SyncStation

TCP Communication Protocol v2.2

This document describes the protocol used during the communication between the PC and the SyncStation, SyncStation+, SyncSationX. For details about communication with a single muovi, muovi+, due+ or sessantaquattro, check the related document.

After the SyncStation has completed the initialization phase, it opens a TCP socket accessible from the ethernet connection on port 54320. The connection can be established with direct connection between a PC and the SyncStation using a standard ethernet cable. The IP address of SyncStation is fixed and is 192.168.76.1.

Once connected to the TCP socket, commands and data can be exchanged between the PC and the SyncStation. The commands to start data transfer and configure the wireless devices have to create a message string including the number of bytes in the message string and a CRC8. The message sting is composed by the following bytes:

START BYTE

CONTROL BYTE1 (optional, for configuring the muovi wireless probe n.1)

CONTROL BYTE2 (optional, for configuring the muovi wireless probe n.2)

CONTROL BYTE3 (optional, for configuring the muovi wireless probe n.3)

CONTROL BYTE4 (optional, for configuring the muovi wireless probe n.4)

CONTROL BYTE5 (optional, for configuring the sessantaquattro device n.1)

CONTROL BYTE6 (optional, for configuring the sessantaquattro device n.2)

CONTROL BYTE7 (optional, for configuring the due+ n.1)

CONTROL BYTE8 (optional, for configuring the due+ n.2)

CONTROL BYTE9 (optional, for configuring the due+ n.3)

CONTROL BYTE10 (optional, for configuring the due+ n.4)

CONTROL BYTE11 (optional, for configuring the due+ n.5)

CONTROL BYTE12 (optional, for configuring the due+ n.6)

CONTROL BYTE13 (optional, for configuring the due+ n.7)

CONTROL BYTE14 (optional, for configuring the due+ n.8)

CONTROL BYTE15 (optional, for configuring the due+ n.9)

CONTROL BYTE16 (optional, for configuring the due+ n.10)

CRC8

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The CONTROL BYTEs set the muovi and sessantaquattro mode, including the number of channels and the sampling frequency, and enable/disable the data transfer. The presence of a CONTROL BYTE in the configuration string is used by the SyncStation to compute the amount of data transferred to the PC regardless of the single EN bits in the different CONTROL BYTEs.

The CRC8 must be always present is obtained as CRC calculation on 8 bits on previous bytes of the command string.

The START BYTE AND COMMAND BYTEs description follows.

START BYTE

0	0	0	SIZE3	SIZE2	SIZE1	SIZE0	GO/STOP

bit 4-1   **SIZE<3:0>:** Size of the command string. The value set with these 3 bits indicates how many CONTROL BYTES follows. The value can range from 0 to 16, it doesn't include the CRC8 byte terminating the command string who must always be in the configuration string

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

         1 = start data transfer of Auxiliary, Accessory and signals channels from muovi probes with EN bit = 1

         0 = stop data transfer on the TCP socket

CONTROL BYTEX:

DEV3	DEV2	DEV1	DEV0	EMG/EEG	MODE1	MODE0	EN

bit 7-4   **DEV<3:0>:** Probe number

     0101 = The command set the configuration of muovi+/sessantaquattro 2

     0100 = The command set the configuration of muovi+/sessantaquattro 1

     0011 = The command set the configuration of muovi probe 4

     0010 = The command set the configuration of muovi probe 3

     0001 = The command set the configuration of muovi probe 2

     0000 = The command set the configuration of muovi probe 1

bit 4   **EMG/EEG:** Sampling frequency

     1 = EMG Mode Fsamp 2000 Hz, high pass filter at 10 Hz*, 16 bit resolution

     0 = EEG Mode Fsamp 500 Hz, DC coupled, 24 bit resolution

bit 3-1   **MODE<1:0>:** Working mode

     11 = Test mode. Sends ramps on all bioelectrical + IMU/AUX/accessory channels

     10 = Impedance check on all bioelectrical + IMU/AUX/accessory channels

     01 = Remove average. Monopolar bioelectrical signals + IMU/AUX/accessory. All bioelectrical channels are acquired with respect to the reference. The average estimated aver all the 32 channels can be subtracted as a common mode trough the Patient Reference connection to reduce the presence of interferences or movement artifact.

     00 = Standard mode. Monopolar bioelectrical signals + IMU/AUX/accessory. All bioelectrical channels are acquired with respect to the reference

bit 0   **EN:** Enable data transfer for the corresponding device

     1 = Enable data transfer to the station

     0 = Disable data transfer to the station

* High pass filter implemented by firmware subtracting the exponential moving average, obtained by:

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

Where α is equal to 1/25 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.