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OT Bioelettronica

sessantaquattro

TCP Communication Protocol v1.4

After reset, sessantaquattro search for a TCP socket. It has to be opened on the PC used for the data acquisition. In case the sessantaquattro is the access point, it automatically get the address when the PC connect to its network.

If an external access point is used, the IP address have to be provided through its internal web page in the field "Server IP address". This value is automatically updated if Firefox or Chrome is used to open the sessantaquattro internal webpage. If another browser is used the field have to be manually filled with the proper IP address (i.e. the IP address of the PC used for the acquisition).

Once the connection has been established, the user can communicate with sessantaquattro using the protocol described in this document.

It is possible to read the sessantaquattro current settings or apply new settings.

NOTE: the sessantaquattro will discard new settings if the acquisition on the internal SD card is running and the new settings are different from the currently used.

The configuration bytes are the following:

- CONTROL BYTE 0
- CONTROL BYTE 1
- FILE SIZE 0
- FILE SIZE 1
- FILENAME PREFIX 0
- FILENAME PREFIX 1
- FILENAME PREFIX 2
- FILENAME PREFIX 3
- FILENAME PREFIX 4
- TIMEDATE 0
- TIMEDATE 1
- TIMEDATE 2
- TIMEDATE 3

The detailed description of each byte is in the following pages. Not all the bytes are necessary, but at least the first two have to be sent in order to change the sessantaquattro settings.

CONTROL BYTE 0:

GETSET	FSAMP1	FSAMP0	NCH1	NCH0	MODE2	MODE1	MODE0

bit 7 **GETSET:** Describe the type of action

1 = GET settings. Regardless of the other bits and bytes sent values, this command require the sessantaquattro current setting. The reply will be a sequence of 13 bytes indicating the actual settings. This command can only be sent if the data transfer is not in progress, otherwise it will be discarded

0 = SET command. All the other bits and bytes are used to set new values to the sessantaquattro settings.

bit 6-5 **FSAMP<1:0>:** Sampling frequency

11 = 4000 Hz (applicable only to a reduced number of channels)

10 = 2000 Hz

01 = 1000 Hz

00 = 500 Hz

bit 4-3 **NCH<1:0>:** Transferred channels (refer to the user manual for additional details):

11 = 64 bioelec. + 2 AUX + 2 accessory (if MODE=001: 32 bio + 2 AUX + 2 acc)

10 = 32 bioelec. + 2 AUX + 2 accessory (if MODE=001: 16 bio + 2 AUX + 2 acc)

01 = 16 bioelec. + 2 AUX + 2 accessory (if MODE=001: 8 bio + 2 AUX + 2 acc)

00 = 8 bioelec. + 2 AUX + 2 accessory (if MODE=001: 4 bio + 2 AUX + 2 acc)

bit 2-0 **MODE<2:0>:** Working mode

111 = Test mode. Sends ramps on all channels

110 = Impedance check.

101 = to be defined

100 = to be defined

011 = Accelerometers. Only 8 channels (plus 2 aux and 2 accessory) are acquired and transferred (even if NCH has a different value) with increased sampling frequency. FSAMP in this mode has the values 2000, 4000, 80000 and 16000 Hz.

010 = Differential. All the channels are the difference between consecutive inputs over groups of 32 channels. Channels 32 and 64 are monopolar. **NOTE:** the configuration 64 CH, 16 bits resolution, HPF on and 2000 Hz, will retrieve all monopolar signals even if set on Differential.

001 = Bipolar using AD8x1SE adapter (differences between Ch3-1 Ch4-2 Ch7-5…)

000 = Monopolar. All the channels are acquired with respect to the reference.

CONTROL BYTE 1:

HRES	HPF	EXT1	EXT0	TRIG1	TRIG0	REC	GO/STOP

bit 7 **HRES:** High resolution (to be implemented)

1 = samples on 24 bits

0 = samples on 16 bits

bit 6 **HPF:** High pass filter

1 = High pass filter implemented by the microcontroller subtracting the exponential moving average, obtained by:

$$Average\_ChX[t] = (1-\alpha)\ Average\_ChX[t-1] + \alpha\ ChX[t]$$

Where α is equal to $1/2^5$ for MODE = 0, 1 or 2. It is equal to 1/2 in case of Impedance check.

For the standard modes, this result in a high pass filter with a cut-off frequency of 10.5 Hz, when sampling the signals at 2000 Hz. More in general the cut-off frequency is Fsamp/190.

0 = DC signals (to be used with the high resolution)

bit 5-4 **EXT<1:0>:** Range extension factor (for 16 bits resolution)

11 = The range is eight times the standard one

10 = The range is four times the standard one

01 = The range is twice the standard one

00 = Standard input range

bit 3-2 **TRIG<1:0>:** event trigger to start data transfer or acquisition on SD card

11 = the SD card acquisition will start and stop using the sessantaquattro button

10 = the data transfer is triggered by the external signal (from the adapter)

01 = the data transfer is triggered by the internal signal (phototransistor)

00 = The acquisition and data transfer is controlled from the REC and GO/STOP bits

bit 1 **REC:** Starts/stops the acquisition on the MicroSD

1 = Rec

0 = Stop

bit 0 **GO/STOP:** Starts/stops the data transfer on the TCP socket

1 = Go

0 = Stop and close the socket

FILE SIZE 0:
Less significant byte indicating the acquisition on the MicroSD card maximum duration in seconds.

FILE SIZE 1:
More significant byte indicating the acquisition on the MicroSD card maximum duration in seconds.

FILENAME PREFIX 0..4:

Five digits used as prefix for the filenames on the MicroSD card. The following 3 digits will be an incremental number.

TIMEDATE 0..3:

YEAR6	**YEAR5**	**YEAR4**	**YEAR3**	**YEAR2**	**YEAR1**	**YEAR0**	**MONTH3**
MONTH2	**MONTH1**	**MONTH0**	**DAY4**	**DAY3**	**DAY2**	**DAY1**	**DAY0**
HOUR4	**HOUR3**	**HOUR2**	**HOUR1**	**HOUR0**	**MIN5**	**MIN4**	**MIN3**
MIN2	**MIN1**	**MIN0**	**SEC4**	**SEC3**	**SEC2**	**SEC1**	**SEC0**

Considering the 4 bytes as a single 32 bits variable:

bit 31-25 **YEAR<6:0>:** Year starting from 1980. Thus, for example, 2017 will be decoded as 37 on these 7 bits.

bit 24-21 **MONTH<3:0>:** Month, where 0 = January, 1 = February…

bit 20-16 **DAY<4:0>:** Day decoded starting from 0 (i.e. subtracting 1 to the day number)

bit 15-11 **HOUR<4:0>:** Hour of the day from 0 to 23

bit 10-5 **MIN<5:0>:** Minutes from 0 to 59

bit 4-0 **SEC<5:0>:** Seconds divided by two. The resolution has been reduced to fit in the 32 bits.