USER GUIDE

WTC 2000

Radwag

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Software manual

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CBCP-01

Character-based Communication Protocol
WLC Precision Scale
WLC C/2 Precision Scale
WTC Precision Scale
C315 Industrial Scale
C315 Industrial Scale

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1. GENERAL INFORMATION

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

***)** - availability conditioned by scale type.

2. LIST OF COMMANDS

Command	Command overview
Z	Zero scale
T	Tare scale
TZ	Tare/Zero scale
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 scale keypad
K0	Unlock scale keypad
DH	Set min checkweighing threshold.
UH	Set max checkweighing threshold.
ODH	Give value of min checkweighing threshold.
OUH	Give value of max checkweighing threshold.

SS	Simulation of pressing ENTER/PRINT key.
SM	Set mass value of a single item.
BP	Activate sound signal.
BN	Give balance type
FS	Give Max capacity
RV	Give program version
A	Set autozero function
IC	Internal adjustment performance
IC1	Disable automatic internal adjustment of the balance
IC0	Enable automatic internal adjustment of the balance
UI	Give accessible units
US	Set current unit
UG	Give current unit
NB	Give scale serial number
PC	Send all implemented commands

⚠	***Each command must end with CR LF characters.***

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 scale parameter)

XX - name of a sent command.
_ - space.

4. COMMANDS OVERVIEW

4.1. Zero Scale

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

4.2. Tare Scale

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

4.3. Tare/Zero Scale

Format: **TZ 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_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

	Command operated only in non-verified scales.

4.4. Give Tare Value

Format: **OT CR LF**

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

Response format:

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

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

4.5. Set Tare

Format: **UT_TARE CR LF**, where **TARE** - 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)

Use dot in tare format as decimal point.

4.6. 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

4.7. 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

4.8. 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

4.9. 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

4.10. 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

4.11. 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

4.12. 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

4.13. 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

4.14. Lock Scale 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

⚠	***Command is not kept in memory upon weighing device restart.***

4.15. Unlock Scale Keypad

Format: **K0 CR LF**

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

4.16. Set Min Checkweighing Threshold

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

Response options:

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

4.17. Set Max Checkweighing Threshold

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

Response options:

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

4.18. Give Value of Min Checkweighing Threshold

Format: **ODH CR LF**

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, right justification.
Unit - 3 characters, left justification.

4.19. Give Value Of Max Checkweighing Threshold

Format: **OUH CR LF**

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

Response format:

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

Mass - 9 characters, right justification.
Unit - 3 characters, left justification.

4.20. Simulation of Pressing ENTER/PRINT Key

Format: **SS CR LF**

Response options:

SS_OK CR LF	- command carried out

Sending **S S CR LF** command results in automatic saving of the weighing result in a database and in activating declared printout.

⚠	***All weighing conditions (result control, stable mass readout) have to be fulfilled during command sending.***

4.21. Set Mass Value of a Single Item

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

Response options:

SM_OK CR LF	- command carried out
SM_I CR LF	- command understood but not accessible at this moment
ES CR LF	- command not recognised (mass format incorrect)

⚠	***Command carried out for "Parts counting" working mode.***

4.22. Activate Sound Signal

Format: **BP_TIME CR LF**, where: _ - space, **TIME** - value specifying how long the sound lasts, parameter given in [ms]. Recommended range **<50÷5000>**.

Response options:

BP_OK CR LF	- command carried out, BEEP activated
BP_I CR LF	- command understood but not accessible at this moment
BP_E CR LF	- command not recognised (time format incorrect)

Example:

BP_350 CR LF - command sent from a computer (activate BEEP for 350 ms)
BP_OK CR LF - BEEP activated

	If value greater than the permissible high limit is given, then BEEP sound is operated for the maximum permissible amount of time.
	BEEP sound activated via BP command is inhibited if in-course of its activation the sound is activated by means of other device (e.g. keypad).

4.23. Give balance type

Format: **BN CR LF**

Response options:

BN_A_"x" CR LF	- command understood, response: balance type
BN_I CR LF	- command understood but not accessible at this moment

x - series of types for a particular balance (in between inverted commas).

Example:

BN CR LF - command sent from a computer
BN_A_"1" - command carried out, response: balance type - "1" (WLC/A2)

4.24. Give max capacity

Format: **FS CR LF**

Response options:

FS_A_"x" CR LF	- command understood, response: Max capacity
FS_I CR LF	- command understood but not accessible at this moment

x - Max value of reading units (in between inverted commas).

Example:

FS CR LF - command sent from a computer
FS_A_"2000.00" - command carried out, response: Max capacity - "2000g"

4.25. Give program version

Format: **RV CR LF**

Response options:

RV_A_"x" CR LF	- command understood, response: program version
RV_I CR LF	- command understood but not accessible at this moment

x - program version (in between inverted commas).

Example:

RV CR LF - command sent from a computer
RV_A_”1.0” - command carried out, response: program version - ”1.0”

4.26. Set AUTOZERO function

Format: **A_n CR LF**, where: _ - space, n - parameter, decimal value determining autozero settings (n = 0 - autozero off, n = 1 - autozero on).

⚠	***Command changes settings for a current working mode.***

Response options:

A_OK CR LF	- command carried out
A_E CR LF	- error in-course of command execution, no parameter or incorrect format
A_I CR LF	- command understood but not accessible at this moment

AUTOZERO function operates until it is turned off by **A_0 CR LF** command.

Example:

A_1 CR LF - command sent from a computer.
A_OK CR LF - command carried out, autozero function is on.

4.27. Internal adjustment performance

Format: **IC CR LF**

Response options:

IC_A CR LF **IC_D CR LF**	- command understood and in progress - calibration completed
IC_A CR LF **IC_E CR LF**	- command understood and in progress - time limit exceeded while waiting for a stable measurement result
IC_I CR LF	- command understood but not accessible at this moment

⚠	***The command applies exclusively to weighing instruments with internal adjustment.***

4.28. Disable automatic internal adjustment of the balance

Format: **IC1 CR LF**

Response options:

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

⚠	***Operation is disabled for verified balances.***
⚠	***The command applies exclusively to weighing instruments with internal adjustment.***

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

4.29. Enable automatic internal adjustment of the balance

Format: **IC0 CR LF**

Response options:

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

⚠	***Operation is disabled for verified balances.***

4.30. Give accessible units

Format: **UI CR LF**

Response options:

UI_"x_1,x_2,…x_n"_OK CR LF	- command carried out, returns accessible units
UI_I CR LF	- command understood but not accessible at this moment

x – parameter, unit symbols separated by means of comas.
Options in case when the main unit is [g]: **x** → g, kg, ct, lb.
Options in case when the main unit is [kg]: **x** → g, kg, N, lb.

Example:

UI CR LF – command sent from a computer
UI_"g,kg,ct,lb"_OK CR LF – response: available units

4.31. Set current unit

Format: **US_x CR LF**, when **x** – parameter, units symbols: g, kg, lb, N, ct, next.

Response options:

US_x_OK CR LF	- command carried out, response: current unit
US_I CR LF	- command understood but not accessible at this moment
US_E CR LF	- error in-course of command execution, no parameter or incorrect format

x – parameter, units symbols.
Options in case when the main unit is [g]: **x** → g, kg, ct, lb, next.
Options in case when the main unit is [kg]: **x** → g, kg, N, lb, next.

⚠	***If x=next, the command swaps to another available unit on the list.***

Example:

US_ct CR LF - command sent from a computer.
US_ct_OK CR LF - „ct" set as a current unit.

4.32. Give current unit

Format: **UG CR LF**

Response options:

UG_x_OK CR LF	- command carried out, response: current unit
UG_I CR LF	- command understood but not accessible at this moment

x – parameter, unit symbol.
Options in case when the main unit is [g]: **x** → g, kg, ct, lb, pcs, %.
Options in case when the main unit is [kg]: **x** → g, kg, N, lb, pcs, %.

Example:

UG CR LF – command sent from a computer
UG_ct_OK CR LF – currently set unit is „ct"

4.33. Give Scale Serial Number

Format: **NB CR LF**

Response options:

NB_A_”Serial No.” CR LF	- command understood, response: serial number
NB_I CR LF	- command understood but not accessible at this moment

”Serial No.” – serial number of the device. Inserted in between inverted commas.

Example:

NB CR LF – command sent from a computer
NB_A_”123456” CR LF – scale serial number - 123456

4.34. Send All Implemented Commands

Format: **PC CR LF**

Response: **PC_A_”Z,T,S,SI,SU,SUI,C1,C0,CU1,CU0,DH,ODH,UH,OUH,OT, UT, SM,K1,K0,BP,IC,IC1,IC0,SS,NB,BN,FS,RV,A,UI,US,UG,PC”CR LF**
– command carried out, the indicator displays all implemented commands

5. MANUAL PRINTOUT / AUTOMATIC PRINTOUT

It is possible to generate printouts both manually and automatically.

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

⚠	***Option of temporary weighing results printout is disabled for verified scale.***

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

6. CONTINUOUS TRANSMISSION

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

Format of frame sent when **<5.1.2.Cnt>** parameter is 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 of frame sent when **<5.1.2.Cnt>** parameter is set to **Cntb** value:

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

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