must be transferred first (MSB-first).

METHOD:

The microcontroller in the L-LAS-LT-...-MASTER sensor permanently reads the input buffer of its RS-232 module (polling). If the arriving word is **0x0055** (0x55 hexadecimal = 85 decimal), this is interpreted as a synchronisation event: (**<sync-word>**). The microcontroller then reads the order number (**<order-word>**) that is transferred with the 2nd word.

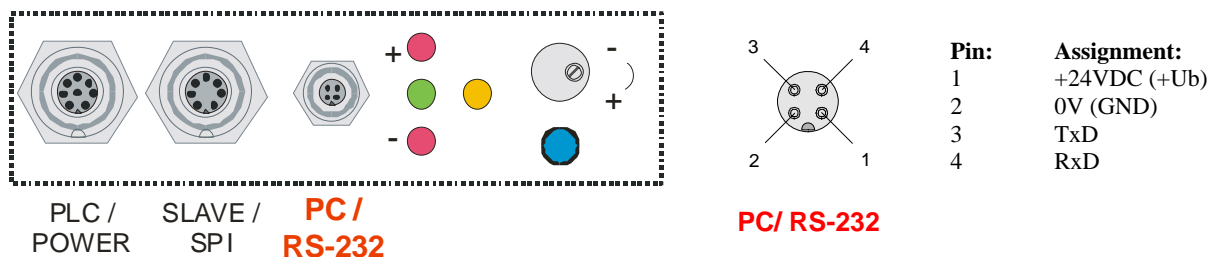
After the order word (**<order-word>**) another word is transferred that informs about the number of the parameter set (**<para-set>**). This is followed by additional 15 words **<parameter-word>** that contain the actual parameters. When the complete data frame (18 words = 36 bytes) has been read in, the L-LAS-LT-...-MA control unit starts to execute the order contained in the 2nd word (**<order-word>**).

DATA FRAME: PC/PLC → SENSOR (18-Words=36Bytes, MSB first)



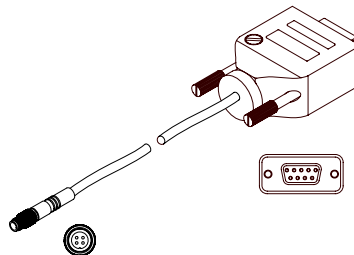
RS232-connection to PC / PLC:

4-pole M5 female connector type Binder 707



Connecting cable:

cab-las4/PC (length 2m, cable jacket: PUR)



Format of the data frame: <para-set = 0> GENERAL-PARAMETERS		
Word no.	Meaning	Comment
1	<sync-word>	hex-code 0x55, binary=0000 0000 0101 0101, dec.=85
2	<order-word>	Order word (see table below)
3	<para-set> = 0	0 = Parameter set GENERAL
4	EVALMODE	Evaluation-mode: (0=SLAVE, 1=MASTER, 2=WIDTH, 3=CENTER, 4=DIFF)
5	TRIGGERMODE	Trigger-mode: (0=CONTINUOUS, 1=EXT-IN0-L/H, 2=EXT-IN0-HIGH, 3=EXT-IN0-L/H DYN-PWR)
6	ANAMODE	Analog-output-mode: (0=DIRECT 0..10V, 1=MAXIMA, 2=MINIMA, 3=MAX-MIN)
7	HWMODE	Operation mode of hardware button and potentiometer (0=DISABLE ALL, 1=ENABLE-ALL, 2=EN.-BTN, 3=EN.-POTI)
8	AVERAGE	Setting for averaging: (1,2,4,8,16,32,64,128 oder 256)
9	POLARITY	Output polarity of the digital outputs: (0=DIRECT, 1=INVERS)
10	ANAZOOM	0=DIRECT,1=ZOOMx1, 2=ZOOMx2, 3=ZOOMx4, 4=ZOOMx8, 5=ZOOMx16, 6=TOL-WIN<5V>, 7=TOL-WIN<10V>
11	MEASMODE	0=USE ABSOLUTE VALUE, 1=USE SETPOINT-VALUE
12	PARA9	0, currently not used
13	umTOLUP LO-WORD	Tolerance value UP in micrometer, low-order 16-bit-word
14	umTOLUP HI-WORD	Tolerance value UP in micrometer, high-order 16-bit-word
15	umTOLLO LO-WORD	Tolerance value LOW in micrometer, low-order 16-Bit-word
16	umTOLLO HI-WORD	Tolerance value LOW in micrometer, high-order 16-Bit-word
17	umSETPOINT LO-WORD	Reference value in micrometer, low-order 16-Bit-word
18	umSETPOINT HI-WORD	Reference value in micrometer, high-order 16-Bit-word

Format of the data frame: <para-set = 1> MASTER-PARAMETER		
Word No	Meaning	Comment
1	<sync-word> = 0x0055	hex-code 0x55, binary=0000 0000 0101 0101, dec.=85
2	<order-word>	Order word (c.f. table below)
3	<para-set> = 1	1 = Parameter set MASTER
4	POWER-MASTER	Power of laser transmitter (0 ... 1000)
5	POWER-MODE-MASTER	Power mode of laser transmitter: 0=STATIC, 1=DYNAMIC
6	VIDEO-THRESHOLD-MA	Video threshold (0 ... 100) in percent
7	TEACH-VALUE-MASTER	Teach value (pixel) (0 .. max. pixel number of used CCD-line)
8	EVAL-BEGIN-MASTER	Evaluation beginning: Pixel (1 ... E_END-1)
9	EVAL-END-MASTER	Evaluation end: Pixel (E_BEGIN+1 ... MAXPIXEL of CCD-line)
10	OPERATION-MODE	0=NON-TRANSPARENT, 1=SEMI-TRANSP., 2=TRANSP.
11	CCD MODE-MASTER	Operating mode of CCD-line: 0=LOW-GAIN, 1=HIGH-GAIN
12	RS-232-MODE-MASTER	Mode of RS-232 data transfer, (0=STAIC-REC, 1=IN0 L/H REC, 2=IN0 L/H 6Byte, 3=CONT 6-Byte)
13	Parameter 10	0 , currently not used
14	Parameter 11	0 , currently not used
15	Parameter 12	0, currently not used
16	Parameter 13	0, currently not used
17	umTEACH LO-WORD	Teach value in micrometer, low-order 16-bit-word
18	umTEACH HI-WORD	Teach value in micrometer, high-order 16-bit word

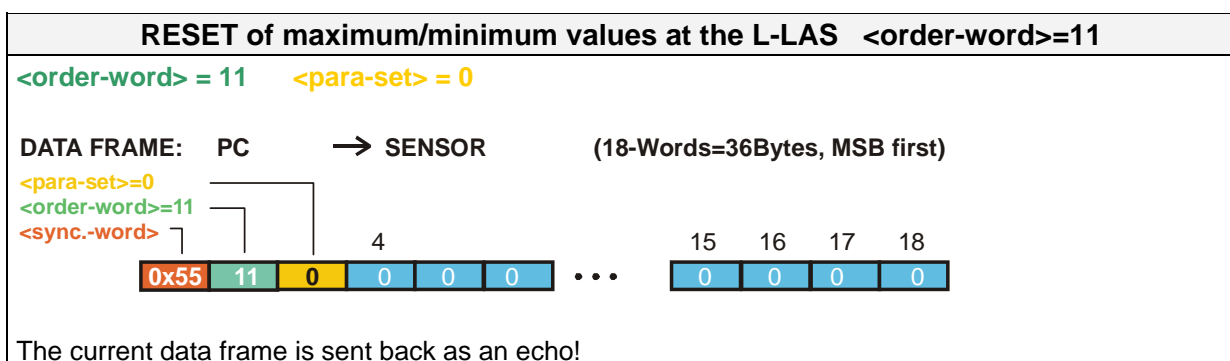
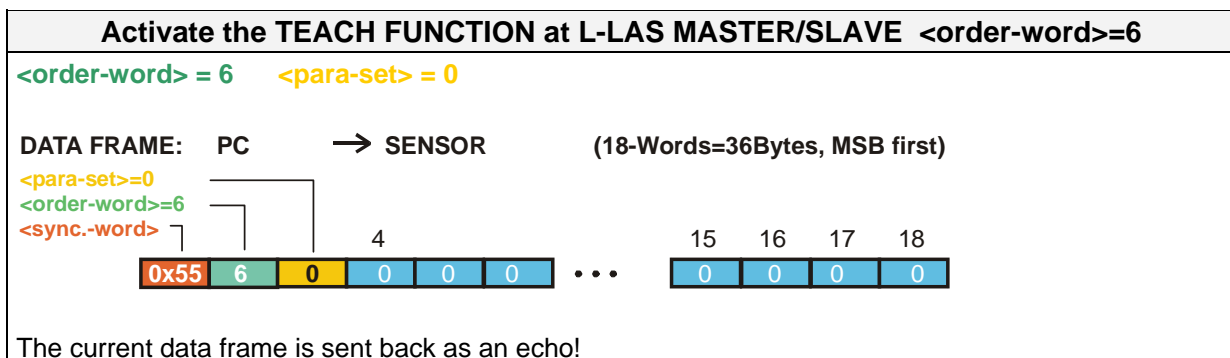
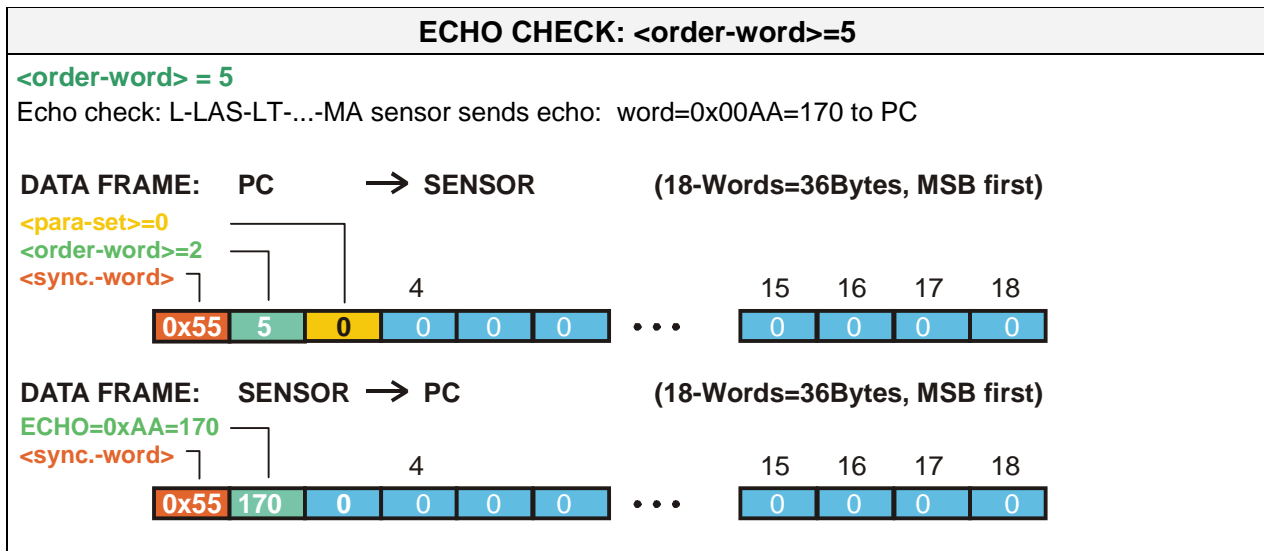
Format of the data frame: <para-set = 2> SLAVE-PARAMETER

Word No	Meaning	Comment
1	<sync-word> = 0x0055	hex-code 0x55, binary=0000 0000 0101 0101, dec.=85
2	<order-word>	Order word (c.f. table below)
3	<order-word> = 2	2 = Parameter set SLAVE
4	POWER-SLAVE	Power of the laser transmitter (0 ... 1000)
5	POWER-MODE-SLAVE	Power mode of the laser transmitter: 0=STATIC, 1=DYNAMIC
6	VIDEO-THRESHOLD-SL	Video threshold (0 ... 100) in percent
7	TEACH-VALUE-SLAVE	Teach value (pixel) (0 .. max. pixel number of the CCD-line)
8	EVAL-BEGIN-SLAVE	Evaluation beginning: Pixel (1 ... E_END-1)
9	EVAL-END-SLAVE	Evaluation end: Pixel (E_BEGIN+1 ... MAXPIXEL of CCD-line)
10	OPERATION-MODE	0=NON-TRANSPARENT, 1=SEMI-TRANSP., 2=TRANSP.
11	CCD OP-MODE-SLAVE	Betriebsart CCD-Zeile: 0=LOW-GAIN, 1=HIGH-GAIN
12	Parameter 9	0 , currently not used
13	Parameter 10	0 , currently not used
14	Parameter 11	0 , currently not used
15	Parameter 12	0, currently not used
16	Parameter 13	0, currently not used
17	umTEACH LO-WORD	Teach value in micrometer, low-order 16-bit-word
18	umTEACH HI-WORD	Teach value in micrometer, high-order 16-bit word

Meaning of the 2nd word in the data frame: <order-word>

Value	Meaning / Action	
0	Nop	no operation
1	Send parameters from PC to L-LAS-RAM	18 words, PC ⇒ L-LAS-RAM
2	Get parameters from L-LAS-RAM	18 words, L-LAS-RAM ⇒ PC
3	Send parameters from PC to L-LAS-EEPROM	18 words, PC ⇒ L-LAS-EEPROM
4	Get parameters from L-LAS EEPROM	18 words, L-LAS-EEPROM ⇒ PC
5	Echo check: Get echo character from L-LAS-hardware, Line Ok = 0xAA	18 words, erstes Wort=0x00AA (Echo=170)
6	Activate teach process, tore in RAM	18 words PC ⇒ L-LAS-RAM
7	Get firmware version message from L-LAS	72-bytes, L-LAS ⇒ PC
8	Get pixel-measure.-data from L-LAS-RAM	18 words, L-LAS-RAM ⇒ PC
9	Get video-buffer information from L-LAS	64 words, L-LAS-RAM ⇒ PC
10	Get hardware information from L-LAS	18 words L-LAS-RAM ⇒ PC
11	Reset maxima/minima values	18 words PC ⇒ L-LAS-RAM
18	Get micrometer-measure.-data from L-LAS-RAM	18 words, L-LAS-RAM ⇒ PC

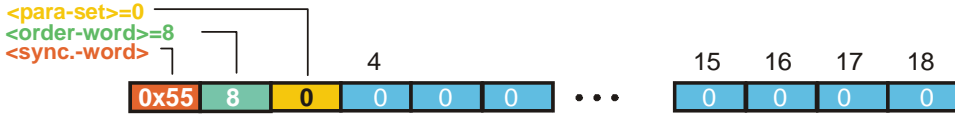
Examples for data exchange:



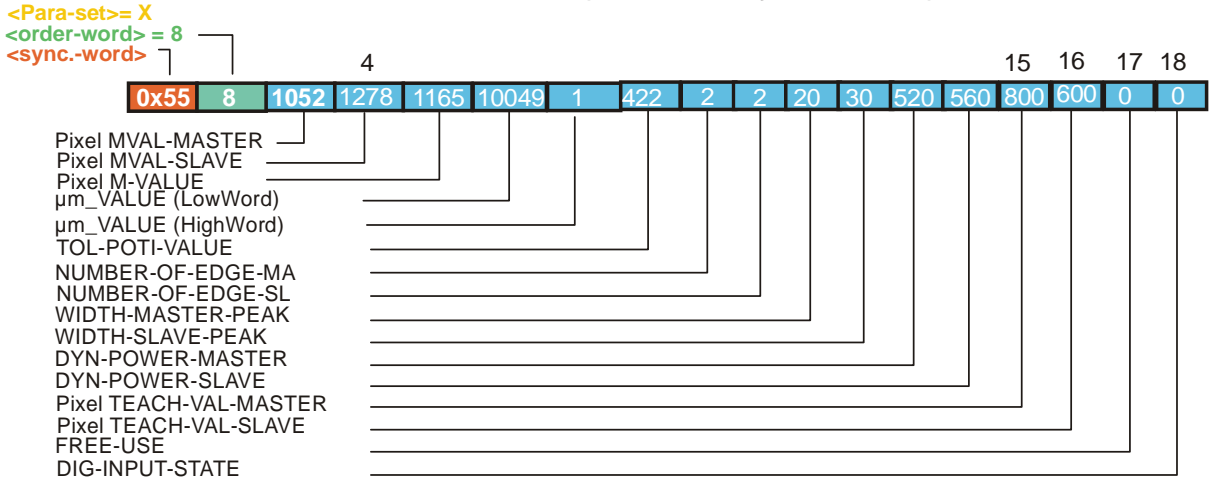
GET measurement values from L-LAS-RAM <order-word>=8

<order-word> = 8 <para-set> = 0

DATA FRAME: PC → SENSOR (18-Words=36Bytes, MSB first)



DATA FRAME: SENSOR → PC (18-Words=36Bytes, MSB first)



Example µm-VALUE: 75.584mm = 75584µm = LowWord (10049) + HighWord (1x65535)

GET micrometer – measurent values from L-LAS-RAM <order-word>=18

<order-word> = 18 <para-set> = 0

DATA FRAME: PC → SENSOR (18-Words=36Bytes, MSB first)

<para-set>=0

<order-word>=18

<sync.-word>



DATA FRAME: SENSOR — PC (18-Words=36Bytes, MSB first)

<Para-set> = X

<order-word> = 18

<sync.-word>



µm-VAL MASTER (LO-Word)

µm-VAL MASTER (HI-Word)

µm-VAL SLAVE (LO-Word)

µm-VAL SLAVE (HI-Word)

µm-VALUE MEAS (LO-Word)

µm-VALUE MEAS (HI-Word)

µm-VAL TEACH-MA (LO-Word)

µm-VAL TEACH-MA (HI-Word)

µm-VAL TEACH-SL (LO-Word)

µm-VAL TEACH-SL (HI-Word)

µm-VAL MAX (LO-Word)

µm-VAL MAX (HI-Word)

µm-VAL MIN (LO-Word)

µm-VAL MIN (HI-Word)

FREE USE (LO-Word)

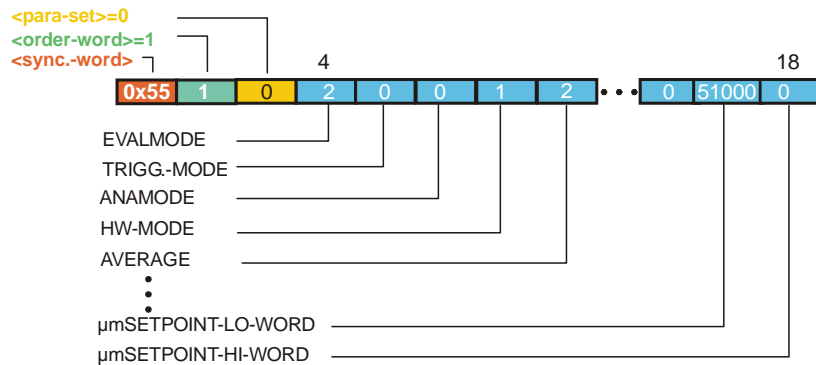
FREE USE (LO-Word)

Example µm-VALUE: 75.584mm = 75584µm = LowWord (10049) + HighWord (1x65535)

SEND parameter-set = 0 to L-LAS-RAM <order-word>=1

<order-word> = 1 <para-set> = 0 = GENERAL-Parameter

DATA FRAME: PC → SENSOR (18-Words=36Bytes, MSB first)

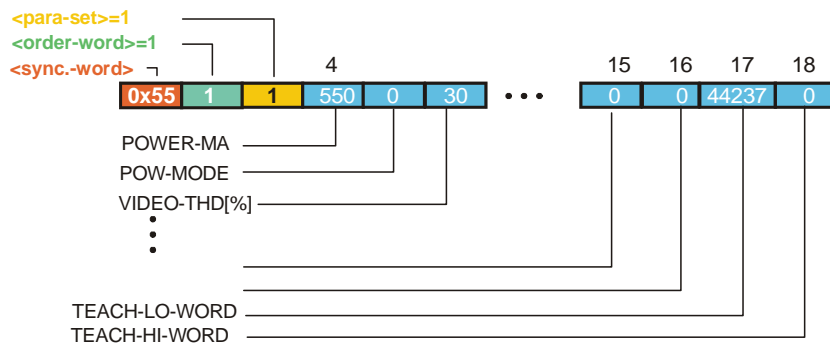


The transferred data frame automatically is sent back as an echo from the L-LAS-LT-...-MA sensor!!

SEND parameter-set = 1 to L-LAS-RAM <order-word>=1

<order-word> = 1 <para-set> = 1 = MASTER-Parameter

DATA FRAME: PC → SENSOR (18-Words=36Bytes, MSB first)

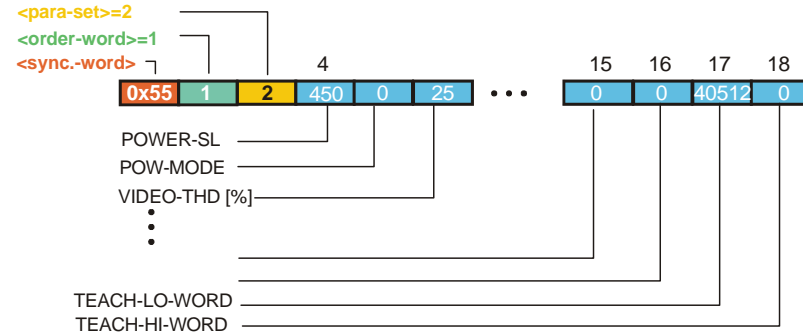


The transferred data frame automatically is sent back as an echo from the L-LAS-LT-...-MA sensor!!

SEND parameter-set = 2 to L-LAS-RAM <order-word>=1

<order-word> = 1 <para-set> = 2 = SLAVE-Parameter

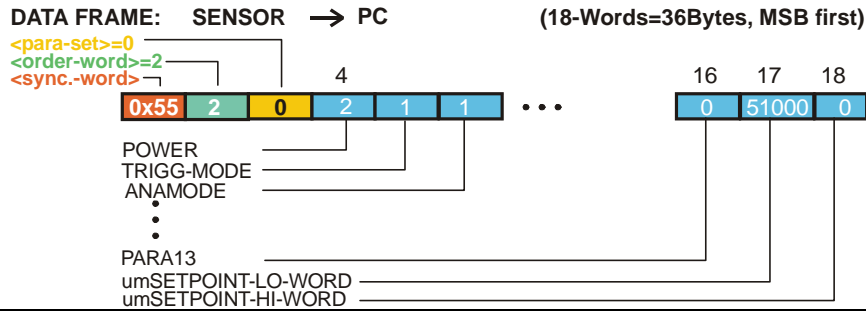
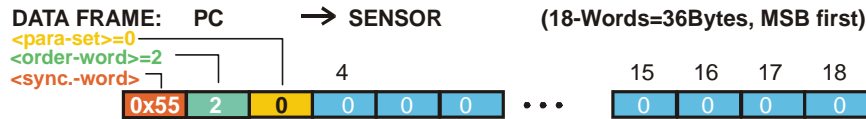
DATA FRAME: PC → SENSOR (18-Words=36Bytes, MSB first)



The transferred data frame automatically is sent back as an echo from the L-LAS-LT-...-MA sensor!!

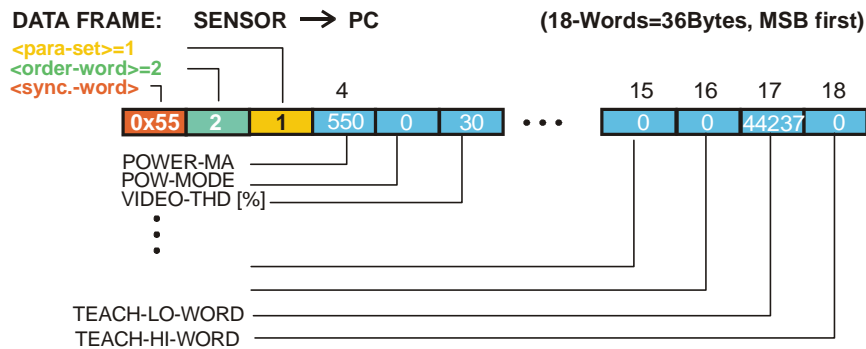
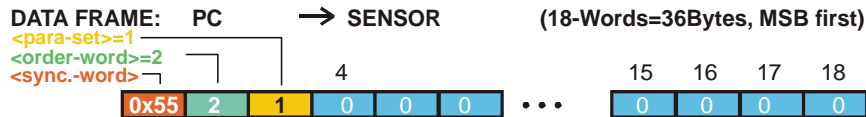
GET parameter-set = 0 from L-LAS-RAM <order-word>=2

<order-word> = 2 <para-set> = 0 = GENEAL-Parameter



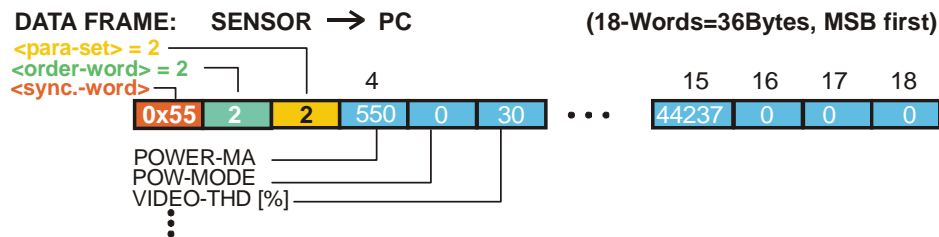
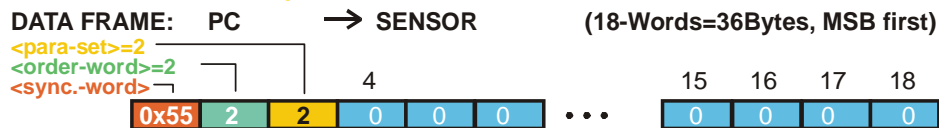
GET parameter-set = 1 from L-LAS-RAM <order-word>=2

<order-word> = 2 <para-set> = 1 = MASTER-Parameter



GET parameter-set = 2 from L-LAS-RAM <order-word>=2

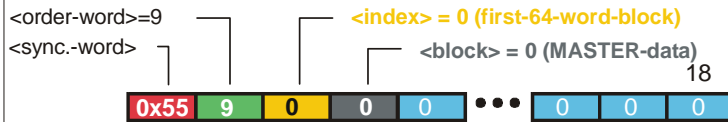
<order-word> = 2 <para-set> = 2 = MASTER-Parameter



GET video-data from L-LAS-RAM <order-word> = 9

<order-word> = 9 <para-set> = 0 or 64, <block-info> 0 or 1

Step1: DATA FRAME: PC → L-LAS-sensor (18-Words=36Bytes, MSB first)



DATA FRAME: L-LAS-sensor → PC (64-Words = 128Byte, MSB first)



First block of 64 words = the first half of the pixel at MASTER CCD.

Attention: Not every single pixel of the MASTER CCD is transmitted

Step2: DATA FRAME: PC → L-LAS-sensor (18-Words=36Bytes, MSB first)



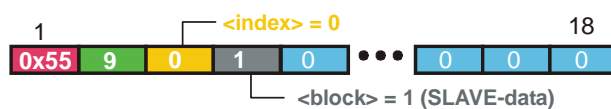
DATA FRAME: L-LAS-sensor → PC (64-Words = 128Byte, MSB first)



2nd. block of 64 words: = second half of pixel at MASTER

Attention: Not every single pixel of the MASTER CCD is transmitted

Step3: DATA FRAME: PC → L-LAS-sensor (18-Words=36Bytes, MSB first)



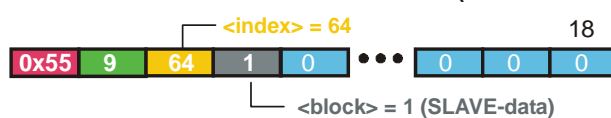
DATA FRAME: L-LAS-sensor → PC (64-Words = 128Byte, MSB first)



1st. block of 64 words = first half of the pixel at SLAVE CCD

Attention: Not every single pixel of the SLAVE CCD is transmitted !

Step4: DATA FRAME: PC → L-LAS-sensor (18-Words=36Bytes, MSB first)



DATA FRAME: L-LAS-sensor → PC (64-Words = 128Byte, MSB first)



2nd. block of 64 words:= second half of pixel at SLAVE CCD

Attention: Not every single pixel of the SLAVE CCD is transmitted !