

22 COMMUNICATION PROTOCOL

General information

- A. A character based communication protocol balance-terminal is designed for establishing communication between a RADWAG balance and peripheral devices via RS 232 interface.
- B. It consists of commands sent from a peripheral device to the balance and responses from the balance.
- C. Responses are sent from the balance on each receipt of a command as a reaction to a specific command.
- D. Commands forming the communication protocol enable obtaining data on balance's status and influencing its operation, e.g.: request measurement results from the balance, zero indication, etc.

22.1 List of commands

Command	Command description
Z	Zero balance
T	Tare balance
OT	Give tare value
UT	Set tare
S	Send stable measurement result in basic measuring unit
SI	Immediately send measurement result in basic measuring unit
SU	Send stable measuring result in current measuring unit
SUI	Immediately send measurement result in current measuring unit
C1	Switch on continuous transmission in basic measuring unit
C0	Switch off continuous transmission in basic measuring unit
CU1	Switch on continuous transmission in current measuring unit
CU0	Switch off continuous transmission in current measuring unit
DH	Set low checkweighing threshold
UH	Set high checkweighing threshold

ODH	Give value of low checkweighing threshold
OUH	Give value of high checkweighing threshold
SM	Set mass value of a single item
TV	Set target mass value
RM	Set reference mass value
NB	Give balance serial number
SS	Value release
IC	Internal calibration performing
IC1	Disable automatic internal calibration of the balance
IC0	Enable automatic internal calibration of the balance
K1	Lock balance keypad

K0	Unlock balance keypad
OMI	Give available working modes
OMS	Set working mode
OMG	Give current working mode
BP	Activate sound signal
PC	Send all implemented commands

CAUTION:

1. *Each command must end with CR LF characters; the spaces provided in the formats should be omitted, they are included only to improve readability.*

22.2 Responses format for commands sent from computer level

On receipt of a command, the terminal sends a response in one of the following formats:

XX_A CR LF	command understood and in progress
XX_D CR LF	command carried out (appears only after the command XX_A)
XX_I CR LF	Command understood but not accessible at this moment
XX _ ^ CR LF	Command understood but max range is exceeded
XX _ v CR LF	Command understood but min range is exceeded
XX _ OK CR LF	Command carried out
S_CR LF	Command not recognised
XX _ E CR LF	An error occurred on command carrying out (time limit exceeded while waiting for stable measurement result), time limit is balance's characteristic parameter

XX - stands for a name of sent command

_ - stands for spaces

22.3 Commands description

Zero the balance

Format: **Z CR LF**

Accessible responses:

- Z_A CR LF - command understood and in progress
- Z_D CR LF - command carried out
- Z_A CR LF - command understood and in progress
- Z^ CR LF - command understood but zeroing range exceeded
- Z_A CR LF - command understood and in progress
- Z_E CR LF - time limit exceeded while waiting for stable measurement result
- Z_I CR LF - command understood but not accessible at this moment

Tare the balance

Format: **T CR LF**

Accessible responses:

- T_A CR LF - command understood and in progress
- T_D CR LF - command carried out
- T_A CR LF - command understood and in progress
- T_v CR LF - command understood but taring range exceeded
- T_A CR LF - command understood and in progress
- T_E CR LF - time limit exceeded while waiting for stable measurement result
- T_I CR LF - command understood but not accessible at this moment

Give tare value

Format: **OT CR LF**

Accessible response: **OT_TARA CR LF** – command carried out

Response format:

1	2	3	4-12	13	14	15	16	17	18	19
O	T	space	tare	space	unit			space	CR	LF

Tare - 9 characters with right justification

Unit - 3 characters with left justification

CAUTION:

Tare value is always given in adjustment unit.

Set tare

Format: **UT_TARA CR LF**, where **TARE** – tare value

Accessible responses:

- UT_OK CR LF - command carried out
- UT_I CR LF - command understood but not accessible at this moment
- ES CR LF - command not recognised (tare format incorrect)

CAUTION:

Use dot in tare format as decimal point.

Send stable measurement result in basic measuring unit

Format: **S CR LF**

Accessible responses:

- S_A CR LF** - command understood and in progress
- S_E CR LF** - time limit exceeded while waiting for stable measurement result
- S_I CR LF** - command understood but not accessible at this moment
- S_A CR LF** - command understood and in progress
- MASS FRAME** - response is mass value in basic measuring unit

Response format:

1	2-3	4	5	6	7-15	16	17	18	19	20	21
S	space	stability marker	space	character	mass	space	unit			CR	LF

Example:

S CR LF – command sent from a computer

S_A CR LF – command understood and in progress

S _ _ _ _ - _ _ _ _ _ 8 . 5 _ g _ _ CR LF – command carried out, response in mass value in basic measuring unit.

Immediately send measurement result in basic measuring unit

Format: **SI CR LF**

Accessible responses:

- SI_I CR LF** - command understood but not accessible at this moment
- MASS FRAME** - response is immediate with mass value in basic weighing unit

Response format:

1	2	3	4	5	6	7-15	16	17	18	19	20	21
S	I	space	stability marker	space	character	mass	space	unit			CR	LF

Example:

SI CR LF – command sent from a computer

SI _ ? _ _ _ _ _ 1 8 . 5 _ k g _ CR LF – command carried out, immediate response of mass value in basic weighing unit.

Send stable measurement result in current weighing unit

Format: **SU CR LF**

Accessible responses:

- SU_A CR LF** - command understood and in progress
- SU_E CR LF** - time limit exceeded while waiting for stable measurement result
- SU_I CR LF** - command understood but not accessible at this moment
- SU_A CR LF** - command understood and in progress
- MASS FRAME** - response is mass value in current measuring unit

Response format:

1	2	3	4	5	6	7-15	16	17	18	19	20	21
S	U	space	stability marker	space	character	mass	space	unit			CR	LF

Example:

S U CR LF – command sent from a computer

S U _ A CR LF – command understood and in progress

S U _ _ _ - _ _ 1 7 2 . 1 3 5 _ N _ _ CR LF – command carried out
response in mass value in current measuring unit.

Immediately send measurement result in current measuring unit

Format: **SUI CR LF**

Accessible answers:

SUI_I CR LF - command understood but not accessible at this moment

MASS FRAME - mass value in current measuring unit is returned immediately

Response format

1	2	3	4	5	6	7-15	16	17	18	19	20	21
S	U	I	stability marker	space	character	mass	space	unit			CR	LF

Example:

S U I CR LF – command from a computer

S U I ? _ - _ _ _ 5 8 . 2 3 7 _ k g _ CR LF – command carried out,
immediate response of mass value in current measuring unit
where: _ - space

Switch on continuous transmission in basic measuring unit

Format: **C1 CR LF**

Accessible answers:

C1_I CR LF - command understood but not accessible at this moment

C1_A CR LF - command understood and in progress

MASS FRAME - response is mass value in basic measuring unit

Response format

1	2	3	4	5	6	7-15	16	17	18	19	20	21
S	I	space	stability marker	space	character	mass	space	unit			CR	LF

Switch off continuous transmission in basic measuring unit

Format: **C0 CR LF**

Accessible responses:

C0_I CR LF - command understood but not accessible at this moment

C0_A CR LF - command understood and carried out

Switch on continuous transmission in current measuring unit

Format: **CU1 CR LF**

Accessible responses:

- CU1_I CR LF - command understood but not accessible at this moment
- CU1_A CR LF - command understood and in progress
- MASS FRAME - response is mass value in current measuring unit

Response format

1	2	3	4	5	6	7-15	16	17	18	19	20	21
S	U	I	stability marker	space	character	mass	space	unit			CR	LF

Switch off continuous transmission in current weighing unit

Format: **CU0 CR LF**

Accessible responses:

- CU0_I CR LF - command understood but not accessible at this moment
- CU0_A CR LF - command understood and carried out

Set low checkweighing threshold

Format: **DH_XXXXX CR LF**, where: _ - space, **XXXXX** – mass format

Accessible responses:

- DH_OK CR LF - command understood
- ES CR LF - command not recognised (mass format incorrect)

Set high checkweighing threshold

Format: **UH_XXXXX CR LF**, where: _ - space, **XXXXX** – mass format

Accessible responses:

- UH_OK CR LF - command understood
- ES CR LF - command not recognised (mass format incorrect)

Give value of low checkweighing threshold

Format: **ODH CR LF**

Accessible response: **DH_MASS CR LF** – command carried out

Response format

1	2	3	4-12	13	14	15	16	17	18	19
D	H	space	mass	space	unit			space	CR	LF

- Mass - 9 characters with right justification
- Unit - 3 characters with left justification

Give value of high checkweighing threshold

Format: **OUH CR LF**

Accessible response: **UH_MASS CR LF** – command carried out

Response format

1	2	3	4-12	13	14	15	16	17	18	19
D	H	space	mass	space	unit			space	CR	LF

Mass - 9 characters with right justification

Unit - 3 characters with left justification

Set mass value of a single item (only for PARTS COUNTING)

Format: **SM_XXXXX CR LF**, where: _ - space, **XXXXX** – mass format

Accessible responses:

SM_OK CR LF - command understood

SM_I CR LF - command understood but not accessible at this moment (eg. mode other than PARTS COUNTING)

ES CR LF - command not recognised (mass format incorrect)

Set target mass value (e.g. for DOSING)

Format: **TV_XXXXX CR LF**, where: _ - space, **XXXXX** – mass format

Accessible responses:

TV_OK CR LF - command understood

TV_I CR LF - command understood but not accessible at this moment (eg. WEIGHING mode)

ES CR LF - command not recognised (mass format incorrect)

Set reference mass value (e.g. for DEVIATIONS)

Format: **RM_XXXXX CR LF**, where: _ - space, **XXXXX** – mass format

Accessible responses:

RM_OK CR LF - command understood

RM_I CR LF - command understood but not accessible at this moment (eg. mode other than DEVIATIONS)

ES CR LF - command not recognised (mass format incorrect)

Give balance serial number

Format: **NB CR LF**

Accessible responses:

NB_A_ "x" CR LF - command understood, returns serial number

NB_I CR LF - command understood but not accessible at this moment

x – serial number of the device (inserted inbetween inverted commas)

Example:

Command:

NB CR LF – give serial number

Response:

NB_A_ "1234567" – serial number of the device – "1234567"

Value release

Format: **SS CR LF**

Accessible responses:

SS_OK CR LF - command understood, execution in progress

Command's function is similar to function of button PRINT located on an overlay,

Internal calibration

Format: **IC CR LF**

Accessible responses:

IC_A CR LF	- command understood, execution in progress
IC_D CR LF	- calibration completed
IC_A CR LF	- command understood, execution in progress
IC_E CR LF	- range exceeded, time limit for awaiting for a stable result
IC_I CR LF	- command understood but not accessible at this moment

Disable automatic internal calibration of the balance

Format: **IC1 CR LF**

Accessible responses:

IC1_I CR LF	- command understood but not accessible at this moment
IC1_E CR LF	- operation disabled, e.g. for verified balance
IC1_OK CR LF	- command carried out

Operation is disabled for verified balances.

For non-verified balances the command inhibits internal calibration until it is enabled via IC0 command or until the balance is turned off. The command does not modify settings specifying calibration start.

Enable automatic internal calibration of the balance

Format: **IC0 CR LF**

Accessible responses:

IC0_I CR LF	- command understood but not accessible at this moment
IC0_OK CR LF	- command carried out

Operation is disabled for verified balances.

Lock balance keypad

Format: **K1 CR LF**

Accessible responses:

K1_I CR LF	- command understood but not accessible at this moment
K1_OK CR LF	- command carried out

Command locks the balance keypad (proximity sensors, touch panel) until the moment of turning the balance off or until sending K0 command.

Unlock balance keypad

Format: **K0 CR LF**

Accessible responses:

K0_I CR LF

- command understood but not accessible at this moment

K0_OK CR LF

- command carried out

OMI - Give available working modes

Command overview:

Command returns accessible working modes.

Format: **OMI <CR><LF>**

Accessible responses:

OMI <CR><LF>

- command carried out, accessible working

n_ "Mode name" <CR><LF>: modes returned

n_ "Modename" <CR><LF>

OK <CR><LF>

OMI_I <CR><LF>

- command understood but not accessible at this moment

Mode name – parameter, working mode name, inserted inbetween inverted comas. The name takes form given on a particular balance display, it is provided in a caurrently selected language.

n – parameter, decimal value determining working mode number

- n →
- 1 – Weighing
 - 2 – Parts Counting
 - 3 – Deviations
 - 4 – Dosing
 - 5 – Formulas
 - 6 – Animal Weighing
 - 8 – Density of Solid Bodies
 - 9 – Density of Liquids
 - 10 – Peak Hold
 - 11 – Totalizing
 - 12 – Checkweighin
 - 13 – Statistics
 - 14 – Pipettes Calibration

CAUTION: Working modes numbering is identical for each kind of balance. The numbers are assigned to working modes names. Some balances give only the number as a response.

Example 1:

Command:

OMI <CR><LF>

- give accessible working modes

Response:

OMI <CR><LF>

- accessible working modes are given;

2_ "Parts Counting" <CR><LF>

number + name

4_ "Dosing" <CR><LF>

12_ "Checkweighing" <CR><LF>

OK <CR><LF>

- command carried out

Example 2:

Command:

OMI <CR><LF>

- give accessible working modes

Response:

OMI <CR><LF>

- accessible working modes are given;
number

2<CR><LF>

4 <CR><LF>

12<CR><LF>

OK <CR><LF>

- command carried out

OMS - Set working mode

Command overview:

Command sets accessible working modes.

Format: **OMS_n <CR><LF>**

Accessible responses:

OMS_OK <CR><LF> - command carried out

OMS_E <CR><LF> - error in-course of command execution, no parameter
or incorrect format

OMS_I <CR><LF> - command understood but not accessible at this
moment

n – parameter, decimal value determining working mode number. To see detailed
description go to OMI command.

Example:

Command:

OMS_13<CR><LF>

- set working mode Statistics

Response:

OMS_OK<CR><LF>

- working mode Statistics selected

OMG - Give current working mode

Command overview:

Command gives selected working modes.

Format: **OMG <CR><LF>**

Accessible responses:

OMG_n_OK <CR><LF> - command carried out, current working mode given

OMG_I <CR><LF> - command understood but not accessible at this
moment

n – parameter, decimal value determining working mode number. To see detailed
description go to OMI command.

Example:

Command:

OMG<CR><LF> - give current working mode

Response:

OMG_13_OK<CR><LF> - balance operates in working mode Statistics

Activate sound signal

Command overview:

Command activates BEEP sound signal for a specified amount of time.

Format: **BP_TIME <CR><LF>**

Accessible responses:

BP_OK <CR><LF>	- command carried out, BEEP sound signal activated
BP_E" <CR><LF>	- no parameter or incorrect format
BP_I <CR><LF>	- command understood but not accessible at this moment

TIME – parameter, decimal specifying how long shall the sound last, parameter given in [ms]. Recommended range <50 - 5000>.

If value greater than the permissible high limit is given, than BEEP sound is operated for the maximum permissible amount of time.

Example:

Command:

BP_350<CR><LF> - activate BEEP for 350 ms

Response:

BP_OK<CR><LF> - BEEP activated

CAUTION! – BEEP sound activated via BP command is inhibited if in-course of its activation the sound is activated by means of other device: keypad, touch panel, proximity sensors.

Send all the implemented commands

Format: **PC CR LF**

Response: **PC_A_"Z,T,S,SI, SU,SUI,C1,C0,CU1,CU0,PC"**

- command carried out, the indicator sent all the implemented commands