DATA COMMUNICATION GUIDE

INDICATOR 3100N (commercially known as *Indicator 4100*)

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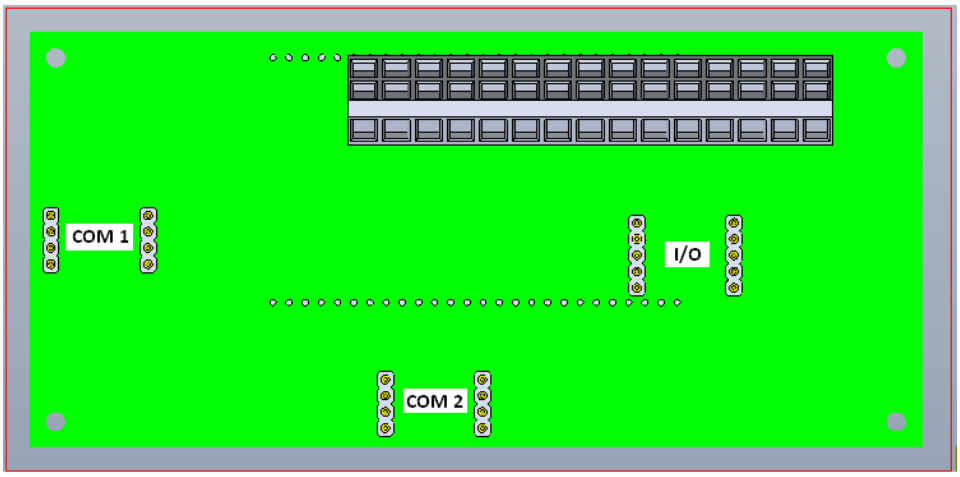
1. Hardware Options Indicator 3100N

The new 3100N main board has three free sockets:

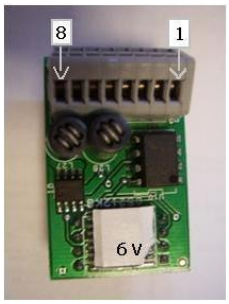
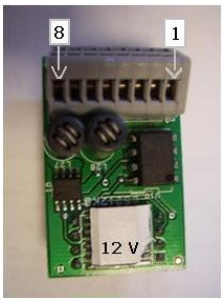
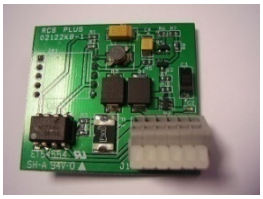
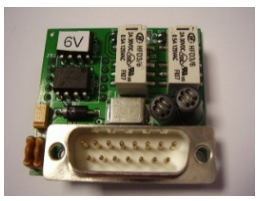
- COM1
- COM2
- I/O

The positions of the sockets on the main board are as shown in the picture underneath:



Main board 3100N

The following option boards can be stacked onto these sockets easily:

			
EB-31-N-PRINTER-RS232-6V **RS232 with 6V output printer** Position: COM1 and COM2	**EB-31-N-PRINTER-RS232-12V** **RS232 with 12V output printer** Position: COM1 and COM2	**EB-31-N-BLT** **Bluetooth class 1 single chip** Position: COM2 only	**EB-31-N-BLT-DUAL** **Bluetooth class 1 dual chip** Position: COM1 only
			
SA-EB-31-N-OPT-WIFI **WIFI** Position: COM2 only	**EB-31-N-RCS+** **RCS+ with valve output** Position: I/O	**EB-31-N-RELAY(6V)** **Relay 6V** Position: I/O	**EB-31-N-RELAY(12V)** **Relay 12V** Position: I/O

For *iForks* application, **COM1** is always standardly equipped with the dual BLT option board (EB-31-N-BLT-DUAL).

Technical specifications dual Bluetooth Option PCB

Supply:
+3.3 VDC through connector COM 1

Low Bat:
None

Power consumption:

Idle (no send/receive)	6 mA
Max	52 mA

Bluetooth spec:

Class	1
Standard	Bluetooth 2.0
Range	250 meters in free space

Electronics/Software:
None

Serial interface:
Through COM 1

Work temperature:
-20°C to +50°C

For *iForks* application, **COM2** can be equipped with the following data output option boards:

Technical specifications RS232 Option PCB

Supply:
+6 VDC / +12 VDC

Low Bat:
+5.5 VDC / +11.5 VDC

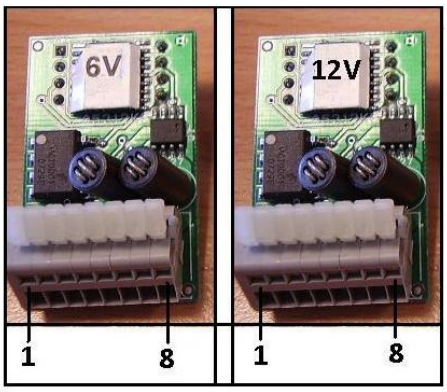
Power consumption:

Idle	2 mA
Print	Printer current

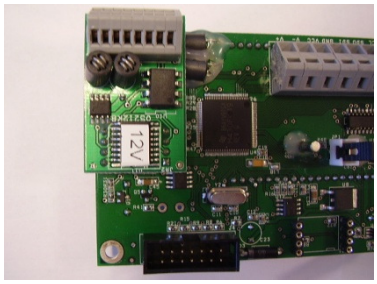
Electronics/Software:

Fuse	1.5A thermal fuse

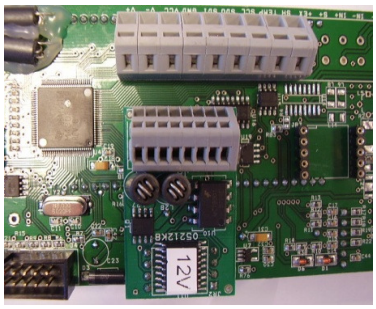
Connector (J6):



1 = Receive Data (RX-input)
2 = Transmit data (TX-output)
3 = Ground (GND)
4 = Ready to Send (RTS-output)
5 = Clear to send (CTS-input)
6 = Connect to Vin+ Mainboard
7 = Connect to Vin- Mainboard
8 = Switched power supply to printer



Stack position RS232 com 1



Stack position RS232 com 2

Serial interface:
Through COM 1 or COM 2 (for *iForks* COM2 only)

Work temperature:
-10°C to +40°C

Technical specifications WIFI Option PCB

Supply:
From main PCB power input

Low Bat:
Main PCB low battery

Power consumption:

connected waiting	135 mA (6V)/ 68mA (12V)
connected data transfer	170 mA (6V) / 75mA (12V)
not connected, seeking	285 mA ((6V) / 145mA (12V)

Wireless specifications:

Frequency Range	2.400-2.484 GHz
Transmission Range	100 meter (indoors)
Standard	IEEE 802.11 b/g
Security	WEP 64/128, WPA, WPA2/802.11i

Electronics/Software:

Default network settings	DHCP
Default network name	RAVAS
port number	10001
Security setting	none

LED condition	Blinking status	Remark
Off	NA	Power off
Blinking	2x per second	Connected
Off (32 seconds)/blinking	7x per second	No connection

Serial interface:
Through COM 2

Work temperature:
-20°C to +50°C

Technical specifications single Bluetooth Option PCB

Supply:
+3.3 VDC through connector COM 2

Low Bat:
None

Power consumption:

Idle (no send/receive)	3 mA
Max	26 mA

Bluetooth spec:

Class	1
Standard	Bluetooth 2.0
Range	100 meters in free space

Electronics/Software:
None

Serial interface:
Through COM 2

Work temperature:
-20°C to +50°C

The **I/O socket** can be equipped with the following relay boards:

Technical specifications Relay Option PCB

Supply:
+6 VDC / +12 VDC

Low Bat:
None

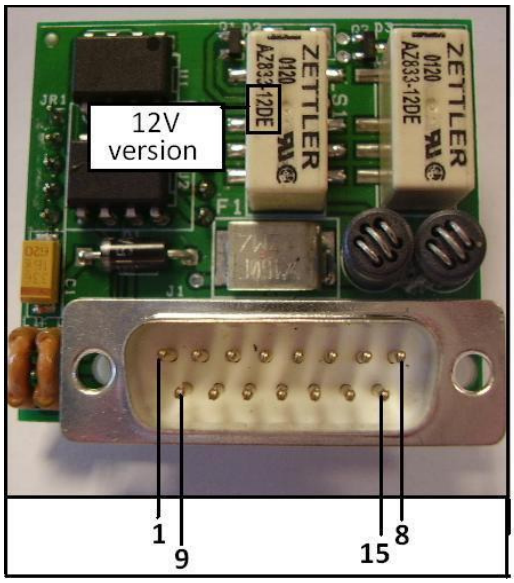
Power consumption:

Idle	less than 1 mA
Input/Output	variable

Electronics/Software:

Fuse	1.5A thermal fuse
External input 1 functionality	activate zero/tare
External input 2 functionality	activate printout

Connector (J1):



1 = potential contact relais 1
2 = normally open relais 1
3 = normally closed relais 1
4 = potential contact relais 2
5 = normally open relais 2
6 = normally closed relais 2
7 = external input 1
8 = external input 2
9 = external supply ground
10 = external supply + (max 30VDC)
11 = connect to Vin+ main board(12V)
12 = connect to Vin- main board (12V)
13 = Ground
14 = Shield
15 = no connection

Work temperature:
-10°C to +40°C

Technical specifications of RCS*plus* Option PCB (RCS*PLUS* application only)

Supply:
+12 VDC

Low Bat:
None

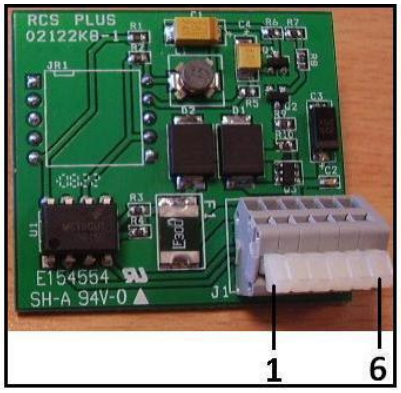
Power consumption:

Idle	less than 1 mA
Valve Active	Valve current

Electronics/Software:

Fuse	3A Thermal fuse
External input 1 functionality	activate weighing
External input 2 functionality	activate printout

Connection (J1):



1 = connect to Vin- main board
2 = connect to Vin+ main board
3 = connect to coil valve -
4 = connect to coil valve +
5 = external input 1
6 = external input 2

Work temperature:
-10°C to +40°C

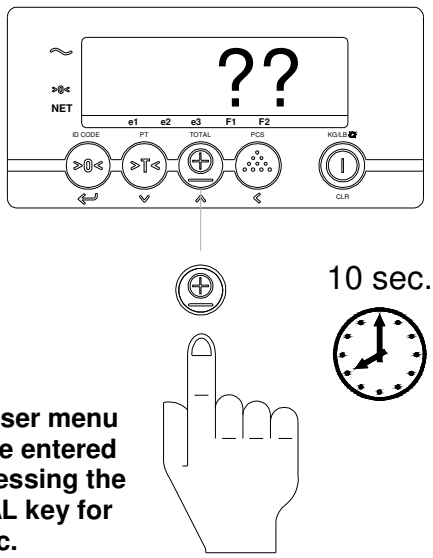
2. Parameter settings 3100N

Relevant parameter settings with regard to data communication:

Par.	Function	Default setting	Possible settings
20	Baudrate com1	9600	600/1200/2400/4800/9600/19200
21	Setting com1	8_n_1	8_n_1; 8_n_2; 7_n_1; 7_n_2
24	End character com1	cr	cr;lf;crlf
25	Protocol com1	5	0(PC bi-directional NU); 1(PC Excel format on print command); 2 (remote display); 3 (printer protocol with power control); 4 (printer protocol without power control); 5 (Dual Bluetooth); 6 (PC Excel format with ack/nack)
26	Number of linefeeds com1	4	0-9
27	Handshake com1	soft	soft (Xon/Xoff)/hard (CTS)
28	Printout format for com1 and com2	stnd	stnd;total;confi
29	Header lines added	0	0 - 3
30	Baudrate com2	9600	600/1200/2400/4800/9600/19200
31	Setting com2	8_n_1	8_n_1; 8_n_2; 7_n_1; 7_n_2
34	End character com2	cr	cr/lf/crlf
35	Protocol com2	0	0(PC bi-directional NU); 1(PC Excel format on print command); 2 (remote display); 3 (printer protocol with power control); 4 (printer protocol without power control); 5 (Wifi); 6 (PC Excel format with ack/nack)
36	Number of linefeeds com2	4	0-9
37	Handshake com2	soft	soft (Xon/Xoff)/hard (CTS)

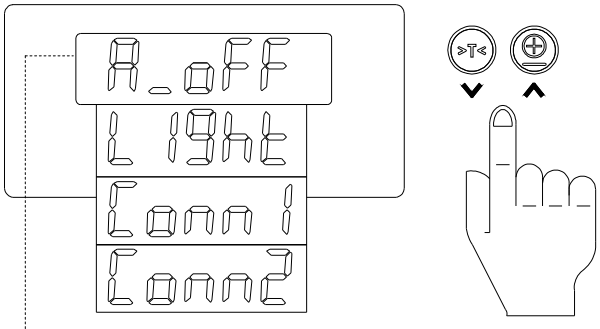
3. Activating the COMports

1



The user menu can be entered by pressing the TOTAL key for 10 sec.

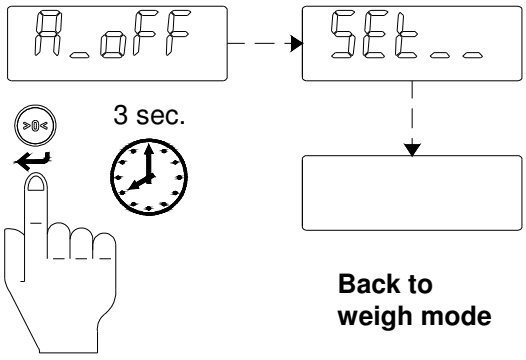
2



These user settings can be changed if desired. See next pages.

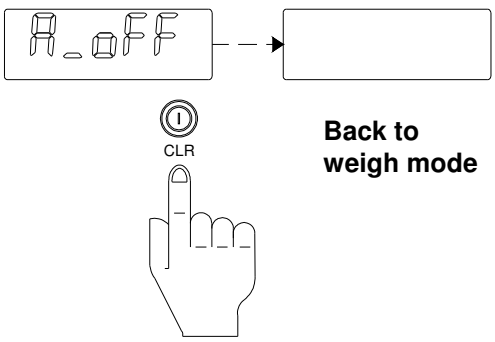
3

EXIT & SAVE



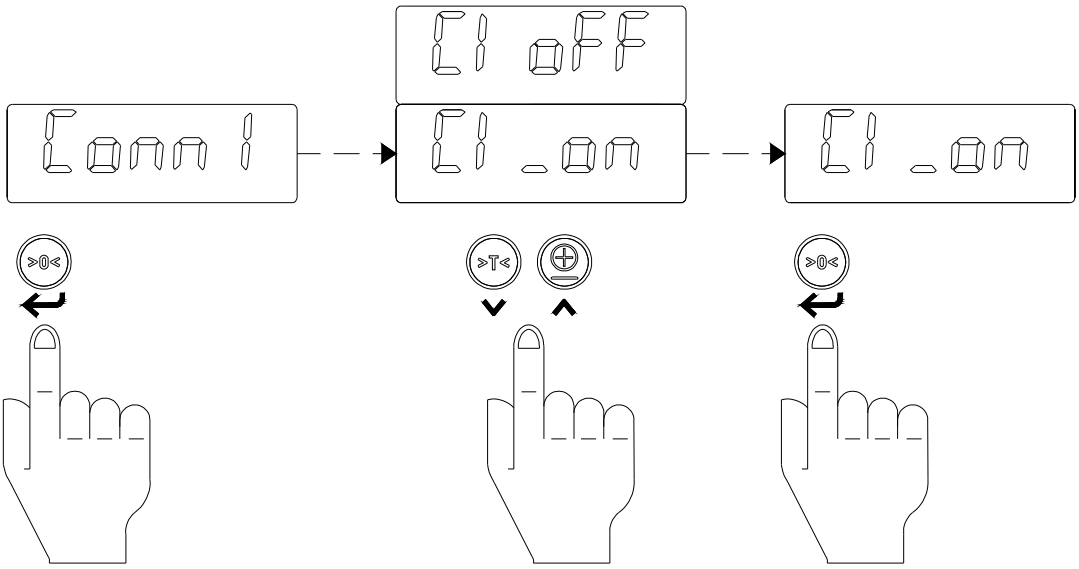
Back to weigh mode

EXIT without SAVING



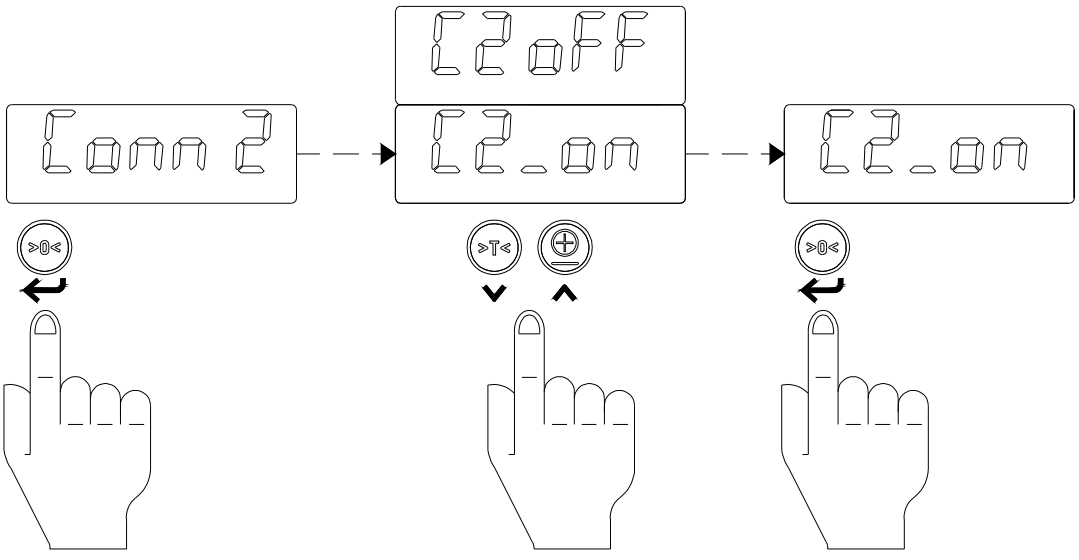
Back to weigh mode

(De-) activate Com Port 1



It is not possible to de-activate Com Port 1 for iForks

(De-) activate Com Port 2



4. Data communication protocols 3100N

4.1 PC PROTOCOL (bi-directional NU)

With parameter 25 or 35 the data protocol for comport 1 or comport 2 may be set. If parameter 25 or 35 is set to “0”, the PC bi-directional command structure is active.

The indicator 3100 offers the possibility to communicate bi-directional with a PC or other hardware devices which can handle simple ASCII commands.

Protocol:

Baudrate- 600 to 19200 (default = 9600)

Databits- 7 or 8 (default = 8)

Stopbits- 1 or 2 (default = 1)

Parity- odd/even/none (default = none)

Handshake-none

ASCII commands:

ASCII command	Response string	Operation
SZ<CR>	OK<CR>/ERR<CR>	Set zero value
RZ<CR>	OK<CR>/ERR<CR>	Reset zero value
S1<value><CR>	OK<CR>/ERR<CR>	Set setpoint 1 value
S2<value><CR>	OK<CR>/ERR<CR>	Set setpoint 2 value
SP<value><CR>*1	OK<CR>/ERR<CR>	Set preset tare value
ST<CR>	OK<CR>/ERR<CR>	Set tare
SG<CR>	G+0001.0<CR>	Send gross mode (continuously)
SN<CR>	N+0001.0<CR>	Send net mode (continuously)

SW<CR>	W+00010+000103805<CR>	Send weights mode (continuously)
RT<CR>	OK<CR>/ERR<CR>	Reset tare
RP<CR>	OK<CR>/ERR<CR>	Reset preset tare
G1<CR>	1+0001.0<CR>	Get setpoint 1 level
G2<CR>	2+0001.0<CR>	Get setpoint 2 level
GP<CR>	P+0001.0<CR>	Get preset tare
GT<CR>	T+0001.0<CR>	Get tare
GG<CR>	G+0001.0<CR>	Get gross
GN<CR>	N+0001.0<CR>	Get net
GW<CR>	W+00010+000103805<CR>	Get net, gross, status and checksum
MN<CR>	N+0001.0<CR>	Get net, wait for no motion
MG<CR>	G+0001.0<CR>	Get gross, wait for no motion
AN<CR>	N+0001.0;0001<CR>	Get net and alibi nr., wait for no motion
AG<CR>	G+0001.0;0001<CR>	Get gross and alibi nr., wait for no motion

*1: If the scale is working in ranges with a number after the decimal point, the preset tare value should be given in accordingly. If the scale is working in ranges equal to or higher than 1 kg/lb, then the value should be entered with the decimal point at the end of the value.

E.g. ranges 0.1/0.2/0.5 >> P0001.5<CR>, ranges 1/2/5/10/20/50 >> P00150.<CR>

Special commands ‘GW’ and ‘SW’

The ‘GW’ and ‘SW’ are commands with checksums. With these commands it is possible to get net, gross and status data. The respons string doesn’t have the decimal point information. The ‘SW’ update rate is slower than the other commands.

Structure of the response string:

W	+00010	+00010	38	05	<CR>
Data ID	Net value	Gross value	Status(hex)	Checksum	End of string

Status bits:

Bit number	**Bit definition**	**Status ‘0’**	**Status ‘1’**
7 (MSB)	Indicator error	No errors	Indicator error
6	Tare active	No tare active	Tare active
5	Zero corrected	No zero correction	Zero corrected
4	Weight stable	Weight unstable	Weight stable
3	Within zero range	Out of zero range	Within zero range
2	Above max load	Under max load	Above max load
1	Setpoint 2 active	Setpoint 1 not active	Setpoint 1 active
0 (LSB)	Setpoint 1 active	Setpoint 2 not active	Setpoint 2 active

Example:

38 (hex) = 0011 1000(binair)

bit 5, zero corrected

bit 4, weight stable

bit 3, within zero range

Calculating the checksum:

The checksum is the inverted sum of all ASCII characters in the response string previous to the checksum.

Example:

Response string = W+00010+000103805<CR>

Add all hex values of the characters in the string:

[W]+[+]+[0]+[0]+[0]+[1]+[0]+[+]+[0]+[0]+[0]+[1]+[0]+[3]+[8]

Total is 2FA(hex)

Remove the most significant digit, result is FA(hex)

Invert the hexadecimal value, result is 05(hex)

Convert the hexadecimal value to characters, result is [0][5]

Special commands 'AN' and 'AG'

With these special commands an extra value is send along together with the weight; the alibi number. It consists of 4 digits and is also saved in the indicators alibi memory. The number increases with every stored weighing.

The command works as follows:

- PC or terminal sends out the command AN or AG for demanding the net or gross weight respectively.
- Indicator waits for the weight to become stable after which it returns the demanded weight accompanied by the alibi number under which this weighing was stored in the alibi memory of the indicator.
- Format of the return string is: N+0001.0;0001<CR> or G+0001.0;0001<CR>

  N = Net indicator

  + = sign indicator

  0001.0 = weight value with decimal point

  ; = semi-colon separator sign

  0001 = alibi number

  <CR> = ending sign

4.2 PC EXCEL PROTOCOL

Excel protocol on print command

The Excel Protocol (EP) is upgraded in order to comply with the new alibi possibilities. If the EP is selected a data string will be send out through the selected com port on every print command. If parameter 25/35 is set to “1”, the EP is active.

The transmitted data string contains the following fields:

Field nr.	description	Number of characters/digits send
1	Scale number; any value between 0 and 255 to be entered in parameter 98	3
2	Date; depending on the setting of parameter 19 this will be *dd/mm/yy* (EU) or *mm/dd/yy* (US)	8
3	Time; format *hh:mm*	5
4	Gross weight; this will always be 5 digits, a decimal point, the units (kg or lb) and the positive or negative sign. For example: +0233.5kg or -00136.lb.	9
5	Net weight; this will always be 5 digits, a decimal point, the units (kg or lb), the positive or negative sign and whether it was a calculated net or a measured net. For example: +0233.5kgC or -00136.lb_. The “C” stands for calculated and is send along when a preset tare value was active. If there is no preset tare value active a blanc (space) is put behind the kg (or lb).	10
6	Tare weight; this will always be 5 digits, a decimal point, the units (kg or lb), the positive or negative sign and whether it was a preset tare or a measured tare. For example: +0233.5kgP or -00136.lb_. The “P” stands for preset tare and is send along when a preset tare value was active. If there is no preset tare value active a blanc (space) is put behind the kg (or lb).	10
7	Code; this is the code which can be entered by keypad. If no code is activated this field is left blanc (5 spaces)	5
8	Alibi number > this is a 4 digit number which is generated by the indicator itself. It will start at “0001” and increase with every weighing up to “9999”. When this number is reached it will start at “0001” again.	4
	Total characters send	54

All fields will be separated by a separator sign, semi-colon (;).

The value of characters to be transmitted in one line are 54(fields)+7(;)=61 characters. As ending character(s) we have a <CR> or <LF> or <CR>and<LF> depending on the setting in parameter 24/34. A complete data string could look like following:

001;09/10/09;15:40;+0125.5kg;+0100.5kgC;+0025.0kgP;12345;0024<CR>

or

001;09/01/09;15:42;+00255.lb;+00203.lb_;+00052.lb_;54321;0102<CR><LF>

Excel protocol with ACK/NACK

If the data is to be transmitted wireless (for example by Wifi or Bluetooth) it is hard to check whether the data has been received and whether the received data was correct. This asks for a possibility to work with some kind of acknowledgement. In these cases, parameter 25/35 must be set to "6" to active PC Excel protocol with ack/nack.

The EP with ACK/NACK works similar to the normal EP. The data string contains the same fields. Also the separator is identical (;)

The biggest difference is the fact that the indicator waits for a reply of the PC/Terminal before it continues. Secondly a checksum is calculated over the data string and send along with it. In order to work with this protocol you will need to program an interface which generates the right commands and is capable of saving the data into a file. Underneath you will find some guidelines for making such an interface.

Communication protocol between indicator and PC:

	INDICATOR			**PC**	
Conditions:	Indicator is turned on			PC read out program is working	
1	Press print key for data transmission			PC waits for data	
2	Collecting the weigh data and calculating the checksum (see calculating the checksum)			PC waits for data	
3	Transmitting data and checksum to PC	Data out	→	PC receives data	Data in
4	Indicator waits for reply			Putting data in buffer and calculating checksum	
5	If ACK is received go on to step 6 If NACK is received go back to step 3 and add 1 attempt to the counter If NACK is received 5 times,	Data in	←	If Checksum=ok, return ACK with dummy character (any HEX value between 21 and FF)and go on to step 6 Checksum=not ok. return NACK with dummy character (any HEX	Data out

	display “trErr” and wait for any key press to return into the normal weighing mode. If the reaction from the PC takes longer than 3 seconds, a timeout will be generated by the indicator and the display will show “trErr” and wait for any key press to return into the normal weighing mode.			value between 21 and FF), clear buffer and go back to step 1	
6	Display “done” for 1 second and return to the normal weighing mode			Store buffer into CSV file and return to step 1	

Example:

Indicator	TXD	001;09/01/09;15:40;+0125.5kg;+0100.5kgC;+0025.0kgP;12345;002444<CR>
		⇩
PC	RXD	000;09/01/09;15:40;+0125.5kg;+0100.5kgC;+0025.0kgP;12345;002444<CR>
		⇩
Remark:		data was corrupted while transmitted which will result in a wrong checksum. The PC needs to demand for another transmission.
		⇩
PC	TXD	<NACK><dummy><CR> Nack = hex value 15, dummy = hex value 21, CR = hex value 0D
		⇩
Indicator	RXD	<NACK><dummy><CR>
		⇩
Indicator	TXD	001;09/01/09;15:40;+0125.5kg;+0100.5kgC;+0025.0kgP;12345;002444<CR>
		⇩
PC	RXD	001;09/01/09;15:40;+0125.5kg;+0100.5kgC;+0025.0kgP;12345;002444<CR>
		⇩
Remark:		data was correct while transmitted which results in a good checksum. The PC needs to send an acknowledgement and save the weighing in a file.
		⇩
PC	TXD	<ACK><dummy><CR> Ack = hex value 06, dummy = hex value 21, CR = hex value 0D
		⇩
Indicator	RXD	<ACK><dummy><CR>
		⇩
Remark:		indicator will close of the sequence and return to the weigh mode. PC remains in standby mode for next transmission.

Calculating the checksum

The calculation of the checksum will be similar to the way we calculate the checksum with the GW command in the PC protocol. This means:

1. Add all hex values of the characters in the string
2. Remove the most significant digit
3. Invert the hex value resulting from that
4. Convert the hex value to characters which are transmitted along with the data string.

Example:

Data string = 001;09/01/09;15:40;+0125.5kg;+0100.5kgC;+0025.0kgP;12345;0024<CR>

1. Add all hex values of the characters in the string;
   [0]+[0]+[1]+[;]+[0]+[9]+[/]+[0]+[1]+[/]+[0]+[9]+[;]+[1]+[5]+[:]+[4]+[0]+ etc.

This results in:

30+30+31+3B+30+39+2F+30+31+2F+30+39+3B+31+35+3A+34+30+3B+2B+30+31+32+35+2C+35+6B+67+3B+2B+30+31+30+30+2C+35+6B+67+3B+43+3B+2B+30+30+32+35+2C+30+6B+67+50+3B+31+32+33+34+35+3B+30+30+32+34= DBB

2. Remove the most significant digit = BB
3. Inverting the hex value = 44
4. Convert to characters and transmit along with the data string : 44

Complete data string with checksum becomes:

001;09/01/09;15:40;+0125.5kg;+0100.5kgC;+0025.0kgP;12345;002444<CR>

4.3 REMOTE DISPLAY PROTOCOL

The indicator 3100N offers the possibility to communicate one-directional with a remote display. With parameter 25 (Com 1) or 35 (Com 2) set to “2” this protocol will be activated.

To be able to use this protocol the hardware option RS232 6V or RS232 12V should be installed (contact your supplier for this).

In remote display mode a data string is send out continuously to a remote display, PC or other host device. Whatever mode is indicated on the indicator will also be send out through the comport. In ‘Gross’ mode the string will contain the gross weight, in ‘Net’ mode the string will contain the net weight.

Data string:

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
+/-	0	0	0	0	0	.	<CR>
Sign	1st digit	2nd digit	3rd digit	4th digit	5th digit	Decimal point position depending of range	End of string

NOTE: In cases of error messages the indicator sends out the minus sign (= ascii value 45) and a <CR>.

Examples:

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Condition on display indicator**
+	0	0	2	5	.	0	CR	Weight displayed of 25.0 kg
-	0	1	3	0	.	5	CR	Weight displayed of –130.5 kg
+	0	0	0	0	.	0	CR	Weight displayed of 0.0 kg
-	-	-	-	-	-	-	CR	Error message displayed e.g. HELP1
+	0	1	2	5	0	.	CR	Weight displayed of 1250.kg

ⓘ NOTE: in case of an error in the display the PC will receive the following strings instead of a weight:

3 Error display*1	3 Error Response string	Meaning
Err02	=======<CR>	Above full scale
Err03	=======<CR>	Attempt to tare out gross negative
Err07	uuuuuuu<CR>	Underload on AD converter
Err06	ooooooo<CR>	Overload on AD converter
L--__	=======<CR>	out of level

*1: All error messages can only be resolved at the weighing system.