WTC 600

WTC Series Verified Balance

USER MANUAL

ITKU-24-03-01-17-EN

RADWAG BALANCES AND SCALES
ADVANCED WEIGHING TECHNOLOGIES

JANUARY 2017

CONTENTS

1. GENERAL INFORMATION

WTC 600 precision balance enables fast and accurate mass measurements under laboratory conditions.

The weighing pan, made of stainless steel and equipped with anti-draft shield, is an integral part of WTC 600 balance. Backlit LCD display ensures clear measurement result. WTC balance is equipped with an internal battery (comes standard), so it does not have to be connected to the mains.

WTC 600 precision balance is equipped with RS 232 interface that enables communication between the balance and peripheral devices (e.g. printer, computer).

2. PRECAUTIONS

2.1. Maintenance

A. Prior first use, carefully read this User Manual. Use the balance only as intended;
B. Balance to be decommissioned, should be decommissioned in accordance with valid legal regulations.

2.2. Battery

WTC 600 precision balance is supplied by **NiMH-type** battery (*nickel-metal-hydrogen*) of **1800-2800 mAh** capacity.

 In case of prolonged storage of the balance in low temperature, the battery has to be charged.

 A worn out battery can be replaced only by the manufacturer or by the authorized service.

 The equipment including accumulators does not belong to regular household waste. The European legislation requires electric and electronic equipment to be collected and disposed separately from other communal waste with the aim of being recycled.

Notice:
Symbols on accumulators identify harmful compounds: Pb = lead, Cd = cadmium, Hg = mercury.

3. WARRANTY CONDITIONS

A. RADWAG feels obliged to repair or exchange all elements that appear to be faulty by production or by construction,

B. Defining defects of unclear origin and means of their elimination can only be realized with assistance of manufacturer and user representatives,

C. RADWAG does not bear any responsibility for defects or losses resulting from unauthorized or inadequate performing of production or service processes,

D. Warranty does not cover:
- mechanical defects caused by product exploitation other than intended, defects of thermal and chemical origin, defects caused by lightning, overvoltage in the power network or other random event,
- Inappropriate cleaning.

E. Loss of warranty takes place if:
- a repair is carried out outside RADWAG authorized service point,
- service claims intrusion into mechanical or electronic construction by unauthorized people,
- the balance does not bear company protective stickers.

F. Warranty conditions outline the warranty period for rechargeable batteries attached to the balance for 12 months.

G. For detailed warranty conditions go to the warranty certificate.

H. Contact with the central authorized service: (0-48) 384 88 00 ext. 106 and 107.

4. BALANCE DESIGN

4.1. Dimensions
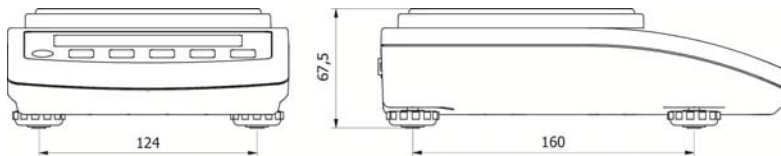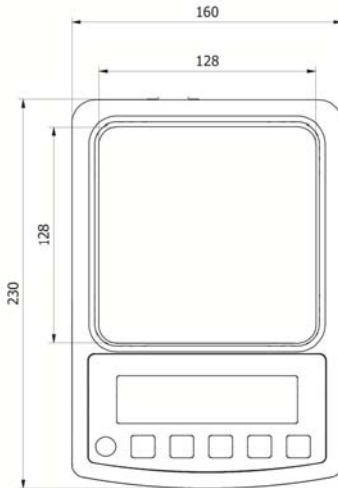
Dimensions of WTC 600 precision balance

4.1.1. Connection Cables - Diagrams
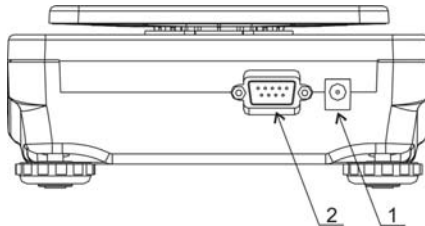
WTC 600 connectors

1- 12 VDC power outlet
2- RS232 connector

4.1.2. Connectors description

	Pin2 – RxD Pin3 – TxD Pin5 – GND	**RS 232 DB9/M connector (male)**

5. UNPACKING AND INSTALLATION

A. Take the device out of the packaging,
B. Place the balance on a flat and even surface. Keep it far away from any sources of heat,
C. Install the weighing pan in accordance with the figure below:
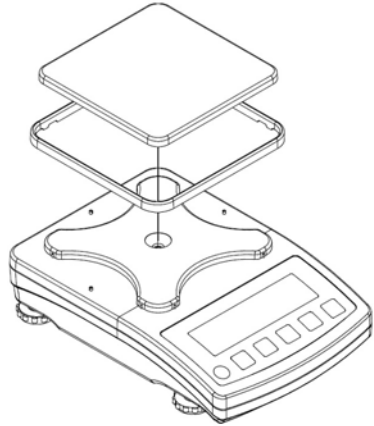
6. START-UP

6.1. Levelling

Prior first use level the balance. To level the platform use the levelling feet and the level indicator. Keep turning the feet until the air bubble takes central position.

level - OK   level incorrect

6.2. Powering the Device

Caution:
Balance can be connected to the mains only with a power adapter that comes standard with the particular model. Nominal power supply of the power adapter (specified on the power adapter data plate) has to be compatible to the power from the mains.

Plug the balance to the mains – connect the power adapter to the socket, next connect its connector to port located at the back of the balance housing.

Turn the balance on or off using key.

Test of the display unit takes place right after connecting the balance to the power, all the elements and pictograms are backlit for a short time. Next, the name and the program number appear, the indication gets to ZERO (displayed reading unit depends on the balance). If the indication is different than zero,

press key.

6.3. Battery Status

An internal battery comes standard with the balance. ⊞ pictogram, displayed at the top of the display, signals battery status.

Pictogram operation	Overview
No pictogram	Battery full. Standard balance operation
Pictogram displayed continuously	Battery status low (message **<bat Lo>** is displayed and the balance turns off). Charge the battery immediately.
Pictogram blinks every 1s	Battery charging. Balance connected to power supplier, the battery is being charged.
Pictogram blinks every 0,5s	Battery error. Battery damaged.

6.4. Battery Power

- Simultaneously press [Esc F] and [▶ →T←] keys .
- Message **<bAtt>** is displayed for 1s. Next, battery power given in **[%]** is displayed for 2 s.
- Wait for the home screen to be displayed.

7. MAINTENANCE ACTIVITIES

Disassembly a weighing pan and other detachable components (the components differ depending on a balance type – see: UNPACKING AND INSTALLATION).

Caution:
Cleaning anti-draft chamber while still installed may cause damage of the measuring system.

7.1. Cleaning ABS components

To clean dry surfaces and avoid smutching use clean non-colouring cloths made of cellulose or cotton. You can use a solution of water and detergent (soap, dishwashing detergent, glass cleaner). Gently rub the cleaned surface and let it dry. Repeat cleaning process if needed.

In the case when contamination is hard to remove, e.g. adhesive, rubber, resin, polyurethane foam residues etc., you can use a special cleaning agents based on a mixture of aliphatic hydrocarbons that do not dissolve plastics. Before using the cleanser for all surfaces we recommend carrying out tests. Do not use products containing abrasive substances.

7.2. Cleaning stainless steel components

Avoid using cleansers containing any corrosive chemicals, e.g. bleach (containing chlorine). Do not use products containing abrasive substances. Always remove the dirt using microfiber cloth to avoid damage of protective coating.

In case of a daily maintenance:
1. Remove the dirt using cloth dipped in warm water.
2. For best results, add a little dishwashing detergent.

8. TEMPERATURE STABILIZATION

- For correct operation of the balance the temperature has to range +15°C ÷ +30°C;
- On switching on, the balance requires 30 minutes of temperature stabilization time;
- During temperature stabilization displayed information may change;
- Adjustment has to be carried out after temperature stabilization;
- Any changes of temperature and humidity during operation can cause indications errors. Errors can be corrected by carrying out user adjustment.

9. KEYPAD
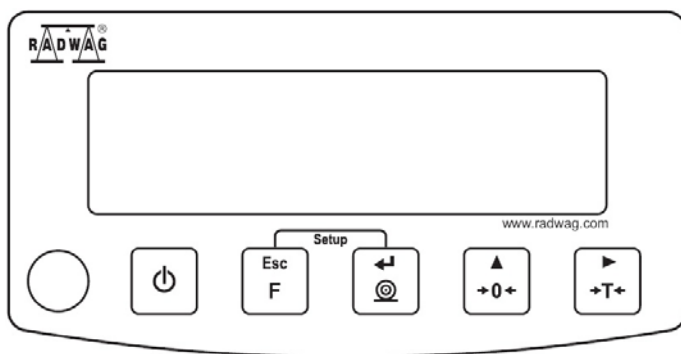
WTC 600 series keypad

10. KEYS

⏻	Press to switch the balance on/off – keep pressing for about 1 s
Esc F	Function key: press to select respective operation mode.
↵ ◎	Press to send the weighing result to a printer or a computer.
▲ →0←	Press to zero the balance
► →T←	Press to tare the balance

Caution:

On pressing Esc F *and* ↵ ◎ *) keys balance menu is displayed and keys' functions change. For detailed overview of keys' functions go further down this user manual.*

11. PROGRAM

Main menu is divided into function groups. Function group is a group of interrelated parameters.

Parameter No.		Name	Options	Overview
P1.		**rEAd**	**-**	**Balance parameters**
	1.1.	FIL	1, 2, 3	Filter
	1.2.	Auto	YES, no	Autozero
	1.3.	tare	no, AtAr, tArF	Tare
	1.4.	Fnnd	YES, no	Median Filter
P2.		**Prnt**		**RS232 parameters settings**
	2.1.	Pr_n	StAb, noStAb, rEPL, CntA, Cntb	Printout type
	2.2.	S_Lo		LO Threshold
	2.3.	bAud	2400, 4800, 9600, 19200, 38400	RS232 baud rate
	2.4.	S_rS	7d2SnP, 7d1SEP, 7d1SoP, 8d1SnP, 8d2SnP, 8d1SEP, 8d1SoP	Serial communication parameters
P3.		**Unit**		**Units**
			g, kg, N, ct, lb	Basic weighing unit selection
P4.		**Func**		**Working modes**

	4.1.	FFun	ALL, Funi, PcS, HiLo, AtAr, PrcA, Prcb, toP, Add, AnLS, tArE	Selection of modes quantity available for the user
	4.2.	Funi	YES, no	<Funi> mode accessibility
	4.3.	PCS	YES, no	<PcS> mode accessibility
	4.4.	HiLo	YES, no	< HiLo> mode accessibility
	4.5.	PrcA	YES, no	< PrcA> mode accessibility
	4.6.	Prcb	YES, no	< Prcb> mode accessibility
	4.7.	AtAr	YES, no	< AtAr> mode accessibility
	4.8.	toP	YES, no	< toP > mode accessibility
	4.9.	Add	YES, no	< Add> mode accessibility
	4.A.	AnLS	YES, no	<AnLS> mode accessibility
	4.b.	tArE	YES, no	<tArE> mode accessibility
P5.		**Misc**		**Miscellaneous**
	5.1.	bL	no, YES, Auto	Backlight for power supply from mains
	5.2.	bLbA	no, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100	Backlight for power supply from battery
	5.3.	bEEP	YES, no	Key sound
	5.4.	t1	no, YES, Auto	Time-defined finish mode
	5.5.	CHr6	YES, no	Battery charging function
P6.		**CAL**		**Adjustment**
	6.1.	St_u	-	Start mass determination
	6.2.	uCAL	-	Adjustment process

12. OPERATING BALANCE MENU

Use keypad to navigate in menu.

12.1. Keypad

Press to enter 'Main Menu'

Press to enter tare value manually
Press to edit parameter value and to change it by 1 digit up
Press to move the menu up

Press to check battery status

Press to switch between gross / net value

Press to swap between particular menu/submenu parameter
Press to change current parameter value

▶ +T←	Press to enter particular submenu Press to select parameter that is to be modified
↵ ◎	Press to confirm introduced modifications
Esc F	Press to leave, parameter remains unmodified Press to move one menu level up

12.2. Return to the Weighing Mode

Introduced modifications are permanently recorded into balance memory upon returning to the weighing operation after carrying out saving procedure.

Press [Esc F] key repeatedly, keep pressing until message **<SAuE?>** is displayed. Upon noticing the query press: [↵ ◎] - to confirm introduced modifications, or [Esc F] - to resign from introducing the modifications. Now the balance proceeds to weighing.

13. WEIGHING

Load the weighing pan. You can read weighing result when ◣◢, pictogram is displayed. To assure long-term operation and correct mass measurements follow the rules presented below:

- Load the weighing pan steadily avoiding shocks:

YES   NO
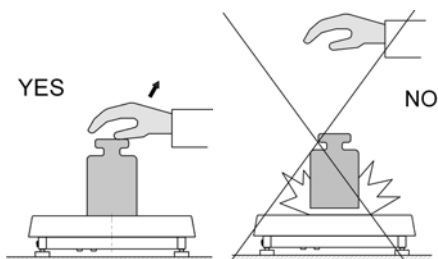
- Place weighed loads centrally on the weighing pan (eccentricity errors are specified by PN-EN 45501 standard, points 3.5 and 3.6.2.):
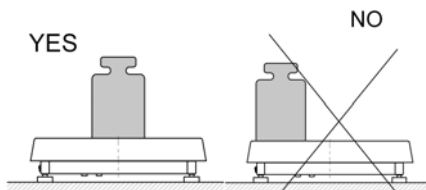
- Do not load the pan with concentrated force:
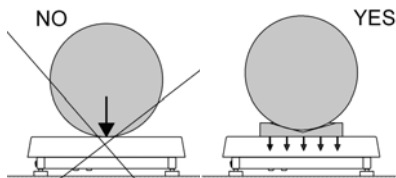
- Avoid side loading, in particular side shocks:
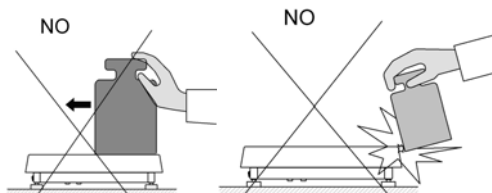
13.1. Taring

To determine net weight, put the packaging on the weighing pan. On stabilizing, press ►→T← key (indication changes to zero, **Net** pictogram is displayed in the left upper corner):
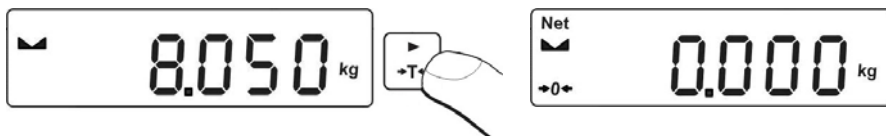
On loading the weighing pan net weight is displayed. You can tare repeatedly within the whole measuring range. While using tare function remember not to exceed the maximum measuring range of the balance. On unloading the weighing pan, the sum of tared masses with minus sing is displayed.

Caution:
*Taring cannot be performed when the displayed value is negative or equal zero. In such case message **<Err3>** is displayed and short signal is emitted.*

13.2. Manual Tare Entering

- Simultaneously press ![+0+ key] and ![+T+ key] keys.

select a digit

select a digit value
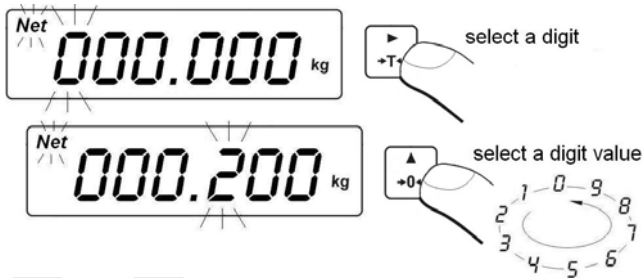
- Using ![+0+ key] and ![+T+ key] keys set **tare value**,
- Press ![key] key,
- Balance returns to weighing mode. Tare value with **'-'** sign is displayed.
- Tare can be entered at any moment during the weighing process.

Caution:
*Tare cannot be entered manually when tare value is already implemented to balance's memory. In such case message **<Err3>** is displayed and a short signal is emitted.*

13.3. Zeroing

To zero mass indication press ![+0+ key]. key. Zero value and following pictograms ➔*0*➔ and ↘↗ are displayed.

Zeroing enables determining new precise zero point. Zeroing is possible only when the indication is stable.

Caution:
*Indication can be zeroed only within **±2%** range of maximum capacity. If the zeroed value is greater than **±2%** of the maximum capacity, message **<Err2>** is displayed and short signal is emitted.*

13.4. Weighing for Dual Range Balances

Switching from weighing with the accuracy of the **I weighing range** to weighing with the accuracy of the **II weighing range** takes place automatically on exceeding Max of **I weighing range**. On switching to weighing with the accuracy of the II weighing range, symbol is displayed on the left. On unloading the weighing pan indication zeroes. Weighing is carried out with **II range** accuracy until the indication is zeroed.
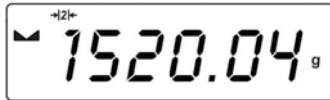
$$\overset{\text{→|2|←}}{\text{⌄}}\ 1520.04\ _g$$

Switching from weighing with the accuracy of the **II   weighing range** to weighing with the accuracy of the **I weighing range** takes place automatically on unloading the weighing pan and returning to AUTOZERO – (symbol →0→ is displayed). II weighing range pictogram is blanked and the balance switches back to the **I weighing range.**

13.5. Basic Weighing Unit Selection

You can set the start unit.

Procedure:

- Enter **<P3.Unit>** submenu.

$$P3.\ Unit$$

$$3.1.\ StUn$$

$$0.000\ _{kg}$$
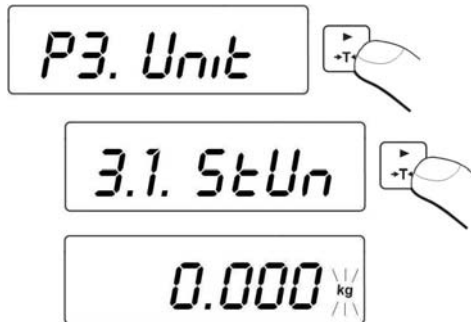
- Press →0→ key to view available units:

$$0.000\ _{kg}$$

kg — lb
N

Options:

    A.   When [kg] is the main unit, then you can select the following units:[kg, lb, N]; *[lb] unavailable for verified balances*,

    B.   When [g] is the main unit, then you can select the following units:[g, ct, lb]; *[lb] unavailable for verified balances,*

- On selecting basic unit, press key to confirm. Return to home screen:

$$3.1.\ StUn$$
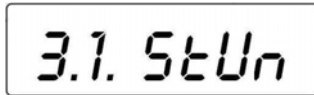
- Return to the weighing mode saving introduced modifications.

Caution:
The balance turns on with basic start unit selected.

13.6. Temporary Weighing Unit Selection

Function enables selecting mass indication unit. Temporary unit remains active until it is changed or the balance is turned off.

Procedure:

- Press key, next:

$$1\ Funi$$

$$0.000\ kg$$

$$0.000\ N$$

$$0.000\ N$$
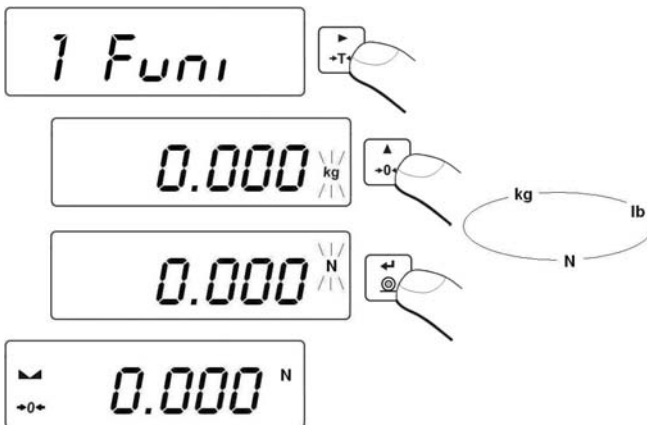
- On confirmation the balance proceeds to weighing with selected unit.

Options:

A. When [kg] is the main unit, then you can select the following units:[kg, lb, N]; *[lb] unavailable for verified balances,*
B. When [g] is the main unit, then you can select the following units:[g, ct, lb]; *[lb] unavailable for verified balances,*

14. MAIN PARAMETERS

You can adjust the balance to ambient conditions (filter level) or to your own needs (autozero, tare value). The parameters are to be found in **<P1.rEAd>** submenu.

14.1. Filter Level

Procedure:

- Enter **<P1.rEAd>** submenu.
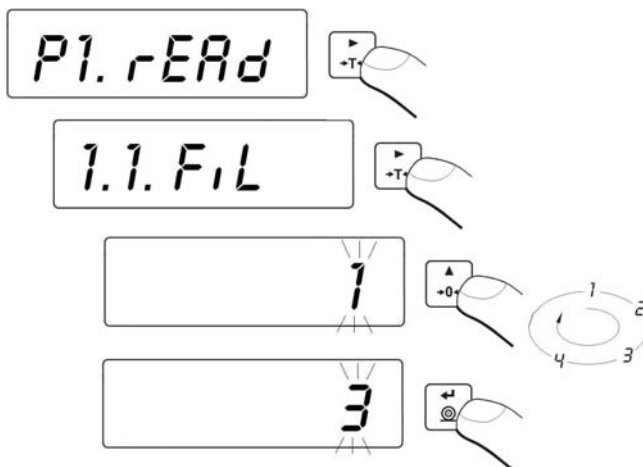
1 - 4 - filter setting in accordance with the ambient conditions

- Return to the weighing mode saving introduced modifications.

Caution:
The higher filter level, the longer the indication takes to stabilise.

14.2. Autozero

The software features an autozero function (Auto) ensuring precise mass indication. This function automatically controls and corrects zero indication.

There are, however, some cases when this function can be a disturbing factor for the measuring process; e.g. very slow placing of a load on the weighing pan (load adding). In such case, it is recommended to disable the function.

Procedure:

- Enter **<P1.rEAd>** submenu.

AUTO no - autozero disabled
AUTO YES - autozero enabled
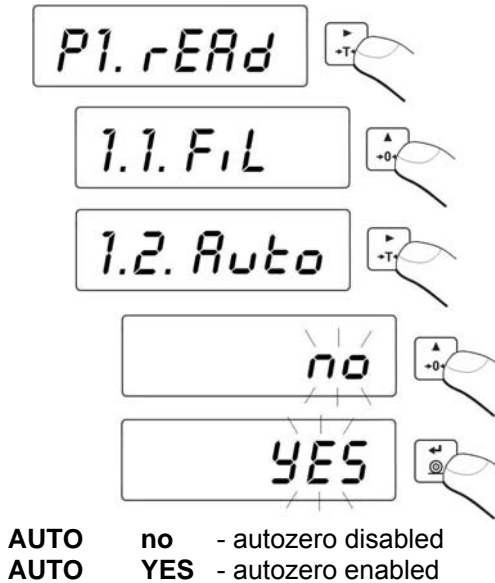
- Return to the weighing mode saving introduced modifications.

14.3. Tare

Function enables setting appropriate parameters related with taring.

Procedure:

- Enter **<P1.rEAd>** submenu.
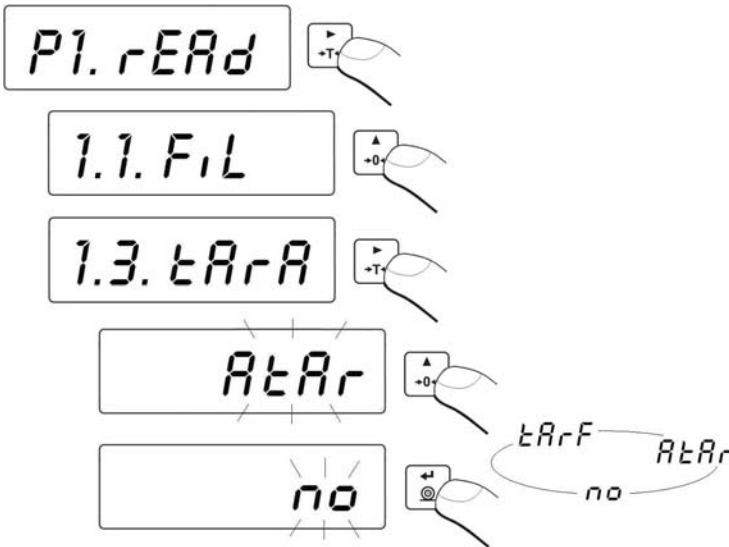
| **tare** | **AtAr** | - | **automatic tare** - saved after the power supply is disconnected; |

| **tare** | **no** | - | **basic tare mode** (taring using ⏩+T+ key); |

| **tare** | **tArF** | - | **tare storage** - last tare value is stored in balance's memory. Tare value is automatically displayed on restarting the balance. |

- Return to the weighing mode saving introduced modifications.

14.4. Median Filter

Median filter enables eliminating short impulse interferences (e.g. mechanical shocks).

Procedure:

- Enter **<P1.rEAd>** submenu.
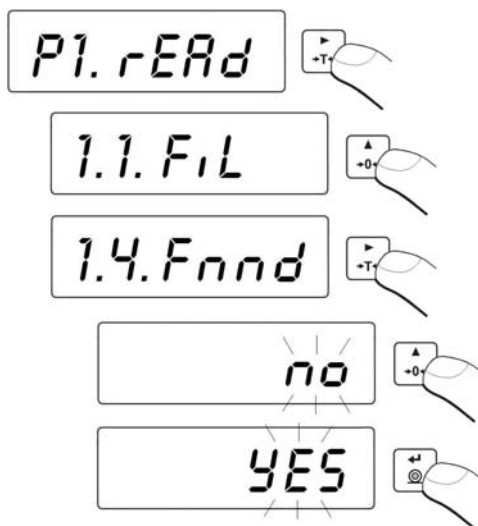
Fnnd   **no**   - median filter disabled
Fnnd   **YES** - median filter enabled

- Return to the weighing mode saving introduced modifications.

15. RS 232 SETTINGS

External devices connected to RS 232C have to be supplied from the same mains with common electric shock protection. It prevents from appearing potential difference between neutral conductors of the two devices. This notice does not apply to the devices that do not use neutral conductors.

Transmission parameters:

- Baud rate - 2400 - 38400 bit/s
- Data bits - 7, 8
- Stop bits - 1, 2
- Parity - no, even, odd

The indication can be sent by serial port to peripheral device in one of the following ways:

- **Manually** - on pressing ⏎ key,
- **Automatically** - on indication stabilization,
- **Continuously**- on function activation or on sending control command,

- **On external request** - see description in point: COMMUNICATION PROTOCOL.

The indication can be sent by serial port to peripheral device in one of the following ways:
- **stable -** information is send on indication stabilization
- **unstable** – on pressing ⏎ key the indication is send to peripheral device and „**?**" pictogram is printed on a printout before weighing result.

15.1. Printout type

Parameter enables selecting printout type.

Procedure:

- Enter **<P2.Prnt>** submenu.
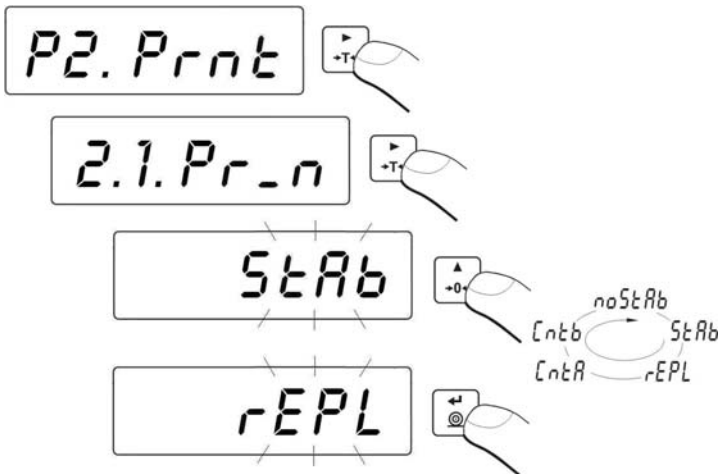
Pr_n	**noStAb**	-	Unstable weighing results printout.
			Function unavailable for non-verified balances.
Pr_n	**StAb**	-	Stable weighing results printout.
Pr_n	**rEPL**	-	Automatic operation
Pr_n	**CntA**	-	Continuous transmission in basic unit.
Pr_n	**Cntb**	-	Continuous transmission in current unit.

- Return to the weighing mode saving introduced modifications.

15.2. LO Threshold

<2.2.S_Lo> parameter is connected with automatic operation.

Next, taring is saved when mass indication is below **LO threshold** gross value.

For automatic operation enabled, the indication is send to computer or printer when mass indication is below net value of **Lo threshold**.

Animal weighing starts when animal mass exceeds gross value of **Lo threshold**.

Procedure:

- Enter **<P2.Prnt>** submenu.
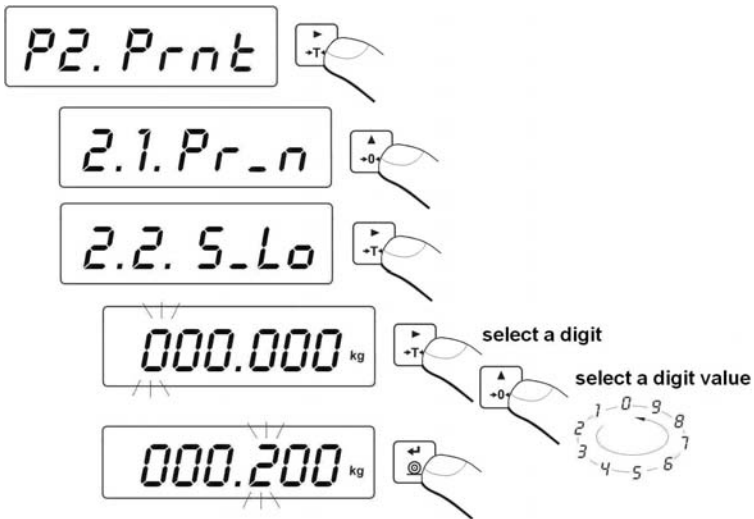
- Return to the weighing mode saving introduced modifications.

15.3. Baud Rate

Procedure:

- Enter **<P2.Prnt>** submenu.
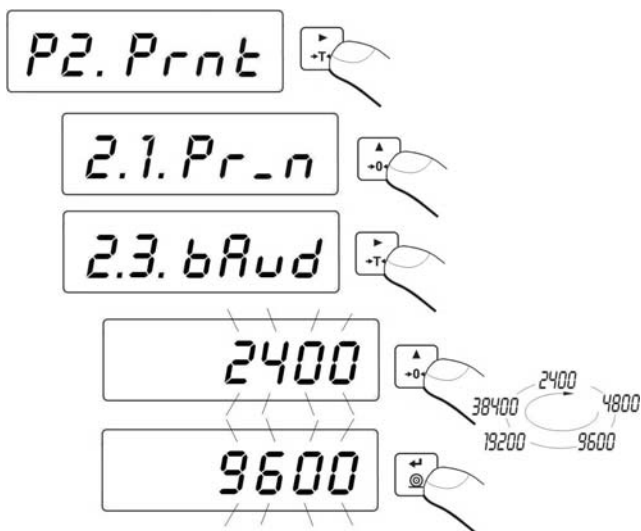
- Return to the weighing mode saving introduced modifications.

15.4. Setting Serial Communication Parameters

- Enter **<P2.Prnt>** submenu.
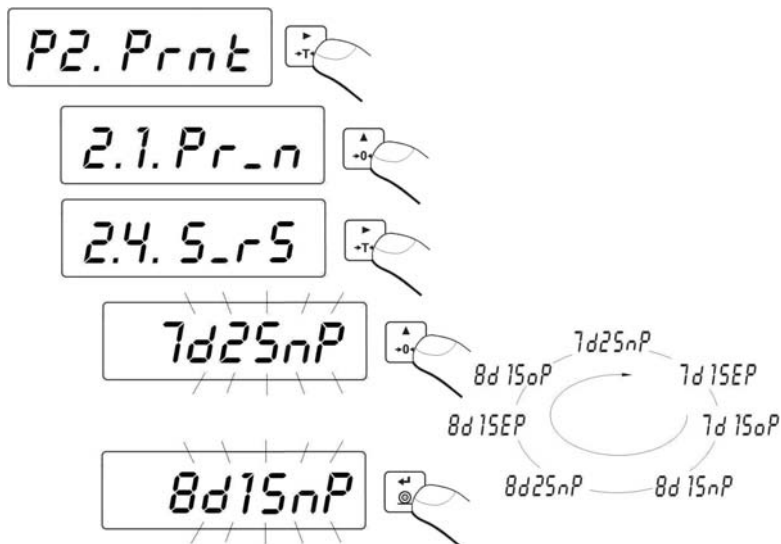
7d2SnP - 7 data bits; 2 stop bits, no parity
7d1SEP - 7 data bits; 1 stop bit, EVEN parity

7d1SoP - 7 data bits; 1 stop bit, ODD parity
8d1SnP - 8 data bits; 1 stop bits, no parity
8d2SnP - 8 data bits; 2 stop bits, no parity
8d1SEP - 8 data bits; 1 stop bit, EVEN parity
8d1SoP - 8 data bits; 1 stop bit, ODD parity

- Return to the weighing mode saving introduced modifications.

16. MISCELLANEOUS

You can set the following parameters: backlight, 'beep' signal, automatic shutdown. The parameters are to be found in **<P5.Misc>** submenu.

16.1. Backlight

The balance automatically selects type of backlight on recognising power supply type (mains, batteries):
- **bL** – mains
- **blbA** – battery

16.1.1. Backlight for Power Supply From Mains

Procedure:

- Enter **<P5.Misc>** submenu.
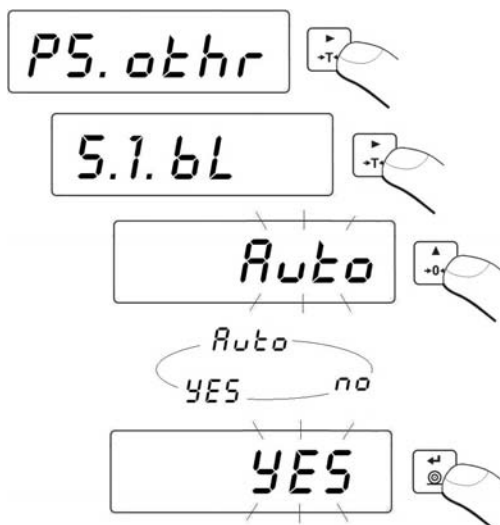
bL	**no**	-	backlight disabled
bL	**YES**	-	backlight enabled
bL	**Auto**	-	backlight automatically disabled when
			indication does not change over 10s

- Return to the weighing mode saving introduced modifications.

Caution:
*For **bL=Auto** setting, the backlight is automatically disabled when the indication remains unchanged for 10s. Backlight is automatically enabled on displayed indication change.*

16.1.2. Backlight for Power Supply From Mains or Battery

You can change display brightness: 0% - backlight disabled, 100% - maximum brightness. For lower intensity of the brightness, battery operation time increases. The function is set to **Auto** value when the brightness is set.

Procedure:

- Enter **<P5.Misc>** submenu.
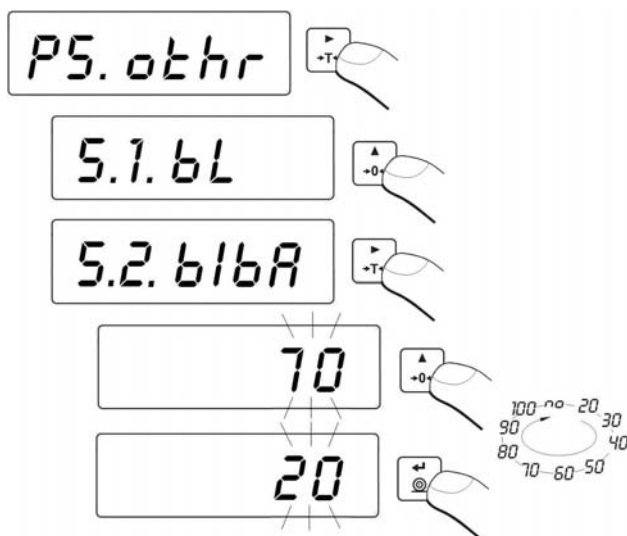
- Return to the weighing mode saving introduced modifications.

Caution:
Using backlight shortens battery operation time.

16.2. 'Beep' Sound

Procedure:

- Enter **<P5.Misc>** submenu.
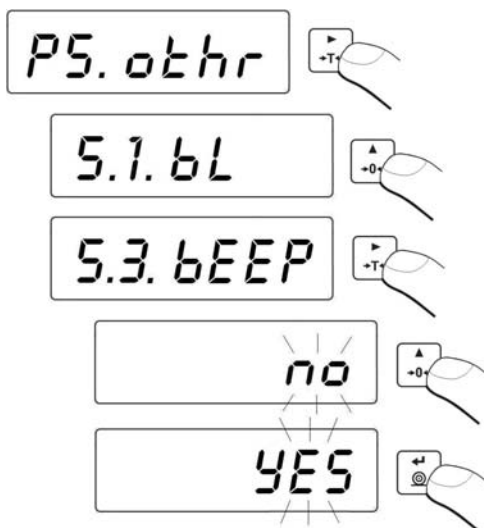
bEEP   no   - 'beep' sound disabled
bEEP   YES - 'beep' sound enabled

- Return to the weighing mode saving introduced modifications.

16.3. Automatic Shutdown

The function enables saving battery power. When **t1** parameter is active, the balance is automatically shut down within 5 minutes when there was no weighing carried out (indication did not change).

Function Operation According to Power Supply Type

Function setting	Function operation	
	Mains	**Battery**
t1 = 0	Disabled	Disabled
t1 = YES	Enabled	Enabled
t1 = Auto *	Disabled	Enabled

* function is enabled or disabled automatically depending on power supply type.

Procedure:

- Enter **<P5.Misc>** submenu.

$$P5.othr$$

$$5.1.bL$$

$$5.4.tI$$

$$Auto$$

$$Auto$$
$$YES \quad no$$

$$YES$$
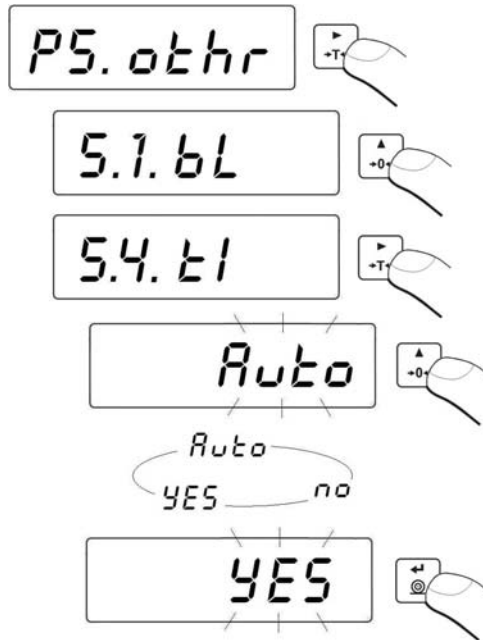
- Return to the weighing mode saving introduced modifications.

16.4. Battery Charging

Option allows to enable or disable batteries charging.

a) **<5.5.CHr6>** parameter set to **<no>** value:
- pictogram is not displayed, charging disabled.
- Message **<bAtt>** is displayed on switching on the balance.

b) <5.5.CHr6> parameter set to **<YES>** value:
- pictogram blinks slowly during charging (2s interval), charging enabled.
- Message **<nlmh>** is displayed on balance turning on.
- When there is no battery (batteries) or the battery is broken pictogram blinks quickly 0.5s interval).

Caution:
*Balances are equipped with **NiMH-type** batteries of **R6 (AA)** size and power supply.*

Procedure:

- Enter **<P5.Misc>** submenu.
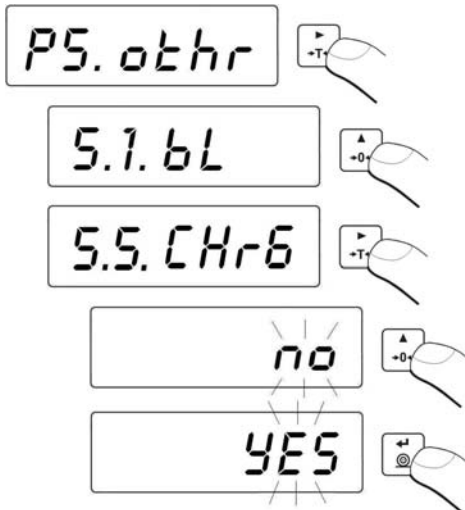
CHr6 YES   - function enabled (signalling enabled)
CHr6 no   - function disabled (signalling disabled)

- Return to the weighing mode saving introduced modifications.

17. WORKING MODES

The balance features the following working modes:

- Weighing,
- Parts counting,
- +/- control
- Percent weighing
- Autotare,
- Peak hold
- Totalising,
- Animal weighing
- Tare values storage

17.1. Running Working Mode

- In home screen press $\boxed{\text{Esc F}}$ key. Name of first available working mode is displayed.
- Press $\boxed{\text{▲ →0←}}$ key to view available working modes.
- Press $\boxed{\text{► →T←}}$ key to enter a working mode.

Caution:
The balance is restarted with the weighing mode activated!!!

17.2. Working Modes Accessibility

In **<4.2.Funi>** parameter you can declare functions available on pressing $\boxed{\text{Esc F}}$ key.

Procedure:

- Enter **<P4.Func>** submenu.
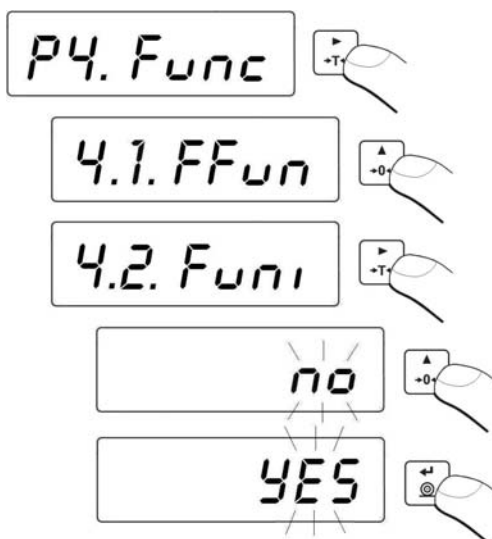
no - mode unavailable
YES - mode available

Caution:
To make other modes available follow the abovementioned procedure.

- Return to the weighing mode saving introduced modifications.

17.3. Selection of Modes Quantity Available For the User

Function enables selecting whether on pressing [Esc F] key will be available all modes (option **<ALL>**) or just one selected and used by an operator.

Procedure:

- Enter **<P4.Func>** submenu.
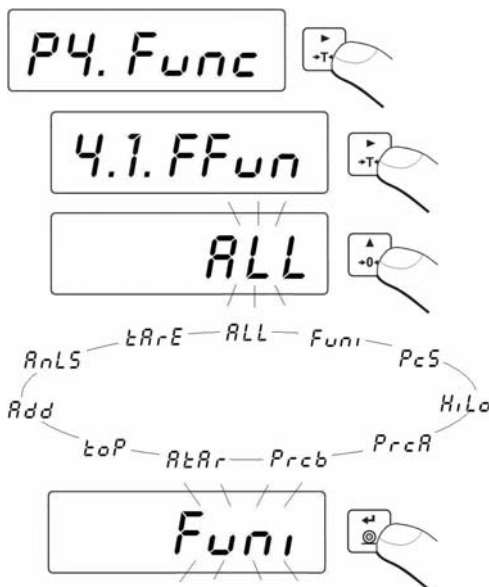
- Return to the weighing mode saving introduced modifications.

17.4. Counting Parts of the Same Mass

Standard balance is equipped with option of counting parts of the same mass. When you use a container to carry out parts counting, first tare it.

Caution:

1. *Parts counting does not work with other functions of the balance.*
2. *Parts counting function is not active on balance restart.*

Procedure:

- Enter **<PcS>** submenu.

- Blinking quantity of parts is displayed. Press [▲ →0←] key to select parts quantity. Press [↵ ⊚]: key to confirm.
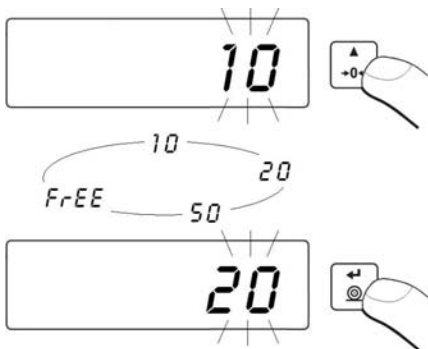
- If **<LASt>** value is selected, last determined mass of a single part is displayed for3s. Balance automatically returns to **Parts counting** mode and sets value displayed before.
- If **<FrEE>** value is selected, the following window is displayed:

- Press [▲ →0←] and [▶ →T←] keys to enter parts quantity, where: [▶ →T←] - selecting the digit, [▲ →0←] - selecting digit's value,

- Press [↵ ⊚] key to confirm.
- Message **<LoAd>** is displayed. Next, the following window is displayed:

blinking pictogram
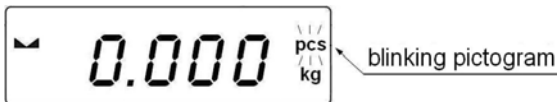
- If the parts are to be weighed in a container, first put it onto weighing pan and then tare it. Next, load the weighing pan with declared amount of parts. When the indication is stable (pictogram ◣◢ is displayed) confirm its mass:
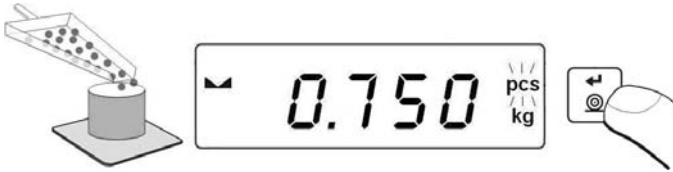
- Mass of a single part is measured automatically. **Parts counting** mode and parts quantity [pcs] are displayed.

Caution:

1. *If you press* ⟲ *key when the weighing pan is not loaded with parts, error message -Lo- is displayed for a few seconds and the balance automatically returns to weighing mode.*

2. *In order to obtain reliable results, load the weighing pan with parts which mass value of a single part is greater than 5 reading units.*

3. *If mass of a single part is smaller than reading unit, message <Err5> is displayed and short signal is emitted. Balance returns to the weighing mode.*

Function disabling:

Press ⌊Esc F⌋ *key twice.*

17.5. +/- Control Against Set Reference Sample Mass

+/- control mode enables entering checkweighing thresholds values (**Min**, **Max**).

Procedure:

- Enter **<HiLo>** submenu,
- Window for setting (**Min**) threshold value is displayed:
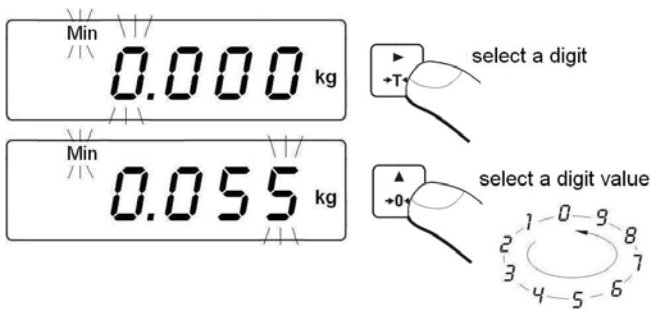
- Press ⏎ key to confirm. Window for setting (**Max**) threshold value is displayed automatically:
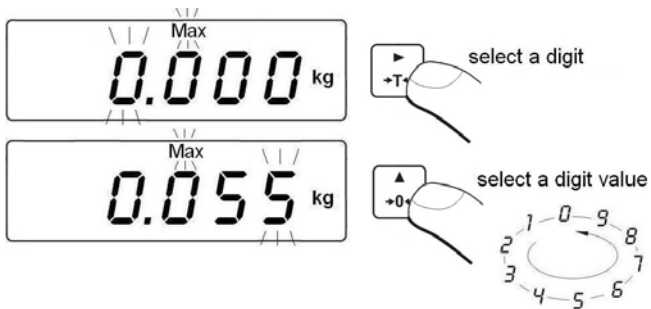
- Press ⏎ key to confirm. Weighing mode home screen is displayed automatically with saved thresholds values.
- The following dependencies occur during setting threshold values:

load mass below the I threshold

load mass between the thresholds

load mass above II threshold
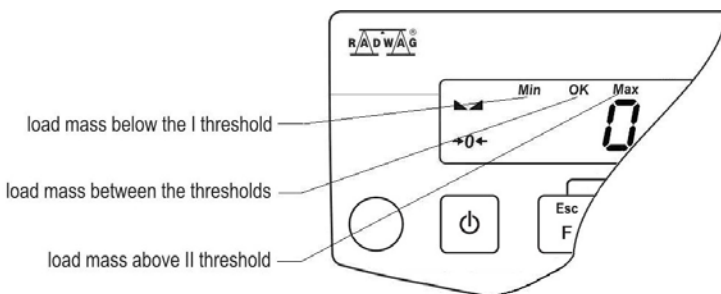
Caution:
If value of entered low threshold (Min) is greater than high threshold value (Max), error message is displayed and the balance returns to the weighing mode.

Function disabling:

Press $\boxed{\begin{smallmatrix}\text{Esc}\\\text{F}\end{smallmatrix}}$ *key twice.*

17.6. Percent Weighing Against Reference Sample Mass

Percent weighing mode enables comparison of measured sample with reference mass. The result is expressed in [**%**]. Reference mass can be determined by weighing (**PrcA** parameter) or entered to balance's memory (**PrcB** parameter).

17.6.1. Reference Mass Determined by Weighing

Procedure:

- Enter **<PrcA>** submenu,
- Message **<LoAd>** is displayed. Next, the following window is displayed:

blinking pictogram
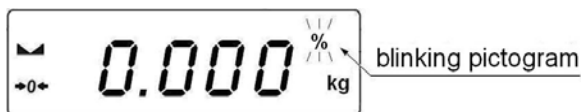
- Load the weighing pan with reference mass. When the indication is stable

  (▶◀ pictogram is displayed) press $\boxed{\begin{smallmatrix}\leftarrow\\\circledcirc\end{smallmatrix}}$ key to confirm the mass.
- Display indicates **100,000%** value,
- Difference between values of loaded mass and reference mass is displayed in [%].

Function disabling:

Press $\boxed{\begin{smallmatrix}\text{Esc}\\\text{F}\end{smallmatrix}}$ *key twice.*

17.6.2. User-Determined Reference Mass

Procedure:

- Enter **<Prcb>** submenu,
- The following window is displayed:

blinking pictogram

- Press ▲/+0+ and ►/+T+ keys to enter **reference mass value**,

  where: ►/+T+ - selecting the digit, ▲/+0+ - selecting digit's value,

- Press ↵/@ key to confirm.
- Display indicates **0,000%** value,
- Difference between values of loaded mass and reference mass is displayed in [%].

Function disabling:

Press [Esc F] *key twice.*

17.7. Autotare

Autotare enables quick net weight determination of weighed objects when tare value is different for next loads. When autotare is enabled, operation is as follows:

- For empty weighing pan press zeroing key,
- Load the weighing pan with the packaging,
- On indication stabilization, packaging mass is **automatically tared** (**Net** pictogram is displayed in the upper part of the display),
- Insert object into packaging,
- Object net weight is displayed,
- Unload the weighing pan (object and packaging),
- Indication zeroes,
- Load the weighing pan with another object, on indication stabilization, packaging mass is automatically tared (**Net** pictogram is displayed in the upper part of the display),
- Insert next object into packaging.

Function disabling:

Press [Esc F] *key twice.*

17.8. Peak Hold

Procedure:

- Enter **<toP>** submenu,
- On selecting peak hold option, pictogram **Max** is displayed in the upper part of the display.

- Load the weighing pan with variable force, maximum value of the force is snapped and displayed.

- Unload the weighing pan.

- Prior next weighing press $\boxed{\begin{array}{c}\blacktriangle\\ \rightarrow 0 \leftarrow\end{array}}$ key.

   Function disabling:

   Press $\boxed{\begin{array}{c}\text{Esc}\\ F\end{array}}$ *key twice.*

17.9. Totalizing

Totalizing mode enables mass totalizing of weighed ingredients and printing totalizing report on a printer connected to the balance.

17.9.1. Totalizing Procedure

- Enter **<Add>** submenu,
- On selecting **<Add>** option, pictogram „**P"** is displayed in the left part of the display.
- Load the weighing pan with first object. If the objects are to be weighed in a container, first put it onto weighing pan and then tare it. Next, load the weighing pan with the object. When the indication is stable (pictogram ▬◢ is displayed) confirm its mass: $\boxed{\begin{array}{c}\leftarrow\\ \textcircled{\odot}\end{array}}$
- Weighings sum and '▲' pictogram are displayed in the right upper corner of the display and the weighing result is printed out using printer connected to the balance.

$$1.912 \text{ kg}$$
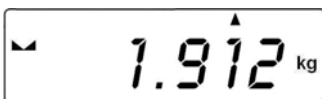
- Unload the weighing pan. **ZERO** indication and „**P**" pictogram are displayed,
- Load the weighing pan with next object.

- On indication stabilization, press ⌨ key. Total sum of the first and the second weighing and pictogram „▲" are displayed in the right upper part of the display. The weighing result is printed out using printer connected to the balance.
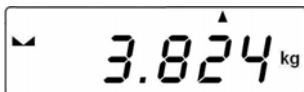
$$3.824 \text{ kg}$$

- Press ⌨ key to finish the process (with loaded or unloaded weighing pan). Total sum of all saved measurements is printed out using printer connected to the balance:

> (1) 1.912 kg
> (2) 1.912 kg
> ------------------------
> TOTAL: 3.824 kg

- When you press ⌨ key with loaded weighing pan, message **<unLoAd>** is displayed. Unload the weighing pan, **ZERO** indication and „**P**" pictogram are displayed. The balance is ready for next totalizing process.

- When you press ⌨ key with unloaded weighing pan, „**P**" pictogram is displayed on the left. The balance is ready for next totalizing process.

17.9.2. Last Total Sum Value Storage

On aborting totalizing (balance disabling, power loss etc.) you can restart the process with last total sum calculated. In order to restart totalizing:

- Enter **<Add>** submenu,
- Value of a total sum saved before balance restart is displayed.

- In order to continue totalizing process press ⏎ key. **ZERO** indication and „**P**" pictogram are displayed. The balance is ready for next totalizing process.

- In order to finish totalizing process, press $\boxed{F}$, $\boxed{→0←}$ or $\boxed{→T←}$ key. „**P**" pictogram is displayed in the left part of the display. The balance is ready for next totalizing process.

17.9.3. Function disabling:

- Press $\boxed{F}$ key, the following window is displayed:

$$Prnt\ ?$$

- Prior leaving **<Add>** option, you can print out mass values of single loads and total sum of the totalizing process using printer connected to the balance (press ⏎ key to print and $\boxed{F}$ key to cancel printing).
- Message **<ESC?>** is displayed,

- In order to return to the weighing mode, press ⏎ key,

- In order to return to the totalizing mode, press $\boxed{F}$ key.

Caution:
In case of exceeding display range of totalized mass on balance's display, message <5-FULL> is displayed. In such case, unload the weighing pan and press ⏎ key to finish totalizing process and print out total sum using printer connected to the balance. Load the weighing pan with smaller mass that does not exceed display range of totalized mass.

17.10. Animal Weighing

Procedure:

- Enter **<AnLS>** submenu,
- For **1s** message **<tinnE>** is displayed. Next, window for setting duration (in seconds) of animal weighing is displayed:

$$tinnE$$

$$5\;5$$

60 S — 5 S — 10 S
50 S — 40 S — 30 S — 20 S

$$40\;S$$
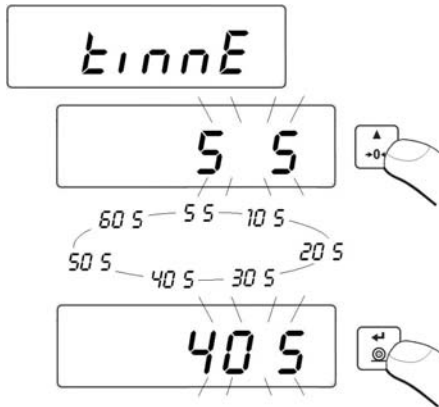
- Press key to confirm. The following window is displayed:

$$\overset{\smile}{\underset{\rightarrow 0\leftarrow}{}}A\;\;0.000\;\text{kg}$$

- Load the weighing pan with an animal,
- On exceeding set value of **-LO-** parameter, animal weighing starts. **< - - - - - - ->** pictogram signalling process progress is displayed.
- On process completion mass value of an animal is snapped and displayed together with *OK* pictogram in the upper part of the display.

$$\overset{OK}{\underset{\rightarrow 0\leftarrow}{\smile}}\;89.450\;\text{kg}$$
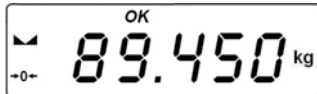
- Press key to restart animal weighing.
- On process completion and unloading the weighing platform, the following window is displayed:

$$\overset{\smile}{\underset{\rightarrow 0\leftarrow}{}}A\;\;0.000\;\text{kg}$$

Function disabling:

Press key.

17.11. Tare Values Storage

You can enter 9 tare values to balance memory.

17.11.1. Entering Tare Value to Balance Memory

Procedure:

- Enter **<tArE>** submenu,
- Window with the name of first tare **<tArE 0>** is displayed in tare database

  (press [▲ →0←] key to select other record):
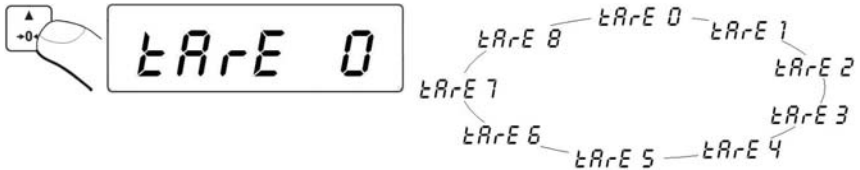
- On selecting the tare, press [► →T←] key. The following window is displayed:
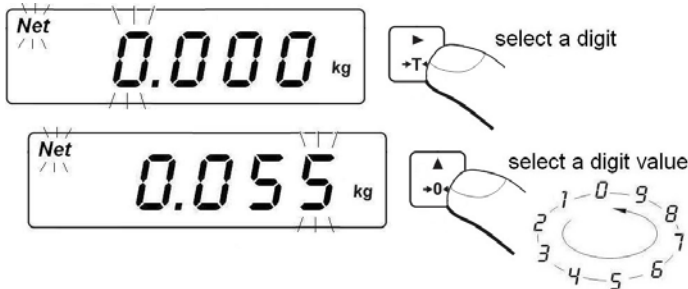
- Enter set **tare value** by pressing [↵ ⊚] key,
- The following window is displayed:

Function disabling:

Press [Esc F] key.

17.11.2. Selecting Tare Value in Balance Memory

- Enter **<tArE>** submenu,
- Window with the name of first tare **<tArE 0>** is displayed in tare database

(press [▲ +0+] key to select other record):
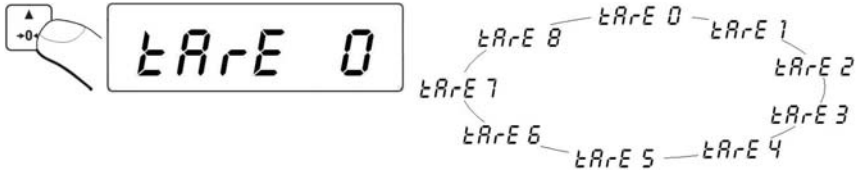
- Press [↵ ◎] key to use selected tare,
- The value of used tare with minus sign and **Net** pictogram are displayed in the left upper part of the display:

Caution:
Entered tare value is not saved on balance restart.

18. ADJUSTMENT

option available for non-verified balances exclusively

In order to ensure the highest weighing accuracy, it is recommended to periodically introduce a corrective factor of indications to balance memory, the said factor must be referred to the reference mass. Adjustment has to be carried out prior first weighing or if the ambient temperature has changed dynamically. Prior adjustment unload the weighing pan.

18.1. Adjustment

Procedure:

- Enter **<P6.CAL>** submenu. Next:

$$P6.\ CAL$$

$$6.1.\ 5t\_u$$

$$6.2.\ uCAL$$

- The following messages are displayed:

$$noCAL$$
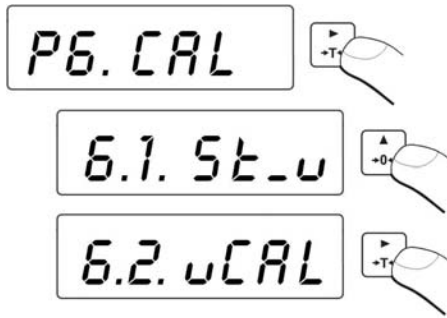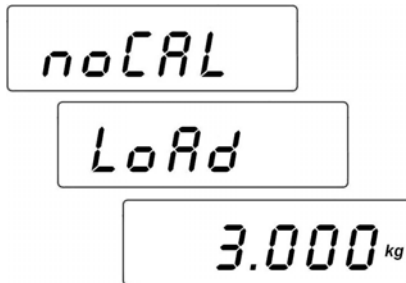
$$LoAd$$

$$3.000\ {}_{kg}$$

- During this time, determination of balance start mass is carried out. On process completion, mass of an adjustment weight is displayed (e.g. **3.000kg**).
- Load the weighing pan with weight of displayed value,
- Adjustment process starts automatically on loading the weighing pan with the weight. The following message is displayed:

$$CAL$$

- Adjustment process completion is signalled by the following message:
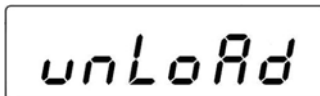
$$unLoAd$$

- Unload the weighing pan. Message **<donE>** is displayed for 1 s. Balance returns to displaying adjustment submenu name:

$$donE$$

$$6.2.uCAL$$

- Adjustment process can be aborted at any time. To do that, press [Esc F] key. The following message is displayed:

$$Abort$$

Caution:

1. *It is crucial to carry out balance adjustment with unloaded weighing pan!*
2. *If adjustment process takes more than 15 seconds then **<Err8>** error message is displayed and short sound signal is emitted. Press [Esc F] key and carry out adjustment procedure again. Remember to maintain stable ambient conditions!*

- Return to the weighing mode saving introduced modifications.

18.2. Start Mass Determination

If the balance does not require adjustment or you do not have suitable amount of weights, you can determine balance start mass.

Procedure:

- Enter **<P6.CAL>** submenu. Next:

$$P6.CAL$$
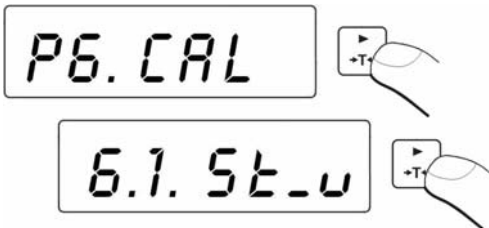
$$6.1.St\_u$$

- The following messages are displayed:

$$StCAL$$

$$donE$$

- On completion of start mass determination, the balance returns to displaying name of the parameter:

$$6.1.\ St\_u$$

- Start mass determination can be aborted at any moment. To do that, press $\boxed{\substack{\text{Esc}\\F}}$ key. The following message is displayed:

$$Abort$$

Caution:

*If start mass determination takes more than 15 seconds then **<Err8>** error message is displayed and short sound signal is emitted. Press $\boxed{\substack{\text{Esc}\\F}}$ key and carry out adjustment procedure again. Remember to maintain stable ambient conditions!*

- Return to the weighing mode saving introduced modifications.

19. COOPERATION WITH PRINTER

Press $\boxed{\substack{\leftarrow\\ @}}$ key to send current mass value with mass units to the printer.

Depending on **STAB** parameter setting, you can print current or stable value. Depending on **REPL** parameter setting, printout can be automatic or manual. The following printer can cooperate with the balance:

Connection cable - diagram:
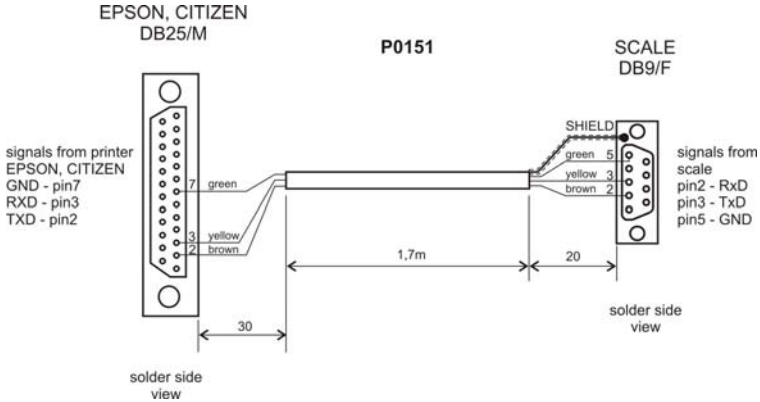
Balance - printer cable (EPSON)

20. COOPERATION WITH COMPUTER

You can send the results to the computer:

- **manually**   -   on pressing [↵ ◎] key

- **continuously**   -   on function activation or on sending control command

- **automatically**   -   on indication stabilization

- **on computer request**   -   on sending control command

Connection cable - diagram:
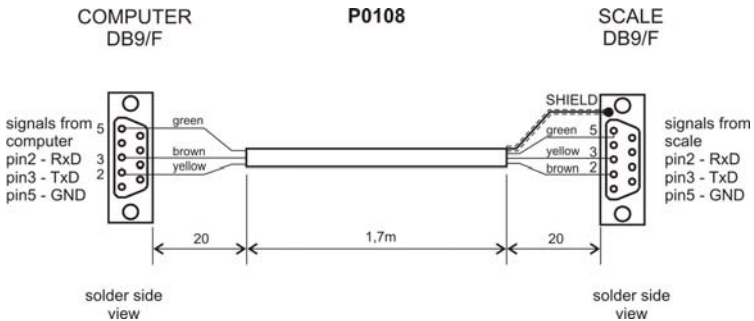
Balance - computer cable

The balance enables cooperation with **„*SCALE EDITOR*"** computer software. Balance window in the software comprises the same crucial information on weighing as balance's display. The software enables uncomplicated way of balance configuration, e.g. printouts customization, main parameters and RS232 parameters edition. For detailed description of balance-software cooperation go to **„Help…"** bookmark.

21. COMMUNICATION PROTOCOL

21.1. General Information

A. A character based communication protocol balance-terminal is designed for establishing communication between a RADWAG balance and a peripheral device via RS-232C interface.
B. The protocol consists of commands sent from a peripheral device to the balance and responses from the balance.
C. Responses are sent from the balance each time a command is received.
D. Commands, forming the communication protocol, enable obtaining data on balance status and facilitate influencing balance operation, e.g.: acquiring measurement results from the balance, monitoring the display, etc.

21.2. List of Commands

Command	Command overview
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 measurement 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
K1	Lock balance keypad

K0	Unlock balance keypad
NB	Give balance serial number
PC	Send all implemented commands

Caution:
1. *Each command must end with CR LF characters;*
2. *Wait before sending another command until the former answer has been received, otherwise the answers may be lost.*

21.3. Response Format

On receipt of a command, the indicator responds as follows:

XX_A CR LF	command understood and in progress
XX_D CR LF	command carried out (appears only after the XX_A command)
XX_I CR LF	command understood but not accessible at this moment
XX _ ^ CR LF	command understood but max threshold is exceeded
XX _ v CR LF	command understood but min threshold is exceeded
ES_CR LF	command not recognised
XX _ E CR LF	time limit exceeded while waiting for stable measurement result (time limit is a characteristic balance parameter)

XX   - name of a sent command
_   - space

21.4. Commands Overview

21.4.1. Zeroing

Format: **Z CR LF**

Response options:

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

21.4.2. Tarring

Format: **T CR LF**

Response options:

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

21.4.3. Give Tare Value

Format: **OT CR LF**

Response: **OT_TARA CR LF** - command carried out

Response format:

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

Tare - 9 characters, right justification
Unit - 3 characters, left justification

21.4.4. Set tare

Format: **UT_TARA CR LF**, where **TARA** - tare value

Response options:

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.

21.4.5. Send stable measurement result in basic measuring unit

Format: **S CR LF**

Response options:

S_A CR LF **S_E CR LF**	command understood and in progress 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 **MASS FRAME**	command understood and in progress response: 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: mass value in basic measuring unit.

21.4.6. Immediately send measurement result in basic measuring unit

Format: **SI CR LF**

Response options:

SI_I CR LF	command understood but not accessible at this moment
MASS FRAME	immediate response: 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

Example:

S I CR LF – command sent from a computer
S I _ ? _ _ _ _ _ _ _ 1 8 . 5 _ k g _ CR LF - command carried out,
immediate response: mass value in basic measuring unit

21.4.7.Send stable measurement result in current measuring unit

Format: **SU CR LF**

Response options:

SU_A CR LF **SU_E CR LF**	command understood and in progress 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 **MASS FRAME**	command understood and in progress response: 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: mass value in current measuring unit.

21.4.8.Immediately send measurement result in current measuring unit

Format: **SUI CR LF**

Response options:

SUI_I CR LF	command understood but not accessible at this moment
MASS FRAME	immediate response: 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

Example:

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

21.4.9. Switch on continuous transmission in basic measuring unit

Format: **C1 CR LF**

Response options:

C1_I CR LF	command understood but not accessible at this moment
C1_A CR LF **MASS FRAME**	command understood and in progress response: 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

21.4.10. Switch off continuous transmission in basic measuring unit

Format: **C0 CR LF**

Response options:

C0_I CR LF	command understood but not accessible at this moment
C0_A CR LF	command understood and carried out

21.4.11. Switch on continuous transmission in current measuring unit

Format: **CU1 CR LF**

Response options:

CU1_I CR LF	command understood but not accessible at this moment
CU1_A CR LF **MASS FRAME**	command understood and in progress response: 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

21.4.12. Switch off continuous transmission in current measuring unit

Format: **CU0 CR LF**

Response options:

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

21.4.13. Lock balance keypad

Format: **K1 CR LF**

Response options:

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

Caution:
Command is not saved on balance restart.

21.4.14. Unlock balance keypad

Format: **K0 CR LF**

Response: **K0_OK CR LF** - command carried out

21.4.15. Give balance serial number

Format: **NB CR LF**

Response options:

NB_A_"Nr fabryczny" CR LF	command understood, response: serial number
NB_I CR LF	command understood but not accessible at this moment

"nr fabryczny" – serial number of the device. Inserted in between inverted commas.

Example:

NB CR LF – command sent from a computer
NB_A_"123456" CR LF – balance serial number - 123456

21.4.16. Send all implemented commands

Format: **PC CR LF**

Response: **PC_- >_Z,T,OT,UT,S,SI,SU,SUI,C1,C0,CU1,CU0,K1,K0,NB,PC** - command carried out, all implemented commands have been sent.

21.5. Manual Printout / Automatic Printout

It is possible to generate printouts either manually or automatically.
- Manual printout is generated for stable weighing result. Load the platform,

  wait for a stable result and press ⏎⊙ key.
- Automatic printout is generated for stable weighing result. Load the platform, wait for a stable result. No key needs to be pressed.

Caution:
For verified balance option of temporary weighing results printout is disabled.

Format:

1	2	3	4 -12	13	14	15	16	17	18
stability marker	space	character	mass	space	unit			CR	LF

Stability marker	[space] if measurement result stable [?] if measurement result unstable [^] if high limit is out of range [v] if low limit is out of range
character	[space] for positive values [-] for negative values
Mass	9 characters with decimal point, right justification
unit	3 characters, left justification
Command	3 characters, left justification

Example 1:

_ _ _ _ _ _ 1 8 3 2 . 0 _ g _ _ CR LF - printout generated upon pressing ENTER/PRINT key.

Example 2:

? _ - _ _ _ _ 2 . 2 3 7 _ l b _ CR LF - printout generated upon pressing ENTER/PRINT key.

Example 3:

^ _ _ _ _ _ _ **0 . 0 0 0** _ **k g** _ **CR LF** - printout generated upon pressing ENTER/PRINT key.

21.6. Continuous Transmission

For continuous transmission the balance provides option of mass measurement printout in basic unit and in additional unit. The mode can be activated with command sent via interface, or by setting respective parameter values.

Format is valid for **<P2.Prnt>** parameter set to **CntA** value:

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

Stability marker	[space] if measurement result stable
	[?] if measurement result unstable
	[^] if high limit is out of range
	[v] if low limit is out of range
character	[space] for positive values
	[-] for negative values
Mass	9 characters with decimal point, right justification
unit	3 characters, left justification
Command	3 characters, left justification

Format valid for **<P2.Prnt>** parameter set to **Cntb** value:

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

Stability marker	[space] if measurement result stable
	[?] if measurement result unstable
	[^] if high limit is out of range
	[v] if low limit is out of range
character	[space] for positive values
	[-] for negative values
Mass	9 characters with decimal point, right justification
unit	3 characters, left justification
Command	3 characters, left justification

21.7. Printout Customization

GENERAL INFORMATION

Standard printout content can be customized. Using **SCALES EDITOR**. freeware software it is possible to specify which data is to be printed, which not. In order to download the software visit RADWAG website: http://www.radwag.com. In order to download the software, visit RADWAG website:
http://www.radwag.pl

22. TECHNICAL SPECIFICATIONS

Scales model:	WTC 600
Max capacity	600g
Min capacity	0.5g
Readability [d]	0.01g
Verification unit [e]	0.1g
Tare range	-600g
Repeatability	0.01g
Linearity	±0.02 g
Stabilization time	2 s
OIML class	II
Weighing pan dimensions	128x128mm
IP rating	IP 43
Operating temperature	+15°C ÷ +30°C
Power supply	100 ÷ 240 V AC, 50 ÷ 60 Hz / 12 V DC + battery
Battery operating time	33h (average time)
Display	LCD with backlight
RS232	x1
Net/gross weight	1.3 / 2kg
Packaging dimensions	330x230x140mm

23. TROUBLESHOOTING

Problem	Cause	Solution
The balance does not switch on	Battery (batteries) discharged,	Connect it to the mains, charge the battery (batteries)
	No batteries (batteries not installed or installed incorrectly)	Check if batteries are installed correctly (polarization)
The balance switches off automatically	't1' parameter set to 'YES' value (the balance switches off automatically)	In 'Misc' menu change <5.4.t1> parameter setting to 'no' value.
During switching on, message 'LH' is displayed	Weighing pan loaded during switching on	Unload the weighing pan. Zero indication is displayed.

24. ERROR MESSAGES

Err2 - Value beyond zero range.

Err3 - Value beyond tare range.

Err4 - Adjustment weight or start mass out of range ($\pm$1% for adjustment weight, $\pm$10 for start mass).

Err5 - Single part mass value is lower than reading unit value.

Err8 - Tarring / zeroing / start mass determination / adjustment operation time exceeded.

null - Zero value from converter.

FULL2 - Weighing range exceeded.

LH - Start mass error, indication out of range (-5% – +15% of start mass).

5–FULL - Limited screen capacity, display of full indication value for totalizing function is impossible.

Caution:

1. *Errors: You are informed about display of **Err2, Err3, Err4, Err5, Err8, null** errors by short sound signal (1 second).*
2. *You are informed about display of **FULL2** error by continuous sound signal lasting as long as excess load remains on the weighing pan.*

25. ADDITIONAL EQUIPMENT

Accessories:

- **P0108** - computer cable
- **P0151** - EPSON printer cable
- **K0047** - 12V DC cigarette lighter cable
- **EPSON** - thermal printer
- **EPSON** - dot matrix printer
- **AP2-1** - power loop output
- **KR-01** - RS232/RS485 converter
- **KR-04-1** - RS232/Ethernet converter
- **SAL/STONE/H** - anti-vibration stainless table
- **SAL/STONE/C** - anti-vibration painted table
- Mass standards with accessories.

Computer software:

- Scale Editor
- RAD-KEY
- PW-WIN