

## TECHNICAL INFORMATION:

PRODUCT:	L-LAS-TB CCD-Line-Laser-Sensor-Series	Date:	23.09.2009
	PC Software - state: V3.10		(wk)
TOPIC:	RS232-Interface-Protocol for L-LAS-TB Sensors		

### RS232 Interface-Protocol PC ↔ L-LAS-TB Sensor Firmware Version 3.1x

- Standard RS232 serial interface, no hardware handshake
- 3-wire-connection: GND, TXD, RXD
- Speed: 9600 baud, 19200 baud, 38400 baud, 57600 baud oder 115200 baud
- 8 data-bits
- NO parity-bit
- 1 stop-bit
- binary-mode.

The control device (PC or PLC) have to send a frame of 18-words (1 word = 2 byte = 16 bit) to the L-LAS-TB hardware. All words must be transmitted in binary format. The most significant byte must be transmitted first (MSB-first).

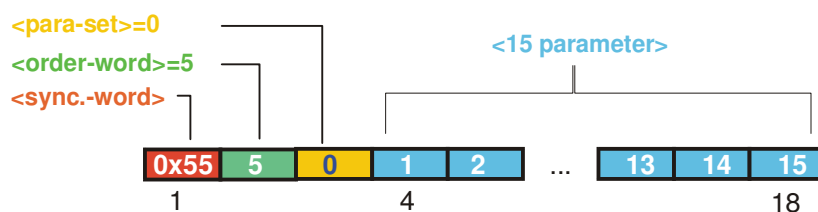
#### METHOD:

The microcontroller of the L-LAS-TB sensor is permanently reading (polling) the input-buffer of the RS-232 module. If the incoming word = 0x0055 (0x55 hexadecimal = 85 decimal), this is interpreted as the synchronisation-event (<sync-word>). After this, the 2.nd word with the order number (<order-word>) is read in by the microcontroller.

The order word (<order-word>), is followed by a further word, which contents parameter-set number 0 or 1 (<para-set>). The para-set-word is followed by 15 further words <parameter-word>, which contents the parameters.

Afer reading the complete data-frame (18-words = 36 bytes), the L-LAS-TB sensor-hardware executes the order which is coded at the 2.nd word (<order-word>) of the data-frame.

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

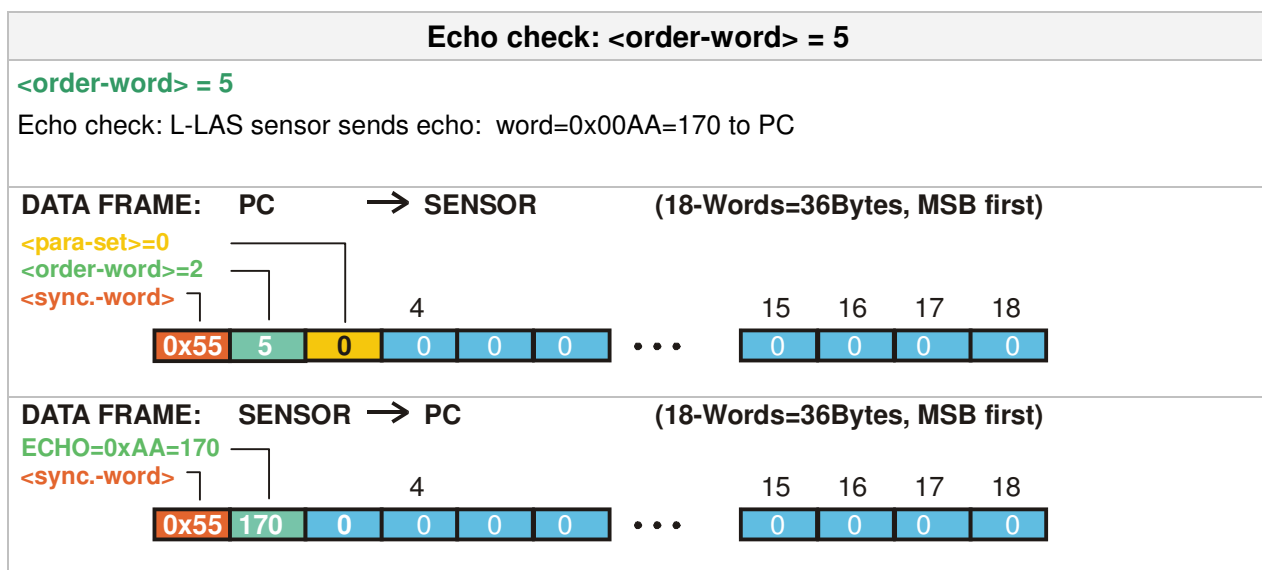


Format of the data-frame: <para-set = 0>		
Word	Meaning	Comment
1	<sync-word>	hex-code 0x55, binary=0000 0000 0101 0101, dec.=85
2	<order-word>	Order word (c.f. table below)
3	<parameter-set> = 0	0 = parameter-set number 0
4	POWER	Laser intensity (0 ... 1000)
5	POWER-MODE	Transmitter-mode: ( 0 = STATIC), (1=DYNAMIC), not used
6	POLARITY	Polarity setting for OUT0, OUT1,OUT2 (0=DIRECT, 1=INVERSE)
7	EVAL-MODE	Evaluation mode (0=L-EDGE, 1=R-EDGE, 2=WIDTH, 3=CENTER)
8	E-BEGIN	Evaluation start -pixel ( 1 .. E_END-1 )
9	E-END	Evaluation end-pixel ( E_BEG+1 .. SUBPIXEL)
10	TEACH-VALUE	Teach-value ( 1 ... SUBPIXEL)
11	TOLERANCE-HIGH VALUE	Upper-tolerance TOL-HIGH: (0 ... SUBPIXEL/2)
12	TOLERANCE-LOW-VALUE	Lower-tolerance TOL-LOW: (0 ... SUBPIXEL/2)
13	AVERAGE	Average-setting ( 1,2,4,8,16,32,64,128 oder 256 )
14	TRIGG-MODE	Trigger mode (0=CONTINUOUS, 1=EXT. IN0 L/H, 2=EXT.IN0 HIGH)
15	ANALOG-OUT	Analog-output-mode: (0=DIRECT 0..10V, 1=MAXIMA, 2=MINIMA, 3=MAX-MIN)
16	OPERATION-MODE	CCD-operation-mode (0=LOW-GAIN / 1=HIGH-GAIN)
17	HW-MODE	Enable/disable TOL-potentiometer and button at housing (DISABLE-ALL=0, ENABLE-ALL=1,ENABLE-BTN=2, ENABLE POTI=3)
18	VIDEO-THD-MODE	Video-threshold -mode 0=FIX, 1=AUTO

Format of the data-frame: <para-set = 1>		
Word .	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	<parameter-set> = 1	1 = parameter-set-number 1
4	VIDEO-THD-FIX	Video-threshold (0 ... 100) percent of full ADC-range
5	VIDEO-THD-AUTO	Video-threshold (0 ... 100) percent of full ADC-range
6	RS-232-MODE	Data-recorder-mode: 0 = STATIC, 1=EXT-IN0 L/H, 2=CONTINUOUS
7	RS-232-BAUD	Baudrate: 0=9600, 1=19200, 2=38400, 3=57600 , 4=115200 baud
8	SMOOTH-VIDEO-SIGNAL	Smooth video signal over (1,2,4,6,8,12,16,24,32,48 or 64 ) pixel
9	ANALOG-ZOOM	Zoom-mode for analog-output (0=DIRECT, 1=ZOOMx1, 2=ZOOMx2, 3=ZOOMx4, 4=ZOOMx8, 5=ZOOMx16, 6=WIN-5V, 7=WIN-10V)
10	Parameter 7	0 , not used
11	Parameter 8	0 , not used
12	Parameter 9	0 , not used
13	Parameter 10	0 , not used
14	Parameter 11	0 , not used
15	SLOPE VALUE L-WORD	Slope value for calibration (x 1024), low-word
16	SLOPE VALUE H-WORD	Slope value for calibration (x1024), high-word
17	REF-OFFSET L-WORD	Intersection parameter with offset = 32767
18	REF-OFFSET H-WORD	Intersection parameter (not used)

Meaning of the 2.nd word of the data-frame: <order-word> order-table		
value	Meaning / Action	
0	Nop	no operation
1	Send parameter from PC to L-LAS-RAM	18 words, PC $\Rightarrow$ L-LAS-RAM
2	Get parameter from L-LAS-RAM	18 words, L-LAS-RAM $\Rightarrow$ PC
3	Send parameter from PC to EEPROM	18 words, PC $\Rightarrow$ L-LAS-EEPROM
4	Get parameter from EEPROM of L-LAS	18 words, L-LAS-EEPROM $\Rightarrow$ PC
5	Echo check: Get echo of L-LAS	18 words, erstes Wort=0x00AA=170dec
6	Activate teach at L-LAS, store in RAM	18 words PC $\Rightarrow$ L-LAS-RAM
7	Get software version info of L-LAS	72-bytes, L-LAS $\Rightarrow$ PC
8	<b>Get measured values out of L-LAS-RAM</b>	<b>18 words, L-LAS-RAM <math>\Rightarrow</math> PC</b>
9	Get video-buffer info from L-LAS	64 words, L-LAS-RAM $\Rightarrow$ PC
11	Reset maximum/minimum values at analog-output	18 words PC $\Rightarrow$ L-LAS-RAM
18	Get measured values from L-LAS-RAM (data-recorder)	18 words PC $\Rightarrow$ L-LAS-RAM
190	Change RS232-baud-rate (L-LAS-RAM)	18 words PC $\Rightarrow$ L-LAS-RAM

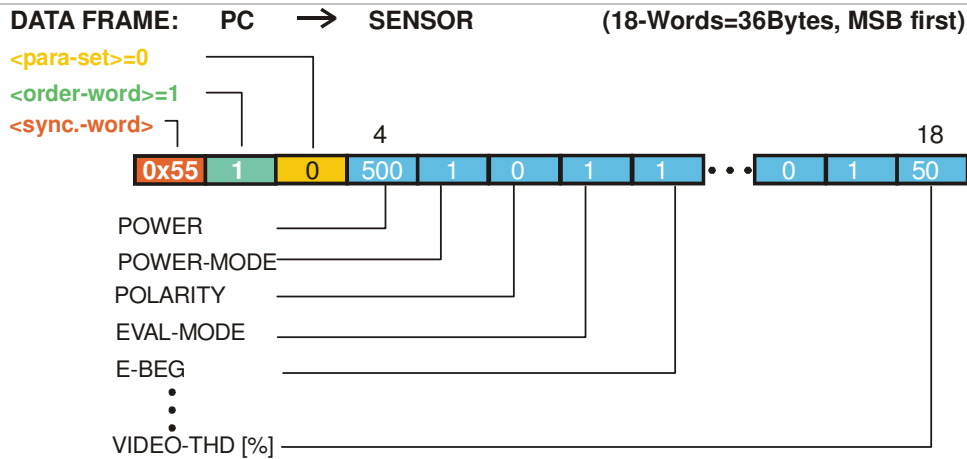
#### Examples for the data-transfer:



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

<order-word> = 1    <para-set> = 0

Send the actual parameter (set=0) into the RAM of the L-LAS-sensor

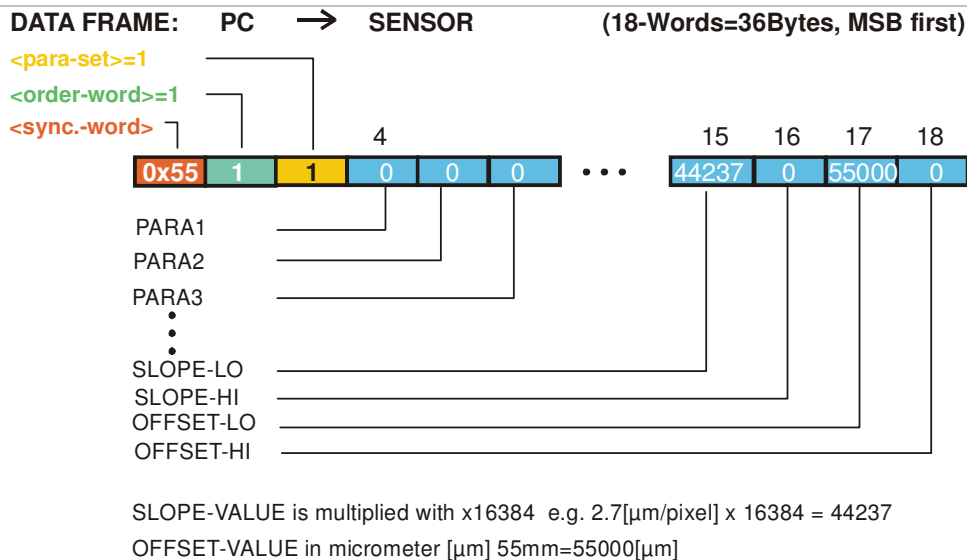


The transmitted data-frame is automatically echoed back by the L-LAS sensor !

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

<order-word> = 1    <para-set> = 1

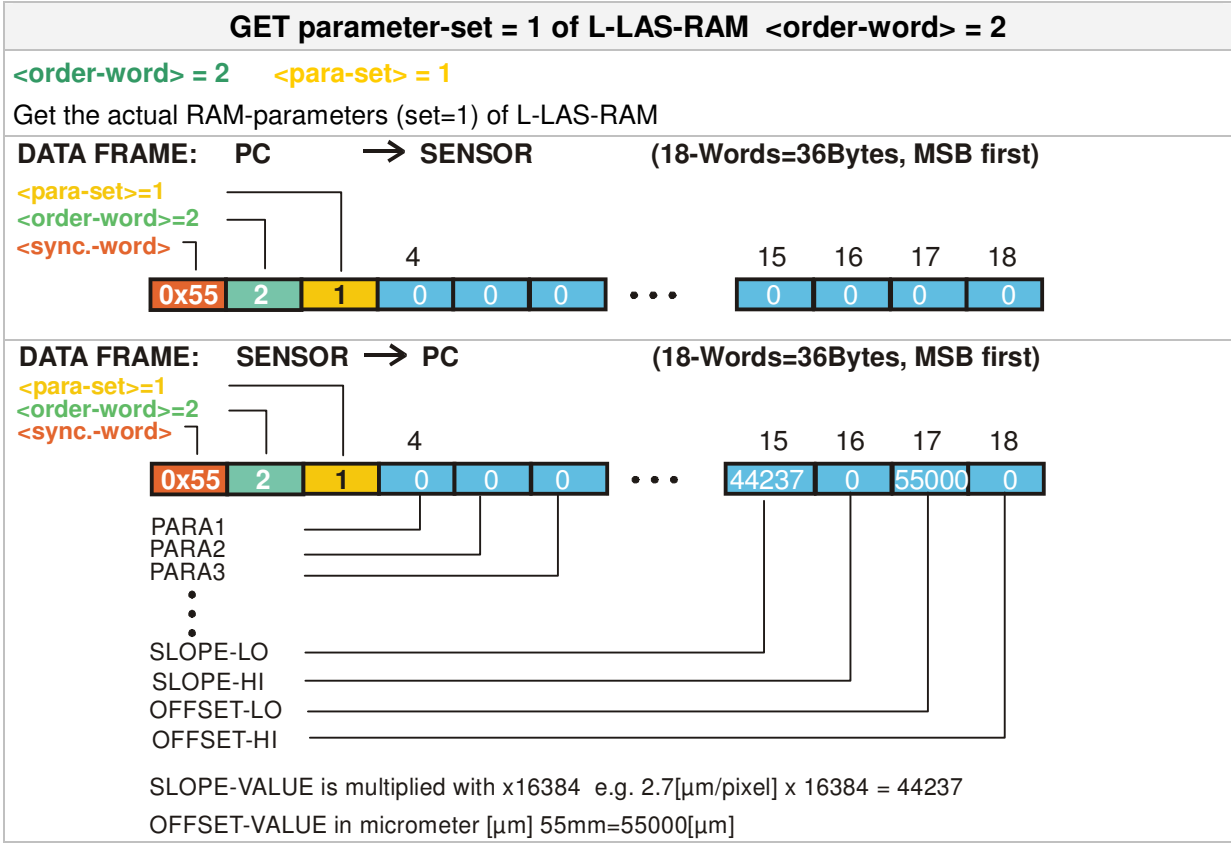
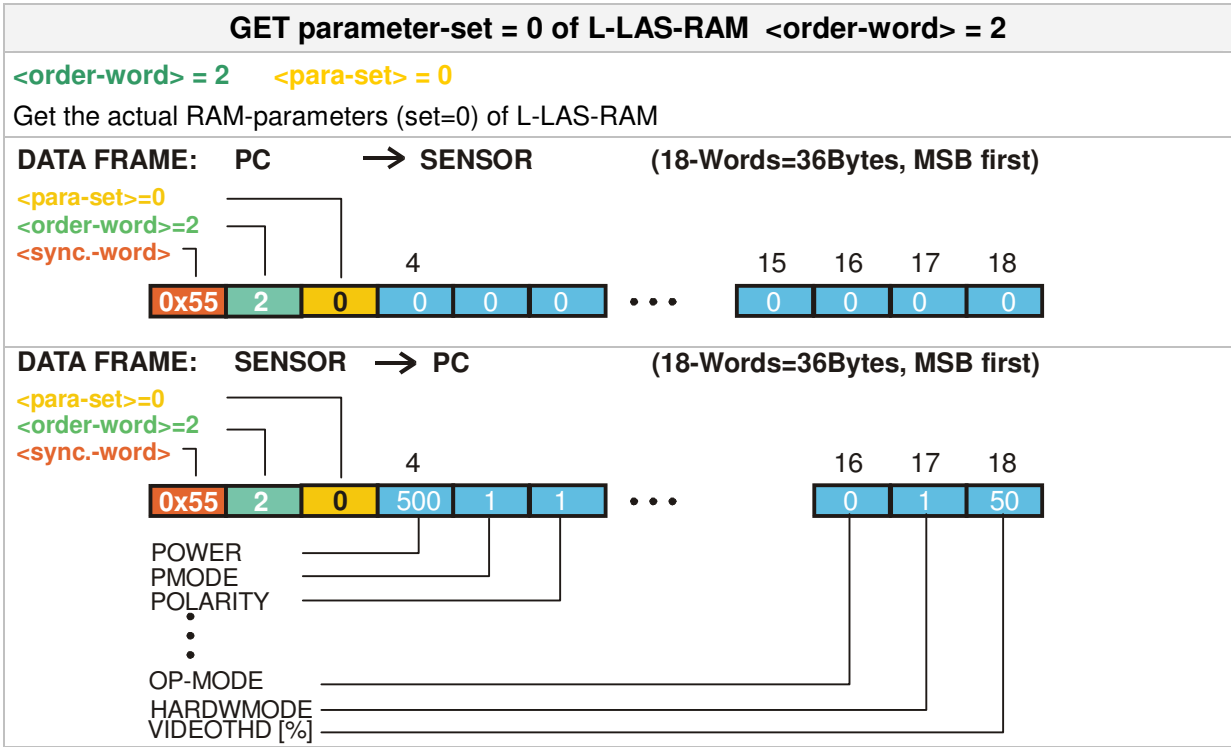
Send the actual parameter (set=0) into the RAM of the L-LAS sensors

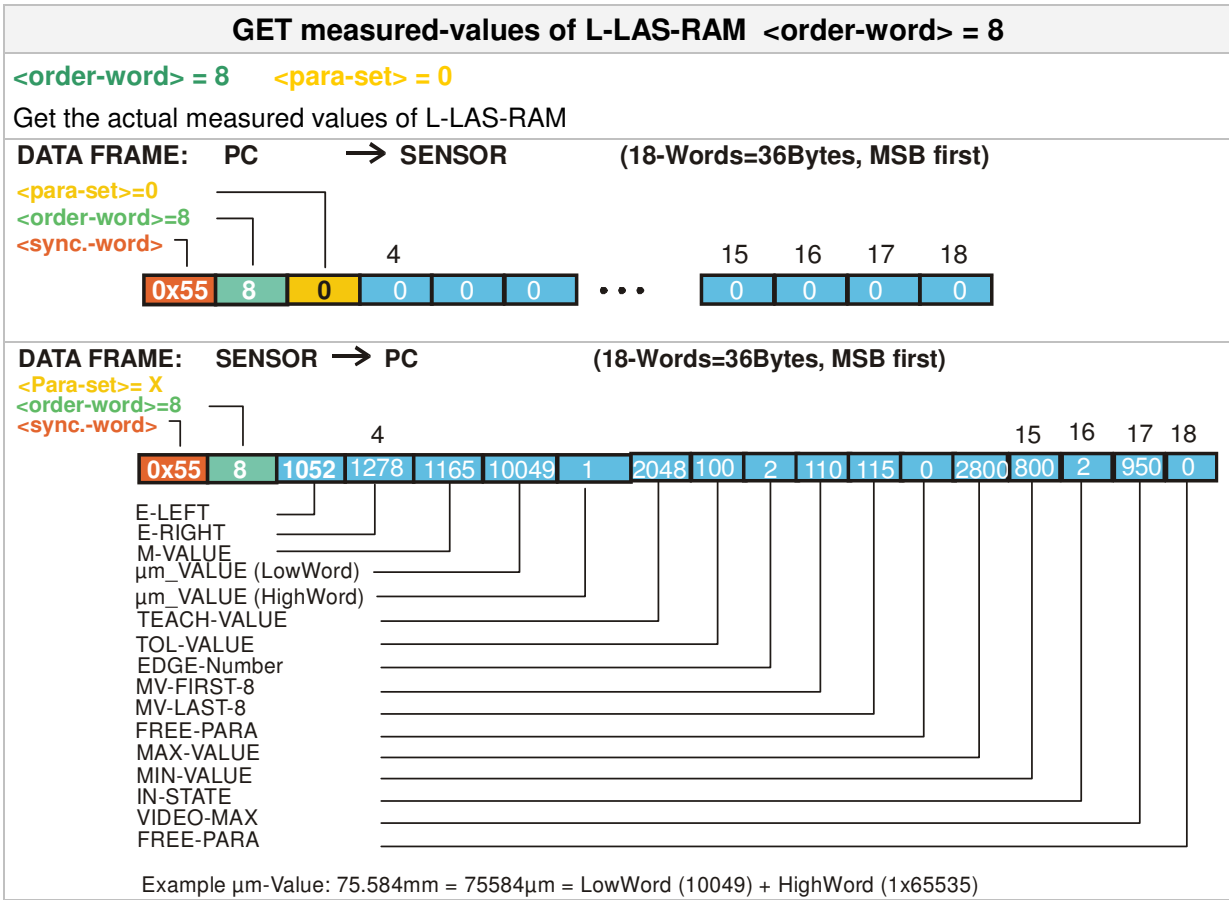
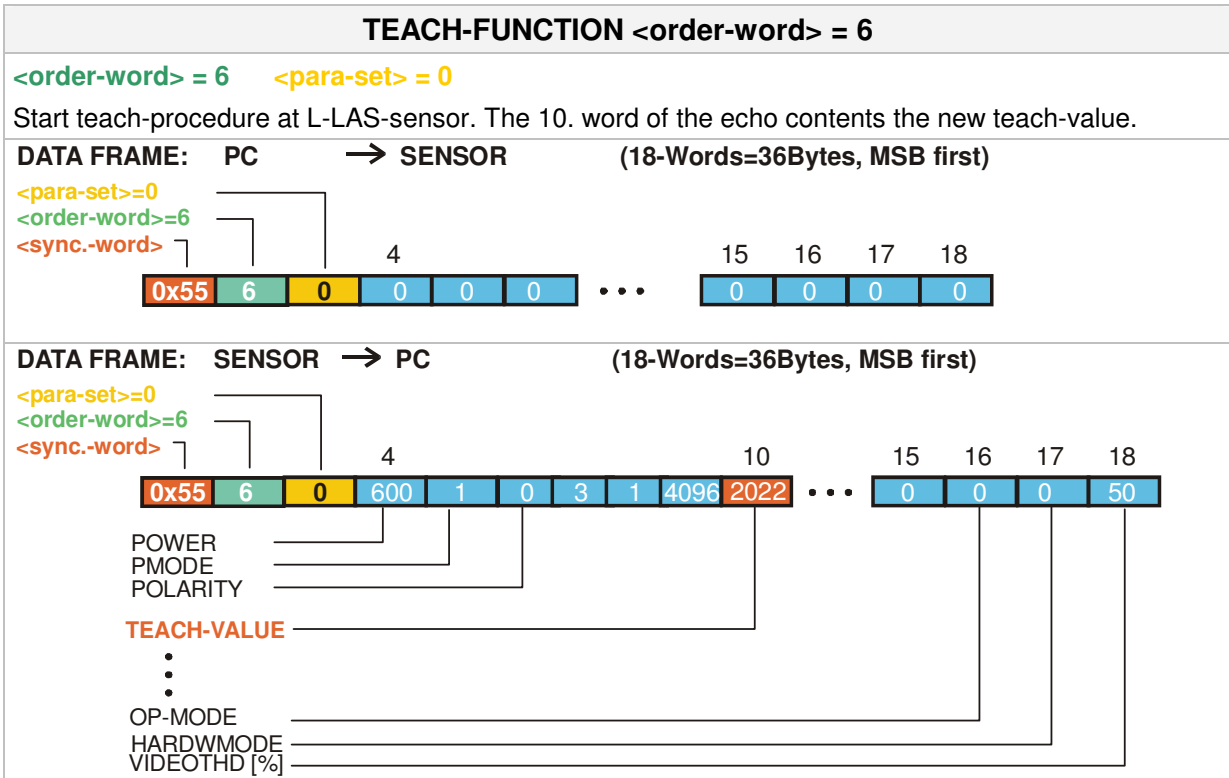


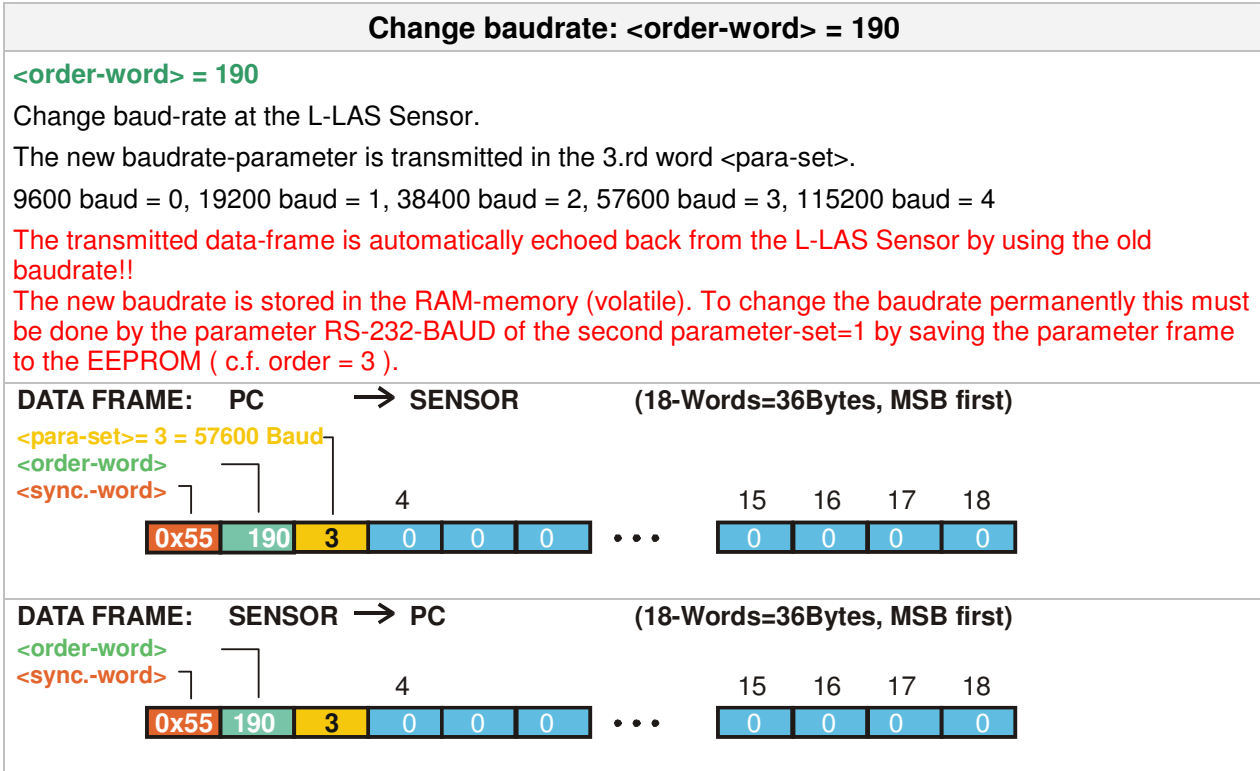
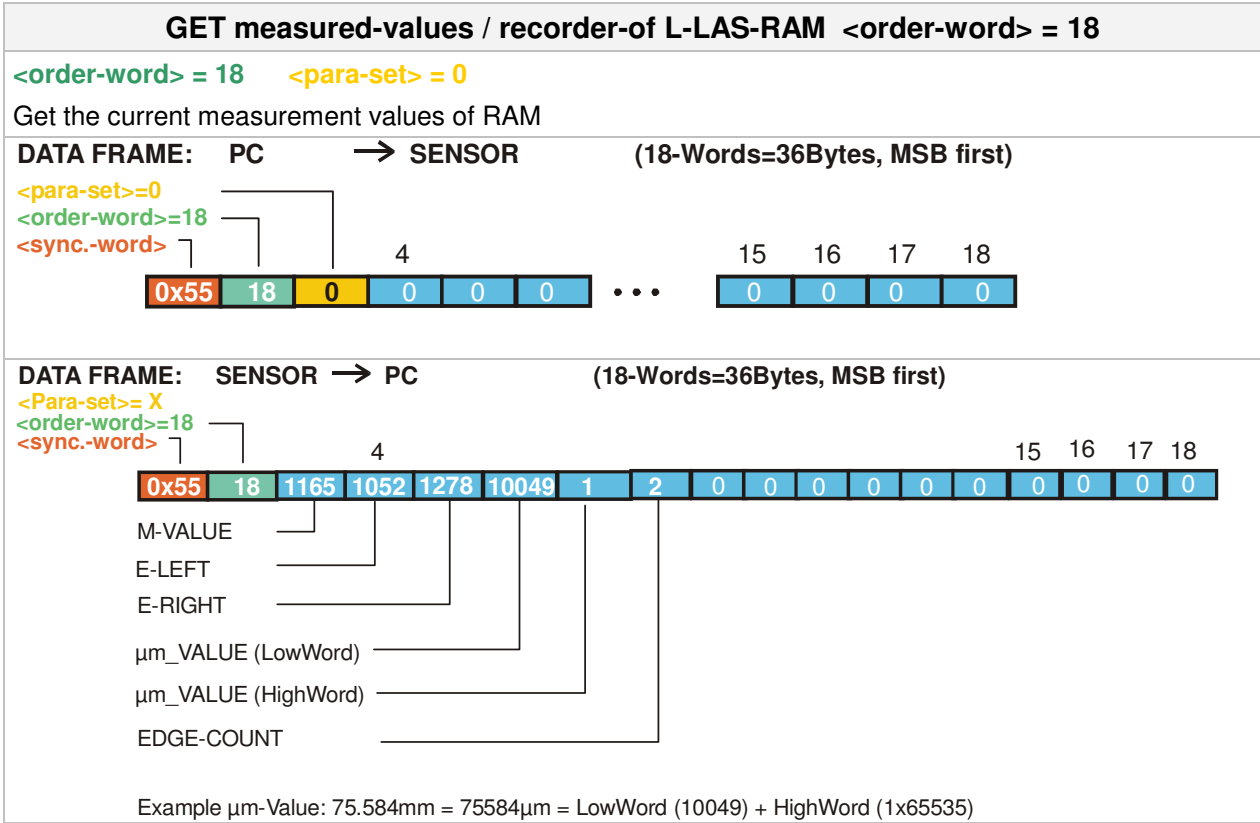
The transmitted data-frame is automatically echoed back by the L-LAS sensor !



To activate the full parameter set (set 0 and set 1) at the L-LAS-sensor both parameter sets must be transmitted!





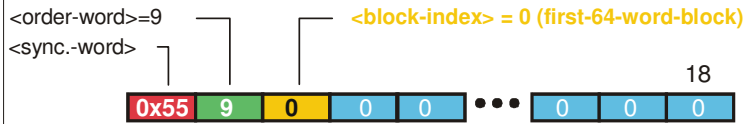


## GET Video-data from L-LAS-RAM <order-word> = 9

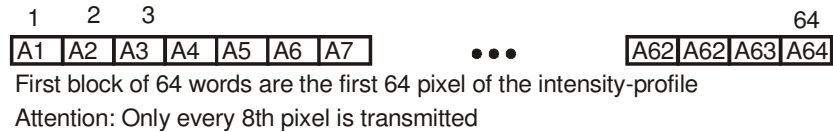
<order-word> = 9    <para-set> = 0,64,128 oder 192

Get the current video-data from the RAM (only 256-pixel of the full video-profile are transmitted)

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



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



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



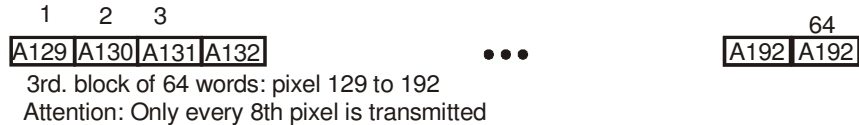
**DATA FRAME: L-LAS-sensor → PC (64-Words = 128Byte, MSB first)**



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



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



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



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

