Fraunhofer
Heinrich-Hertz-Institut

TeraFlash: Communication Protocol (from TF4-1510 up)

After Initialising (green LED is lit continuously), the device tries to connect to a host computer with the dedicated IP address 169.254.84.101. This IP is to be fixed for the LAN adapter provided for connection with the TeraFlash. The related subnet mask has to be 255.255.0.0.

The host computer must listen on this address for connection build up by the TeraFlash on one TCP channel with port 6341 for commands and answers and one with port 6342 for data streaming (only in direction to the computer).

Commands are initiated by five 32-bit sequences:

hex CDEF1234	
hex 789AFEDC	
hex 00000002	Code for: command
hex ????????	is not evaluated anymore.
U32	length of following command, therefore no end-of-line character

The first three shall ensure an error-free communication.

List of valid commands: (the , ␣ ‘ shall be a blank, hex 20)

SYSTEM ␣ : ␣ STOP
Shuts off the laser and stops the shaker action.

SYSTEM ␣ : ␣ TELL ␣ STATUS
Reports the system status

SYSTEM ␣ : ␣ MONITOR ␣ %d
%d is a decimal value:
0: reports the actual receiver signal, averaged over 2 ms.
1: reports the automatically generated offset of the TIA in a.u.
5: reports the CPU load of the RT processor in %
6: reports effective delay position in ps and the signal value
15: shuts off the automatic TIA offset control
16: shuts on the automatic TIA offset control
25: switches transfer to ‚sliding‘
26: switches transfer to ‚block‘

SYSTEM ␣ : ␣ TIA ␣ FULL
Switches TIA to full sensitivity

SYSTEM ␣ : ␣ TIA ␣ ATN1
Switches TIA to medium sensitivity

SYSTEM ␣ : ␣ TIA ␣ ATN2
Switches TIA to smallest sensitivity

LASER ␣ : ␣ OFF
Switches laser off

LASER ␣ : ␣ ON
Switches laser on

LASER ␣ : ␣ SET ␣ %f
Sets laser pump current. %f: floating number 0..100

ACQUISITION ␣ : ␣ BEGIN ␣ %f
Sets start position of pulse acquisition in ps. %f: floating number 0..3000, resolution 0.1

ACQUISITION ␣ : ␣ RANGE ␣ %d
Sets measuring range in ps. %d: decimal number 20..200
May only be set when shaker off (acquisition stopped).

ACQUISITION ␣ : ␣ STOP
Stops shaker; may last some seconds, since zero position is searched for.

ACQUISITION ␣ : ␣ START
Starts shaker; may last some seconds, since motion amplitude is to be stabilized.

ACQUISITION ␣ : ␣ AVERAGE ␣ %d
Sets number of averages. %d: decimal number 1..30000

ACQUISITION ␣ : ␣ RESET ␣ AVG
Clears the average accumulator.

TRANSMISSION ␣ : ␣ SLIDING only from TF5-xxxx up
Switches transfer to ‚sliding'

TRANSMISSION ␣ : ␣ BLOCK only from TF5-xxxx up
Switches transfer to ‚block'

Answers:

After each command an answer is sent, which must be received, in order that the communication buffer will not overflow. After time consuming commands the answer is given not before execution ended. The answer is initiated by the same five 32-bit sequences as the command, besides the third: hex 00000003 (code for answer). The fifth 32-bit number shows, how many bytes one has to receive from now in order to read the complete answer. There is no end-of-line character. The answer can be ‚OK', describe an error, or deliver a parameter.

Data:

Immediately after having commanded ‚ACQUISITION : START', the data stream is to be received in an endless loop until 'ACQUISITION : STOP' is commanded. The streamed data for every pulse are initiated by nine 32-bit values:

hex CDEF1234	
hex 789AFEDC	
hex 00000001	Code for pulse data
U32 timestamp	of pulse trace measurement in multiples of 100 µs.
FXP +/- 32,16	Actual TIA-sensitivity in nA; the range is +/- of this value.
FXP +/- 32,16	Start position of pulse trace in ps.
FXP +/- 32,16	Time resolution in ps; is fixed on 50 fs.
U32	Pulse amplitude p-p approximately in a.u.
U32	Length of following data string, therefor no end-if-line character

After that the pulse trace data follow, calculated for a 50-fs raster. For every point a FXP +/-32,5 number is transmitted. In order to get values in nA, they have to be multiplied by the TIA sensitivity and the value 7.451E-10.