How to do Volatile Filter Settings for TLI4970 – Quick Instruction Guide

Scope:

The following instructions describe the sequence of commands how the TLI4970 RAM can be modified for filter settings.

Note: With this instruction guide just the RAM is modified. Therewith, the settings are volatile. For non-volatile settings, the changes have to be programmed in the EEPROM. In this case please use the "How to Program TLI4970 – Quick Instruction Guide"

Interface:

The communication with the sensor is performed by the one wire SICI interface (the OCD pin supports the SICI communication).

Physical Layer

Serial Inspection and Configuration Interface (SICI)

This chapter gives an overview about the Serial Inspection and Configuration Interface (SICI). This interface is available and functional in parallel with the SPI interface mode. For this, the OCD pin is used.

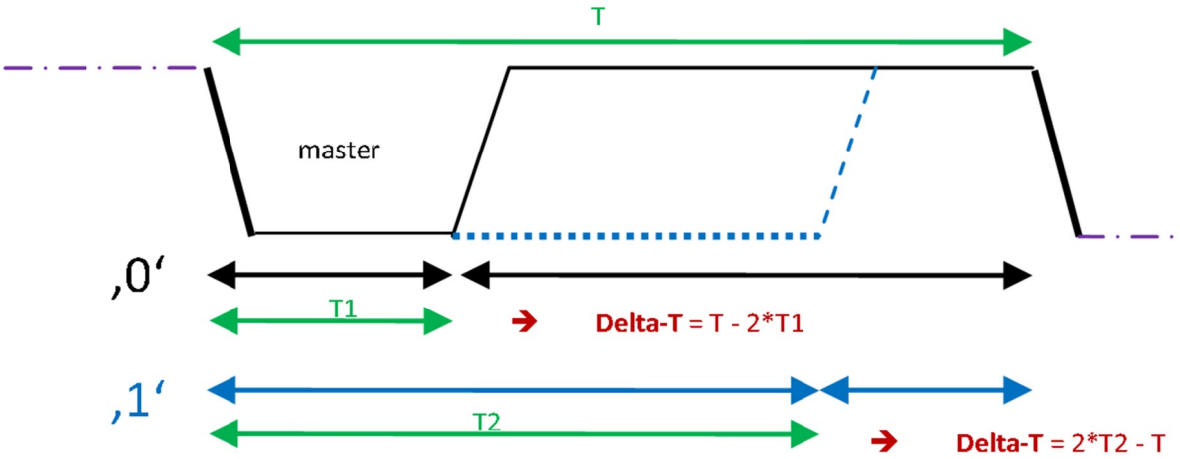
The transmission is based on transmitting a single bit to the sensor and immediately receiving a bit. These bits form a 16bit command word, similar to the SPI interface. This makes the interface bit-synchronous (and thus robust) and very flexible in timing (within some quite large boundaries).

Communication Timing

A microcontroller needs to perform the following steps 16 times to send/receive 16 bits (starting with MSB).

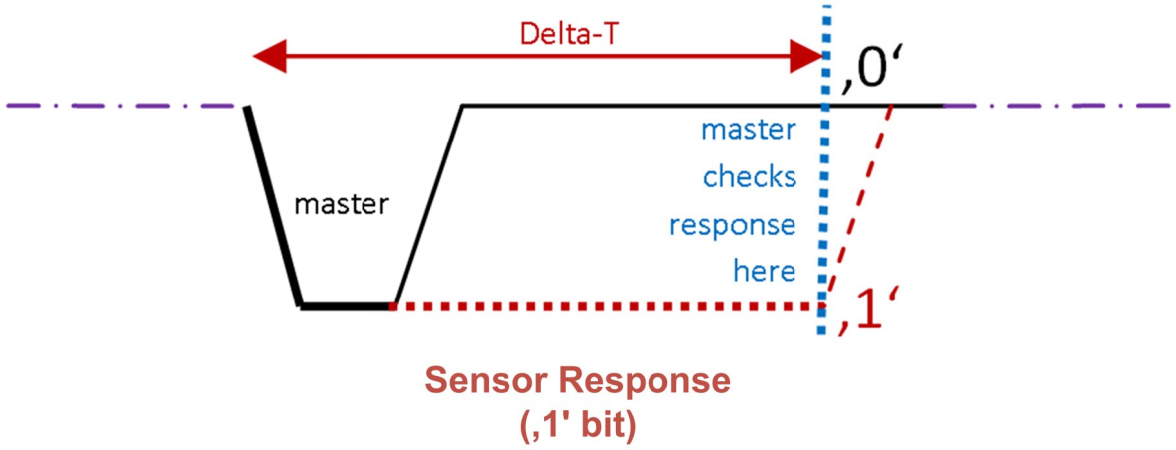
- Send a single low/high PWM transmission, with at least 30/70 (or 70/30) duty cycle:
  - 0 is sent as a short low and long high PWM pulse (e.g. 2us low, 6us high)
  - 1 is sent as a long low and short high PWM pulse (e.g. 6us low, 2us high)

The initial pulse length (T1/T2) and the overall period T determines the read-out time "Delta-T". An example of a 1 bit transmission can be seen in below:

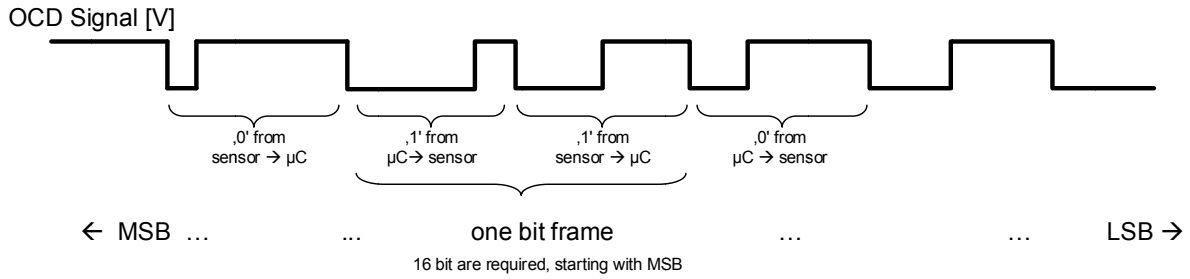


- Send a short low pulse (marks the end of the transmitted PWM and syncs the sensor to send a bit)
- If the sensor transmits a 1, it pulls the output low for the time difference given by the transmitted PWM (see figure above: 6us-2us = 4 us)
- If the sensor transmits a 0, it does not pull the output low

By checking the output after the read-out time (determined by the time given by the previous PWM transmission of a bit "Delta-T", for this case 4 us), the microcontroller can determine if a 0 or 1 is transmitted by the sensor. See below a 1 bit response example from the TLI4970:



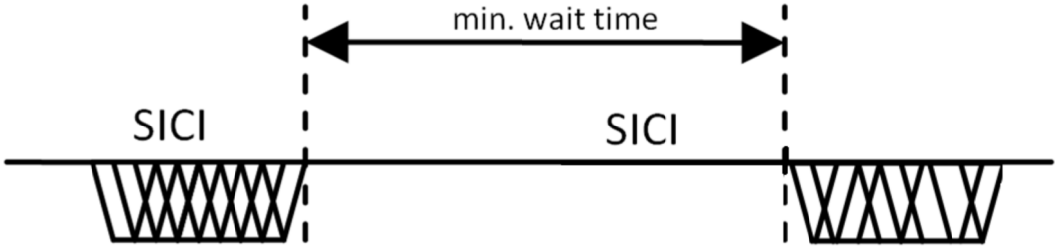
The figure below shows a transmission through the OCD pin as could be seen using an oscilloscope:



- Typical bit transmission speed (PWM) is: ~0.4 µs / ~1.6 µs, check after ~1.1µs, wait ~0.4 µs (gives ~285 kBit/s).

- Slowest bit transmission (PWM) is: ~60 µs / ~90 µs, check after ~29 µs, wait ~21 µs (gives ~5 kBit/s).

The slowest mode may be useful in distorted environments and/or with high (capacitive) loads on the SICI interface.
Please take care to wait between SICI frames to allow the sensor to decode and process the data. Minimum wait time between cycles for read/write and test commands (except EEPROM): 25µs (EEPROM commands may take longer).



Data Link Layer

Overview

Register 0x00 [11:7] contains the volatile filter settings. In addition, further information/settings are stored here. To be sure not changing the settings here by overwriting the content of this register besides the bits 11:7, the whole register has to be read out first. Knowing the content of register 0x00, all other bits besides 11:7 has to set identically.

Sequence of Commands:

Read RAM Register 0x00

Read command (0x8000):

Bit:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Content:	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

The register address 0x00 is marked by gray background.

Note: With the 1st read command, the response will not have the content of this register. Every answer is delayed by one command (n-1). Either, a dummy command has to be send (e.g. the same command again), or the correct answer will be given with the next command.

Write RAM Register 0x00

Send the write command (0x8001):

Bit:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Content:	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

The register address 0x00 is marked by gray background.

With the next command, the content of register 0x00 will be set:

Bit:	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Content:	X	X	X	X	HP	PR	LP			X	X	X	X	X	X	X

Please copy for the bits [15:12] and [6:0] exact the same content you read out before with the command "*Read RAM Register 0x00*".

For the bits [11:7] please reference to the TLI4970 data sheet, section 2.5 "*Filter Setting*" or the table below:

HP, 0x1D[11]	PR, 0x1D[10]	LP, 0x1D[9:7]	Cut-off frequency
1	1	1 1 1	70 Hz
1	1	1 1 0	130 Hz
1	1	1 0 1	260 Hz
1	1	1 0 0	530 Hz
1	1	0 1 1	1.1 kHz
1	1	0 1 0	2.4 kHz
1	1	0 0 1	5.2 kHz
1	1	0 0 0	6.9 kHz
0	0	0 0 0	10 kHz
0	1	0 0 0	18 kHz

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