Optima OP-900 Series

User Manual

Rev. 2

Warnings

- For safety operation of the weighing indicator, please follow the following warning/safety instructions:
    - Calibration inspection and maintenance of the indicator are prohibited by non-professional staff
    - Please ensure that the indicator has good ground
    - The indicator is a static and sensitive equipment; Please cut off power during electrical connections; Touching the internal components by hand is prohibited; Please take anti-static prevention measures

Optima OP-900 Series
User Manual / Table of Contents

Overview

Thank you for using Optima's OP-900 series indicator for your important application. The OP-900 series weighing indicator can be used for many type of scales such as bench and floor scales. The basic functions are as follows:
- Hold function
- Print
- kg/lb unit conversion
- Count/Total
- Gross/Tare/Zero
- Overload reminder

Options can also be requested to include the following:
- RS232/RS485 serial interface or second display
- I/O
- 4-20mA outputs

Technical Parameters

- Accuracy class: 6000 e
- Resolution:
  - Display: 30,000
  - ADC: 2,000,000
- Zero stability error: $TK_0 < 0.1\mu V//K$
- Span stability error: $TK_{spn} < \pm 6$ ppm//K
- Sensitivity (internal): 0. 3 μV /d
- Input voltage: -30 to +30mV DC
- Excitation circuit: 5 VDC, 4 wire connection, 6 load cell of 350ohm maximum
- AC power: AC 100-250V (use only the 9V adapter supplied with the indicator)
- Operation temperature: -10 ℃ ~ +40 ℃
- Operation humidity: ≤90%RH
- Storage temperature: -40 ℃ ~ +70 ℃

Indicator Drawing
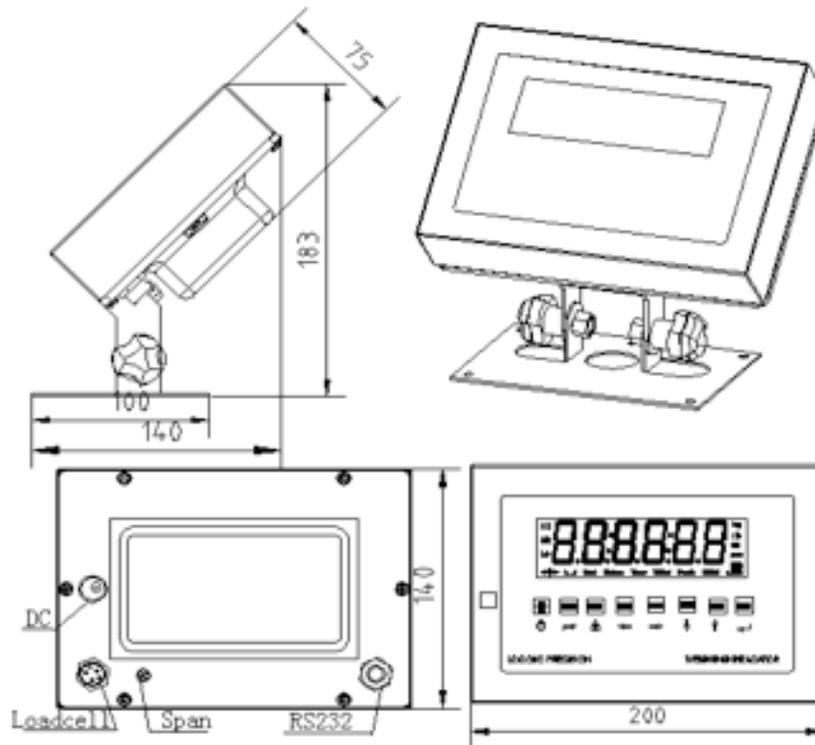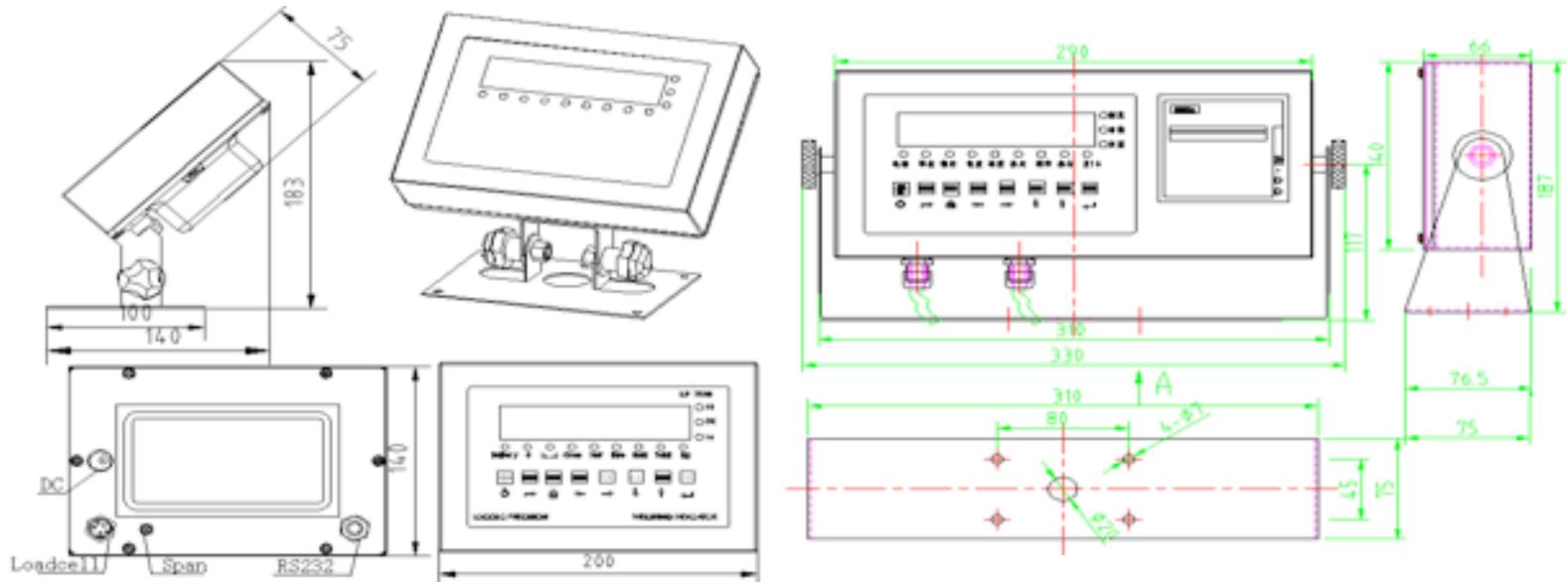
Battery

- Charge the internal battery (option) fully before first time use
- When "battery" light is on, it means the battery is low and needs recharging
- During charging, the battery light turns yellow
- When the battery light turns green, its means the battery is fully charged
- Remove the battery when not in use for a long period of time
- To keep the battery in best condition, fully discharge battery every month by leaving the indicator on until indicator powers off

Installation

- The indicator can connect with 6 load cell of 350ohm maximum with 4 wire or 6 wire load cell. There are two connection methods between the load cell and the indicator:
  - Quick disconnect
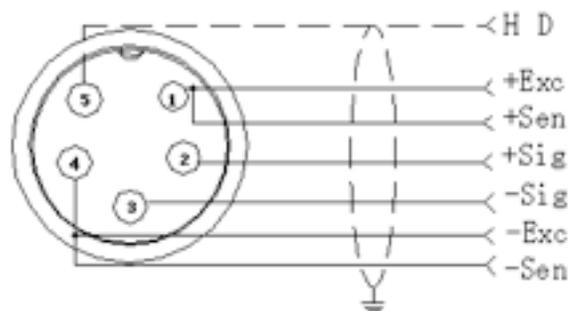
  - Terminal trip connection (inner connection)
    - The excitation voltage for the load cell is 5VDC; largest output current = 120mA; maximum connect 6 350ohm load cell
    - Load cell (or the signal cable for the junction box) is connected with 5 pin terminal block (J5) on the circuit board of the weighing indicator
    - Open the back cover of the weighing indicator, and insert signal cable to the terminal block (J5); Make sure the screw is fixed tightly

+EXC = Positive excitation voltage to load cell
+IN = Positive output signal from load cell
HD = Shielded wire
-IN = Negative output signal from load cell
-EXC = Negative excitation voltage to load cell

- RS232: DB9 Pin or 3 Pin
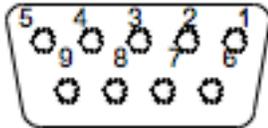
DB9 joint	Definition	Function
2	TXD	Sending data
3	RXD	Receiving data
5	GND	Ground interface

Note: if RS485, The connection pin is 2 and 5 pin.

3 Pin definition
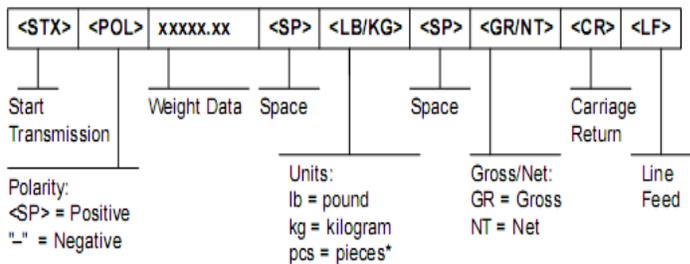
- 4-20mA output
  - Resolution: 1/1000
  - Outside Load: 100-350ohms
  - Inside connection: load input port connect with "1" of J2, ground port connect with "GND" of J2
  - Outside connection: load input port connect with pin 1 of DB9, ground port connect with pin 6 of DB9
  - To test the connection, connect a 250ohm load; Adjust the multimeter to the current stalls; To test the output current, connect the loading port to the red lead of the multimeter and the GND to the black lead of the multimeter
  - Calibration:
    - Press PRINT and TOTAL to go into configuration mode
    - Go to C32 and change out to out-20

- Relay output signal function
  - The indicator can output 4 signals, which when connected to outside equipment, can perform automatic control function and upper/lower limit alarm function. Go to setting C33 as follows:

	Output port	Port definition	Function
C33＝0	Out1	Close output function	No output signal
	Out2	Close output function	No output signal
	Out3	Close output function	No output signal
	Out4	Close output function	No output signal
C33＝1	Out1	Open overload control function	Output overload control signal
	Out2	Open compliance control function	Output compliance control signal
	Out3	Open under-load control function	Output under-load control signal
	Out4	Open stable control function	Output stable control signal
C33＝2,3	Preserved, no function.		

DB9 pin	definition	port
1 pin	1st output signal pin	Out1
6 pin	1st output signal pin	Out1
2 pin	2nd output signal pin	Out2
7 pin	2nd output signal pin	Out2
3 pin	3rd output signal pin	Out3
8 pin	3rd output signal pin	Out3
4 pin	4th output signal pin	Out4
9 pin	4th output signal pin	Out4

Calibration and Parameter Settings

• The parameter settings menu has a calibration section (C01 to C07) and a parameter settings section (C08 and up). To access the calibration section the seal switch (top left of the pcb board) must be OFF as shown in the picture below. This will allow access to all C01 and up settings. If the seal switch is ON, then only C08 and up can be accessed by the user.

• **CAUTION:** *If you break the official seal by opening the back of the indicator to access the seal switch, you may need to have the indicator recertified by local weights and measures official. Be sure to adjust the seal switch back to the original setting after calibration/configuration has been performed.*

• To enter calibration/parameter settings
   • Press and hold the HOLD and PRINT key at the same time (OP-900)
      • For OP-901, press ON/OFF and SET at the same time
   • Navigate through the settings (C01 to C06) as shown in the following tables by using the arrow and return keys (labeled below the indicator keys)
   • Press the TOTAL key (OP-900) to save and exit settings at any time
      • Press ON/OFF key (do not hold) for OP-901
   • Please make sure your maximum capacity set at C04 divided by your resolution doesn't exceed 5,000 division. For example:
      • Case #1 (Good): C02=0; C03=1; C04=5,000 (Gives 5,000 division)
      • Case #2 (Bad): C02= 2; C03=1; C04=5,000 (Gives 500,000 division)

The following table shows the steps to properly calibrate the indicator in the calibration menu:

Step	Method of operation	Display	Remark
1		[C01]	After you enter calibration mode, it display [C01]
2	Press◄┘	[C01 1]	Weight unit option：1=kg 2=lb
3	Press◄┘ Press◄┘ Press↑ or ↓	[C02] [C02 0] [C02 2]	Set decimal digits option：0/1/2/3/4 Select decimal digit example：two decimal point：[C02 2]
4	Press◄┘ Press◄┘ Press↑ or ↓	[C03] [C03 1] [C03 5]	Set graduation option：1/2/5/10/20/50 Select required graduation example：graduation 5：[C03 5]
5	Press◄┘ Press◄┘ Press↑ or ↓/←	[C04] [0100.00] [0100.00]	Max capacity example：max weighing 100kg: [0100.00]
6	Press◄┘ Press◄┘ Press↑ Press◄┘	[C05] [C05 0] [C05 1] [CAL 9] ○ ○ ○ ○ ○ ○ [0000.00]	Zero calibration need zero calibration calibration zero please choose 1 and ensure scale is empty and "stable" light is on Ensure Option 0=no need zero calibration 1=zero calibration, countdown. Till show[0.00](example for two decimal point)。
7	Press ◄┘ Press ◄┘ Press ↑ or ↓ Press ◄┘ Press ↑ or ↓ Press ◄┘	[C06] [C06 0] [C06 1] [SPAN] [0100.00] [0080.00] [CAL 9] …… [0080.00] [CAL End]	calibration option: 0=No need calibration 1= need calibration Load weights on scales according to max. capacity. Suggest close to the max capacity, at least 10% of max. capacity. For example: the weights is 80kg; Input 0080.00, count down , then indicator shows 0080.00 , calibration is over. If you want to set application function parameter. Press "PRINT" if you want to exit press "TOTAL"
8	Press ◄┘ Press ◄┘ Press ↑ or ↓	[C07] [07 0] [07 1]	Default parameters setting option:0=non-restore default parameters 1=restore default parameters Note: after the above parameters setting finish, please do not set default parameters to avoid the original setting parameters is lost.

The following table shows the other parameter settings in the same calibration menu as above:

Function	Setting Item	parameters setting and instruction
warning tone	**C08** warning tone	Options: 0 = close warning tone 1 = open warning tone
Automatic power off	**C09** Automatic power off	option：0=close auto power off 10= power off automatically if no change within 10 minute. 30= power off automatically if no change within 30 minute. 60= power off automatically if no change within 60 minute.
Power saving setting	**C10** Power saving setting	LED Version: option：0= close power saving setting 3= close display if no change within 3min. 5= close display if no change within 5 min. LCD Version: 0=Close he backlight 1= backlight when the weight change or press the keyboard 2=constant backlight
Hold function	**C11** Hold mode	option：0=close hold function 1=Peak hold /2=Data Hold Instruction: Peak-hold: it shows the max. data, mainly application for materials testing, such as tension and pulling force. Date-hold: it shows current weight value. Mainly application for animal weighing.
Kg/lb conversion	**C12** Kg/lb conversion	C12=0 stop kg/lb conversion C12=1 kg/lb conversion is ok
Upper/lower limit alarm	**C13** Upper limit alarm value	You can set it within the max. capacity limit
	C14 Lower limit alarm value	
Inner Code display	**C15** Check inner code	Enter C15 to check the inner code

Date and time	**C16** Date	Enter C16, you can set the date, from left to right: year/month/day
	C17 Time	Enter C17, you can set the time from left to right: hour/min./sec.
Communication setting	**C18** Serial interface data output method	option：0= Close serial interface data output 1=Continuous sending, connect big display 2=Print method, connect printer. 3=Command request method，connect computer. 4=PC continues sending format, connect computer. 5=PC/ big display continuous sending format.
	C19 Baud rate	option： 0=1200/1=2400/2=4800/3=9600
Zero range	**C20** Manually zero range	Option: 0= close manually zero setting 1=±1% max capacity 2=±2% max capacity 4=±4% max capacity 10=±10% max capacity 20=±20% max capacity 100=±100% max capacity
	C21 Initial zero range	option：0= no initial zero setting 　　　1=±1% max capacity 　　　2=±2% max capacity 　　　5=±5% max capacity 　　10=±10% max capacity 　　20=±20% max capacity
Zero tracking	**C22** Automatically zero tracking range	Options: 0= close zero tracking 　　0.5=±0.5d 　　1.0=±1.0d 　　2.0=±2.0d 　　3.0=±3.0d 　　4.0=±4.0d 　　5.0=±5.0d Note: 1. d = division 　　2. the zero tracking range can not bigger than manual zero range.
	C23 Automatically zero tracking time	Options: 0= close zero tracking time 1= 1 second 2= 2 seconds 3= 3 seconds

Overload range	**C24** Overload range	option：00= close overload range 01d～99d remark：d =division
Negative display	**C25** Negative display range	Option：0=-9d 　　10=10% max. capacity 　　20=20% max. capacity 　　50=50% max. capacity 　　100=100% max. capacity
Standstill time	**C26** Standstill time	Option: 0= quick 1= medium 2= slow
	C27 Standstill range	Option: 1= 1d 2=2d 5=5d 10=10d D= division
Digital filter	**C28** Dynamic filter Instruction：Dynamic filter is collecting the data filter before loaded weight stable. When loaded weight easily shaking (for example animal) , you can set this filter to make weight display more stable	option：0= close dynamic filter 1=1 digital filter strength 2=2 digital filter strength 3=3 digital filter strength 4=4 digital filter strength 5=5 digital filter strength 6=6 digital filter strength Note：Pls setting dynamic filter strength carefully, the No. is bigger, more stable. if the loaded weight shake not too much. The setting is less than 3
	C29 Noise filter	option：0=close noise filter 　1=1 digital filter strength 　2=2 digital filter strength 　3=3 digital filter strength
	C30 Print time and date	C30=0 yy.mm.dd C30=1 mm.dd.yy C30=2 dd.mm.yy C30=3 yy.mm.dd
Analog output setting	C31 output type	C31=0 0~5Vouput C31=1 4~20mA output

4~20mA current calibrate	C32 calibrate current	Refer to 2.5
Relay output setting	C33 Relay output	C33=0 close relay output C33=1 Open relay output function 1 C3=2 Open relay output function2 C33=3 Preserved menu
Muti communication add.	C34 Communication add.	C34= 0~99 Add. Code
Wireless communication	C35	C35=0~99 signal
Gravity of calibration location	C36	C36=9.7000~9.9999
Gravity of destination	C37	C37=9.7000~9.9999
Version No.	C38	
Preserved menu	C39	

Basic Weighing

After the scale has been properly calibrated, the scale is now ready for use.   Here are the available keys as shown in the following overlays:

DISPLAY	FUNCTION
8	Weighing data
kg	kg
lb	lb
Hold	Data hold
Gross	Gross weight
Net	Net weight
Tare	tare
◁▷	The weighing data is stable
⇒〉〈⇐	Weight is zero
Hi	Overload
OK	ok
Lo	Underload
.	Decimal
PCS	Show the counting status.
TOTAL	Go to accumulation mode

keys	Key name	Key function
Print	Print	1.work with "ZERO" TARE" "ON/OFF" key to perform many functions. 2.Print
Zero	Zero	Zero the weight within tolerance
Tare	Tare	At G.W mode, get the tare weight. At N.W mode, clear the tare, get the G.W
Gross	Gross weight	At N.W mode, check the G.W, after 3 seconds back to N.W automatically
Count	Counting	Counting operation
kg/lb	Kg/lb convert	Covert between kg and lb
Total	Accumulation	1. Accumulation 2. work together with " Print" to perform The accumulation function and check the accumulation result
ON/OFF	Power on/off	Press 2 seconds to power on or power off

Power On/Off

• Press the ON/OFF key for about 2 seconds to power on/off the indicator. After self inspection, the indicator will go into weighing mode.

Zero

• When the indicator is powered on, if the weight on the scale is within the initial zero tolerance, indicator will show zero automatically. This tolerance can be set in configuration C20 and C21.
• You can manually zero the indicator by pressing the Zero key.

Tare

- When the indicator is in gross mode (Gross status light on), pressing the Tare key will tare the current weight. The indicator will then go into Net weight mode (Net status light on).
- When the indicator is already in net mode (Net status light on), pressing the Tare key will clear the tare weight and go back to gross mode (Gross status light on).

Changing Units

- Press the kg/lb key to change between the following units:
  - kg (Status light kg on)
  - lb (Status light lb on)

Hold

- Set configuration setting C11 to configure different hold functions

Print

- Press the Print key to print to printer connected to RS232. Please remember to configure parameter settings C18 and C30.

Counting Function (Optional)

To perform counting function, follow the procedure below:
1. At weighing mode, load the weight to count and press the Count key. Indicator will show "PCS 0". Use the up and down arrow key to change the quantity that represents the load weight.   Press the return (Print) key to confirm.
2. Press Count key to return to weighing mode.
3. Repeat the above steps for counting of different goods.

Accumulation Function (Optional)

1. After the weight is at zero mode (zero light on), load weight and wait for the stable light to turn on.
2. Press Total key and the Total light should turn on.
3. The indicator will display "n 001" and then the loaded weight.
4. Unload the weight, and load the 2nd weight until stable light on.
5. Press the Total key and the indicator will display "n 002" and then the loaded weight.
6. Repeat steps 4 and 5 to continue to accumulate (max 999 times).
7. After accumulation is finished, press the TOTAL and PRINT key at the same time. The display will show the number of accumulation ("n ***") (first 4 digits) and then the total weight (last 4 digits). If you want to print the accumulated total, press the PRINT key.
8. To exit accumulation mode, after the indicator shows all 8 digits, press and hold Total key and the indicator will show "clr n".
9. Press the up or down key to change from "clr n" (don't clear total) and "clr y" (clear total). Press the Print key to accept and exit accumulation mode.

RS232 Output Format

Big Display Continuous Output Format (C18 = 1)

Output continuous format																
S T X	S W A	S W B	S W C	X	X	X	X	X	X	X	X	X	X	X	X	C R	C K S
1	2			3						4						5	6

State A			
Bits0,1,2			
0	1	2	Decimal point position
1	0	0	XXXXXX0
0	1	0	XXXXXXX
1	1	0	XXXXX · X
0	0	1	XXXX · XX
1	0	1	XXX · XXX
Bits3,4			Division
0		1	X1
1		0	X2

State B	
BitsS	function
Bits0	gross=0, net=1
Bits1	Symbol: positive =0,negative =1
Bits2	Overload(or under zero)=1
Bits3	dynamic=1
Bits4	unit：lb=0, kg=1
Bits5	Constant 1
Bits6	Constant 0

State C			
Bit2	Bit1	Bit0	unit
0	0	0	Kg or lb
0	0	1	g
0	1	0	t
Bit 3			printing=1
Bit 4			Extend display=1
Bit 5			Constant 1
Bit 6			Constant 0

Computer Continuous Output Format (C18 = 2)
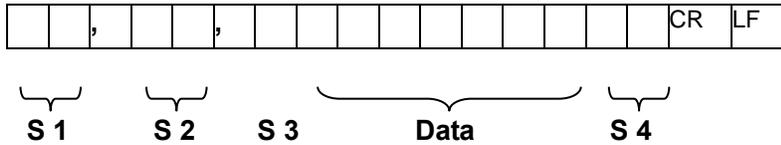
S1:   weight status, ST= standstill, US= not standstill, OL= overload

S2:   weight mode, GS=gross mode, NT=net mode

S3:   weight of positive and negative, "+" or " –"

S4:   "kg" or "lb"

Data: weight value, including decimal point

CR: carriage return

LF: line feed

Serial Interface Command Mode (C18 = 3)

• In this mode, indicator can receive ASCII commands listed below:

Command	NAME	Function
T	TARE	Save and clear tare
Z	ZERO	Zero gross weight
P	PRINT	Print the weight
R	G.W/N.W	Read gross weight or net weight
C	Kg/lb	Kg/lb conversion
G	G.W	Check gross weight at net weight mode

• The R command will trigger the indicator to output the following data format:
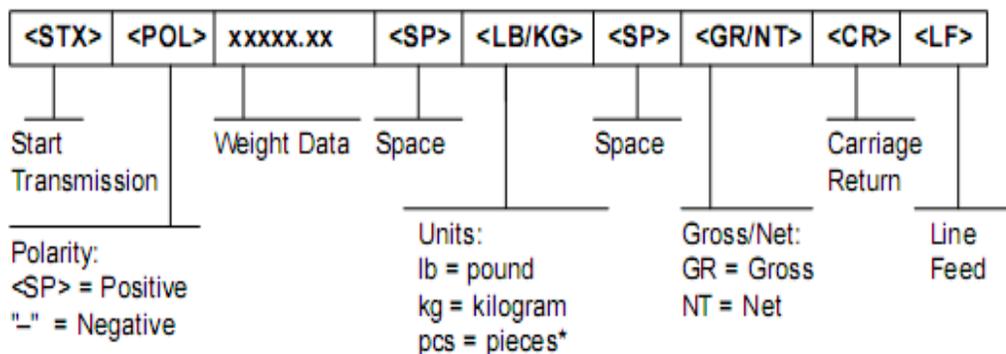
Print Format (C18 = 4)

ID.NO.	004 （Serial No.）
Date:	XX.XX. XX (yy.mm.dd)
Time:	XX.XX.XX (hh.mm.ss)
GROSS	8.88kg (gross weight)
TARE	2.88kg （tare）
NET	6.00kg （net weight）

PC or Big Display Continuous Sending Format (C18 = 5)

<STX>	<POL>	xxxxx.xx	<L/K>	<G/N>	<STAT>	<CR>	<LF>

Start Transmission

Polarity:
<SP> = Positive
"–" = Negative

Weight Data

Units:
L = pound
K = kilogram
PCS = pieces*

Gross/Net:
G = Gross
N = Net

Status:
<SP> = Valid
M = Motion
O = Over/under range

Carriage Return

Line Feed
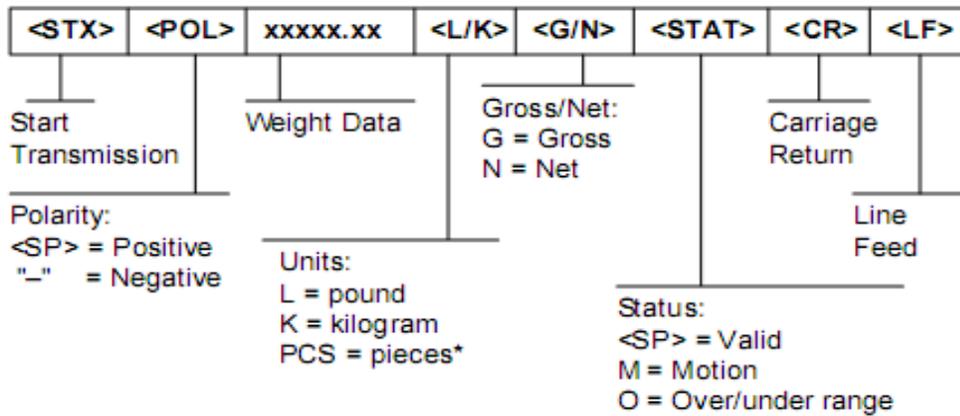
Troubleshooting

Q: What are the different error codes?
A: The following table shows the error codes and explanations:

ERROR	REASON	SOLUTION
uuuuuu	1. Overload 2. wrong connection with load cell 3. load cell has quality problem.	1. reduce the weight 2. check load cell connection 3. inspection load cell. Check the input and output 4. see Q&A below
nnnnnn	1. calibration is no good 2. wrong connection 3. load cell has quality problem	1.check scale is resisted or not, foot is kept level or not. 2.check load cell connection. 3.checking load cell : check input and output resistance to judge it is good or not. 4. see Q&A below
ERR1	During calibration, not input the weights or the weight is overload	Input the correct weights
ERR2	During calibration , the weights is below than Min. required weights	The calibration weights Minimum is 10% of Max. cap. Recommend 60%-80% of Max. Cap.
ERR3	During calibration, the input signal is negative	1. check the connection is correct 2. check load cell is no problem 3. recalibration if still wrong change the PCB
ERR4	During calibration, the signal is unstable	After the platform is stable, start calibration
ERR5	EEPROM Error	Change PCB
ERR6	Exceed Zero Range	See Q&A below

Q: The scale does not turn on.
A: Make sure the power cord is plugged in, and that there is power. One easy way to test this is by connecting another appliance to the same outlet and see if it's operational.

Q: The reading goes negative when a load is applied.
A: Try interchanging the Sig+ and Sig- wiring connected to the load cell and/or junction box (if one is used).

Q: How do I resolve ERR6 error?
A: Please follow the procedure below:

1) Turn on indicator make sure nothing is on the scale, and that the scale is level and not wobbling
2) Press and hold the "PRINT and HOLD" (for metal indicator) or "SET and ON/OFF" (for plastic indicator) key simultaneously for a couple of seconds
3) You should see C01 now.
4) Using the arrow keys, change C01 to C20. You have to change the 1st digit from 0 to 2 first before you can change the 2nd digit 1 to a 0.
5) Press enter ("PRINT" key for metal indicator; "SET" key for plastic indicator).
6) Change the value of C20 on the right to 100 if possible using the up arrow key. If 100 is not available change to 20.
7) Press enter ("PRINT" key for metal indicator; "SET" key for plastic indicator).
8) You should see C21 now. Press enter ("PRINT" key for metal indicator; "SET" key for plastic indicator).
9) Change the value on the right of C21 to 100 if available, 20 if not.
10) ("PRINT" key for metal indicator; "SET" key for plastic indicator).
11) You should see C22 now. Press the TOTAL key (metal indicator) or ON/OFF key (plastic indicator, do not hold this button too long) to save and exit.
12) Turn off and on indicator again, and see if this resolves the ERR 6 issue. If not, then following the Q&A answers below for resolving "nnnnnn" and "uuuuuu" errors.

Q: How do I resolve "nnnnnn" and "uuuuuu" error?
A: Please follow the procedure below:

1) Check if the cable that runs from the indicator to the junction box is damaged. If it is, replace the cable.
2) If #1 above did not resolve the issue, then open up the junction box (if available) and check to see if there is any water damage. If so, replace the junction box.
3) If the junction box is free of visible damage (#2 above did not resolve the issue), make sure all the wires on all 5 terminal blocks (5 wires on each terminal block) are not loose. Re-tighten the screws even if the wires seem to be connected.
4) If #3 above did not resolve the issue, try re-calibration.
5) If #4 above did not resolve the issue, there is a possibility one or more load cells are defective (consult with support@optimascale.com for further instructions).

Technical Support

Please email support@optimascale.com if you have any further questions.