

Communication protocol

for the devices of the premium and medical series

Table of contents

0 Introduction.....	3
0.1 Purpose of this document.....	3
0.2 Concepts and abbreviations.....	3
0.3 Structure of the document.....	3
1 Introduction / General Part.....	4
1.1 Structure of a data packet:.....	4
1.2 Description of the communication.....	4
2 The functions in details.....	7
2.1 List of functions.....	7
2.1.1 Querying the protocol version.....	7
2.1.2 Querying the dashboard software version.....	7
2.1.3 Querying the device type.....	7
2.1.4 Safety mode.....	7
2.1.5 Actual training time.....	7
2.1.6 Validity of heart rate data.....	7
2.1.7 Query heart rate.....	7
2.1.8 Simulating key press.....	8
2.1.9 Query error.....	8
2.1.10 Query speed status.....	8
2.1.11 Query speed.....	8
2.1.12 Set speed.....	8
2.1.13 Query emergency STOP.....	8
2.1.14 Query top speed.....	8
2.1.15 Acceleration / deceleration.....	9
2.1.16 Acceleration / deceleration.....	9
2.1.17 Query distance	9
2.1.18 Inclination possibility.....	9
2.1.19 Actual inclination.....	9
2.1.20 CosRec - Emulation.....	10
2.1.21 Training data complete.....	10
2.1.22 Inclination setting possibility.....	10
2.1.23 Load control.....	10
2.1.24 Query actual rotational speed.....	10
2.1.25 Set rotational speed.....	11
2.1.26 Set load (watt).....	11
2.1.27 Determine (detect) active device limits.....	11
2.1.28 (Reserved).....	11
2.1.29 Query / set actual gear.....	11
2.1.30 Query / set actual bike type.....	11

0 Introduction

0.1 Purpose of this document

The communication protocol is used to control daum electronic devices of the premium and medical series using a USB-serial adapter or using a TCP/IP network.

0.2 Concepts and abbreviations

This chapter describes the most important concepts and abbreviations as they are used in this document.

Abbreviations	Description
SOH	Start of Header
ETB	Terminating character
GS	Separator, ASCII 0x1d, see 1.1.
AF	Query
AW	Answer
BF	command
bike	Devices of the ergo_bike type
lyps	Devices of the ergo_lyps type
run	Devices of the ergo_run type

0.3 Structure of the document

Chapter 1 contains a general description of the communication protocol.

Chapter 2 describes the functions.

1 Introduction / General Part

Only ASCII characters are transmitted.

Recommended send/receive buffer size: minimum 256 Bytes.

RS232 interface parameters: 9600 Bps, 8N1

Protocol version: 2.01. daum device software version 1.316 or higher required.

1.1 Structure of a data packet:

SOH	Header			Data unit			checksum		ETB
1	2	3	4	5	...	n	n+1	n+2	n+3
0x01	s1	z1	z2	Data			(checksum)		0x17

The "Start of Header" **SOH** contains the ASCII character 0x01.

The **header** consists of the combination of a letter s1 and two digits (numeric characters) z1 and z2, e.g. P01.

The **data unit** consists of one or many numerical values or character strings. Numerical values are separated by white spaces, character strings are separated by the separator character GS ASCII (0x1d). The description of the individual functions contains an exact description of the respective data unit structure.

The **checksum** is obtained by getting the sum of the header and data unit modulo 100.

The **ETB** contains the ASCII character 0x17.

1.2 Description of the communication

A client-server relationship is established between the PC and the daum electronic-ergometers. The ergometer processes the queries and commands send to it by the PC.

We differentiate between queries, commands and answers in the communication protocol.

Queries (AF) have no data field; they are used to query data from the ergometer.

Commands (BF) have a data field which is processed by the device.

Answers (AW) are returned from the device to answer a query or a command. The device always returns an answer with an identical header. If the data delivered by a command are successfully processed, this same data is then returned in the answer. The data field of the answer will differ from that of the command when the data are not successfully processed or when the transmitted value cannot be set, in that last case the closest possible value is set.

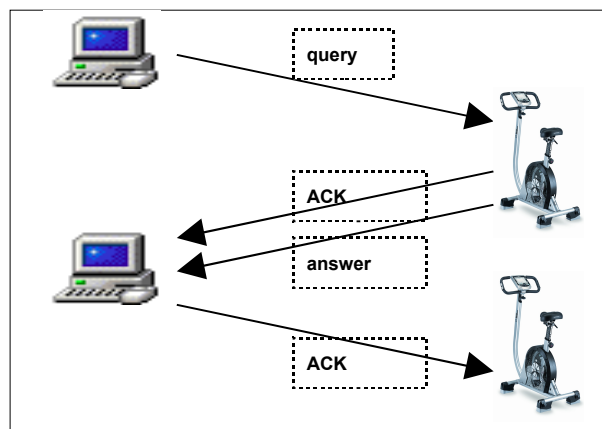
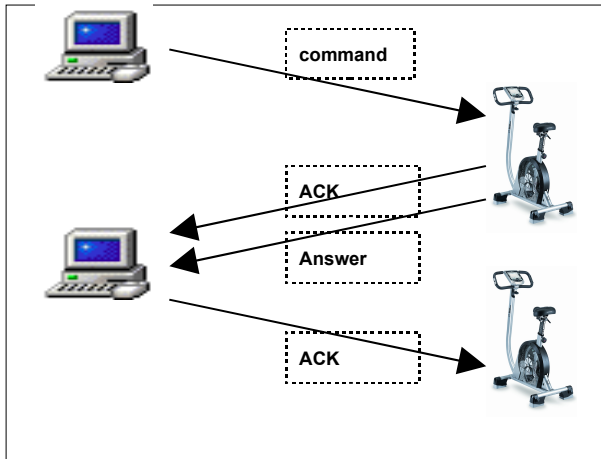


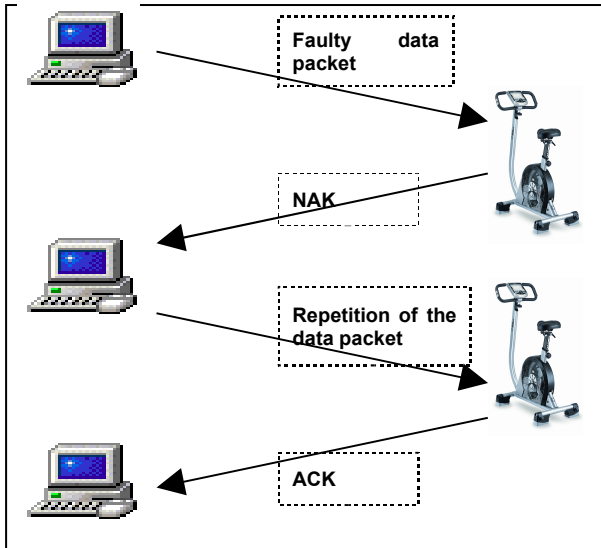
Fig 1: Communication in the case of a query

Fig 2: communication of a command



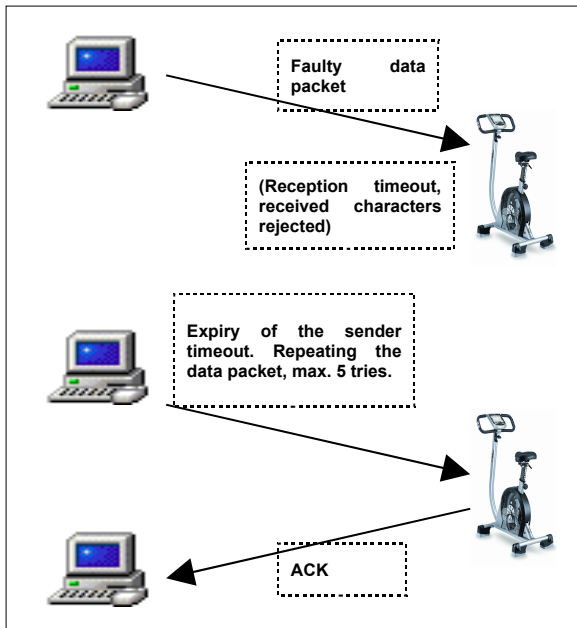
Each data packet is acknowledged with an ACK (0x06 ASCII) character or a NAK (0x15 ASCII) character if the checksum is incorrect. A NAK character prompts (triggers) the repetition of the rejected data packet. Unrecognised ACK characters are processed as NAKs.

Fig 3: transmission error



In the case of an incorrect end character the receiver rejects the data packet after a reception time out of 10s. The sender in that case does not receive any ACK or NAK and repeats sending the data packet after a send time out of 11s. After five unsuccessful attempts the sender gives up.

Fig 4: error with an ETB character.



2 The functions in details

2.1 List of functions

The format of the data field is similar to that of the “sprintf” function of the C programming language. The commands are valid for the device software version 1.316 and up, if not stated otherwise.

2.1.1 Querying the protocol version

Header	Type	For device type	Data field	Returns
V00	AF,AW	bike, lyps, run	%3u	201, means version 2.01

2.1.2 Querying the dashboard software version

Header	Type	for device type	Data field	Returns
V70	AF,AW	bike, lyps, run	%s	e.g. „Version 1.380”

2.1.3 Querying the device type

Header	Type	for device type	Data field	Returns
Y00	AF,AW	bike, lyps, run	%1u	0 = run 2 = bike 7 = lyps

2.1.4 Safety mode

Header	Type	for device type	Data field	Returns
F00	AF,BF,AW	bike, lyps, run	%u	0 = safety mode OFF 1 - 250 communication timeout for safety mode (=STOP) in one tenth of a second (0.1s - 25s)

2.1.5 Actual training time

Header	Type	for device type	Data field	Returns
T00 T10	AF,AW	bike, lyps, run	%02u:%02u:%02u	hours:minutes:seconds

2.1.6 Validity of heart rate data

Header	Type	for device type	Data field	Returns
P00	AF,AW	bike, lyps, run	%1u	0 = no 1 = yes

2.1.7 Query heart rate

Header	Type	for device type	Data field	Returns
P01	AF,AW	bike, lyps, run	%u	heart rate in beats per minute

2.1.8 Simulating key press

Header	Type	for device type	Data field	Returns
U10	AF,BF,AW	bike, lyps, run	%c%c	<i>First character: key to activate</i> + = faster - = slower U = up D = down E = Start / Enter F = emergency STOP S = Stop <i>Second character:</i> P = pressed R = released

2.1.9 Query error

Header	Type	for device type	Data field	Returns
Z00	AF,AW	bike, lyps, run	%u	0 (no error)

2.1.10 Query speed status

Header	Type	for device type	Data field	Returns
S00	AF,AW	run	%1u	0 = Stop 1 = Start 2 = Pause

2.1.11 Query speed

Header	Type	for device type	Data field	Returns
S01	AF,AW	run	%4.2f	speed in m/s

2.1.12 Set speed

Header	Type	for device type	Data field	Returns
S02	AF,BF,AW	run	%4.2f	speed in m/s

2.1.13 Query emergency STOP

Header	Type	for device type	Data field	Returns
S03	AF,AW	run	%1u	0 = normal operation 1 = emergency STOP active

2.1.14 Query top speed

Header	Type	for device type	Data field	Returns
S04	AF,AW	run	%4.2f	highest allowable speed in m/s

2.1.15 Acceleration / deceleration

Header	Type	for device type	Data field	Returns
A00	AF,BF,AW	run	%1u	0 = none 1 = 131s 2 = 66s 3 = 33s 4 = 16s 5 = 8s 6 = 5s 7 = 3s

The time value set corresponds to the duration it takes to change the speed from standstill to maximum speed or inversely. The value used here applies after the next speed setting with the S02 command.

2.1.16 Acceleration / deceleration

Header	Type	for device type	Data field	Returns
A01	AF,BF,AW	run	%u	0 - 65535

The value set is added to the actual internal speed value, or subtracted from it, every 10 milliseconds. The internal maximal value for the speed is 65535. This command must be send after a new S02 speed command if the standard acceleration value A00 should not apply.

This command is to be used with caution because extreme acceleration values can be very dangerous.

2.1.17 Query distance

Header	Type	for device type	Data field	Returns
D00	AF,AW	bike, lyps, run	%6u	distance in m

2.1.18 Inclination possibility

Header	Type	for device type	Data field	Returns
E00	AF,AW	run	%6u	0 = no inclination system 1 = inclination system exists

2.1.19 Actual inclination

Header	Type	for device type	Data field	Returns
E01	AF,AW	run	%3.1f	height / length * 100%

2.1.20 CosRec - Emulation

Header	Type	for device type	Data field	Returns
X00	AF,AW	bike, lyps, run	%uGS %uGS %4.2fGS %3.1fGS %uGS <SPACE> (32bit-Systeme)	time in s heart rate in s ⁻¹ speed in m/s inclination in % distance in m labelling for a new time interval: <SPACE>

2.1.21 Training data complete

Header	Type	for device type	Data field	Returns
X70	AF,AW	bike, lyps, run	%uGS %uGS %4.2fGS %3.1fGS %uGS %4.1fGS %uGS %4.1fGS %4.1fGS %4.1fGS %cGS %cGS %c	time in s heart rate in 1/min speed in km/h inclination in % distance in m rotational speed in 1/min power in Watt physical energy dissipated in kJ realistic energy dissipated in kJ torque in Nm gear + 1 (1 = gear shift OFF, 2...29 = gear 1...28 selected) 0 = device OFF, 1= device ON rotational speed status + 1 status 0 = rotational speed ok 1 = rotational speed too low to achieve the required load in watt 2 = rotational speed too high to achieve the required load in watt

Available starting from version 1.380

2.1.22 Inclination setting possibility

Header	Type	for device type	Data field	Returns
I00	AF,AW	run	%1u	0 = no setting possibility 1 = setting is possible

2.1.23 Load control

Header	Type	for device type	Data field	Returns
S20	AF,BF,AW	bike, lyps	%1u	0 = OFF 1 = ON

2.1.24 Query actual rotational speed

Header	Type	for device type	Data field	Returns
S21	AF,AW	bike, lyps	%4.1f	rotational speed in 1/min

2.1.25 Set rotational speed

Header	Type	for device type	Data field	Returns
S22	AF,BF,AW	bike, lyps	%4.1f	rotational speed in 1/min

2.1.26 Set load (watt)

Header	Type	for device type	Data field	Returns
S23	AF,BF,AW	bike, lyps	%5.2f	load in watt

2.1.27 Determine (detect) active device limits

Header	Type	for device type	Data field	Returns
L70	AF,BF,AW	bike, lyps, run	%cGS %5.2fGS %5.2fGS %5.2f	limit type: L = heart rate limit, S = speed limit, W = watt limit, E = inclination limit, A = acceleration limit minimal value maximal value default value

Available with daum premium software starting from version 1.380

2.1.28 (Reserved)

Header	Type	for device type	Data field	Returns
M70	AF,BF,AW	bike, lyps, run		

Available with daum premium software starting from version 2.000

2.1.29 Query / set actual gear

Header	Type	for device type	Data field	Returns
M71	AF,BF,AW	bike, lyps	%u	actual gear

Available with daum premium software starting from version 2.000

2.1.30 Query / set actual bike type

Header	Type	for device type	Data field	Returns
M72	AF,BF,AW	bike	%u	bike type: 0 = All-round 1 = racing bike 2 = Mountain bike

Available with daum premium software starting from version 2.000