![SENSOMATIC — We Sense Your Life... (An ISO 9001:2008 Company)]

MO2 USER MANUAL

CONTENTS

1 General Description

M02 weighing indicator is specially designed for weight transmitting in industrial fields.

This indicator has the features of small volume, plenty communicating commands, stable performance, easy operation and practicability. It can be widely applied to concrete and bitumen mixing equipment, metallurgy furnace and converter, chemical industry and feed, etc. .

Functions and Characteristics

- ➢ Small volume, unique design, easy operation
- ➢ Applicable to all kinds of resistance strain gauge bridge load cell
- ➢ Front panel numerical calibration
- ➢ Multilevel of digital filter
- ➢ Automatic zero -tracking
- ➢ Automatically zero when powered on
- ➢ 4 set points
- ➢ 1 input and 2 outputs
- ➢ Serial communication interface:RS232 or RS485
- ➢ Calibration via serial interface
- ➢ Optional interfaces: Analog output, serial interface

Front Panel
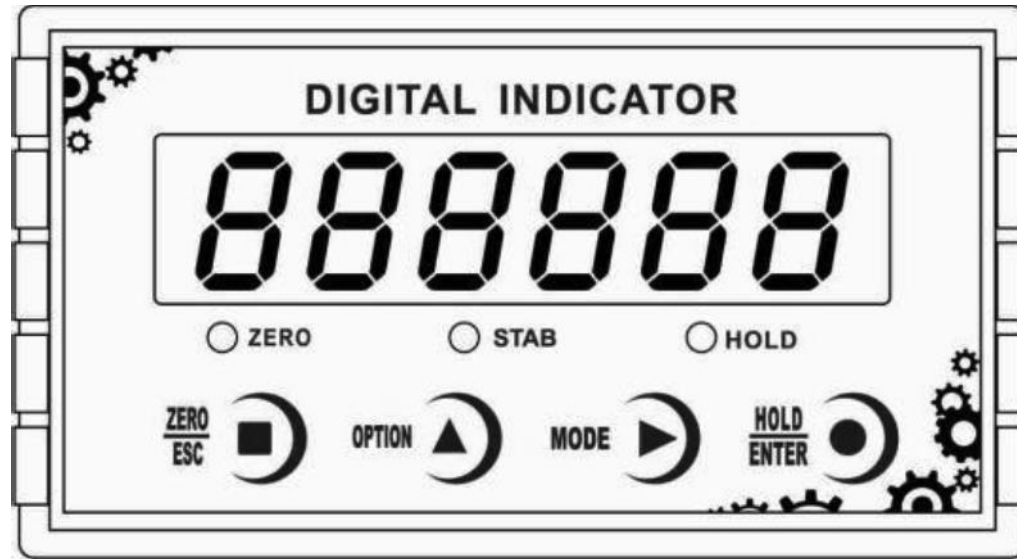
M02 Front panel

Main Display:6 digits, for displaying weight and the information of parameters.
Status Indicator Lamp:
  ➢ **ZERO:** Light on when present weight is within 0±1/4d.
  ➢ **STAB:** Light on when changes of weight values are within the range of motion
         detecting during motion detecting time.
  ➢ **HOLD:** Light on when indicator displays the value of D/A output.
Keypad:

ZERO / ESC ■ : Zero/Esc, Used to exit from current operation or go previous.

OPTION ▲ : Used to scroll optional values of parameter and to make flashing digit increase 1 while data inputting.

MODE ▶ : Function Selecting Key, To make flashing position move to the right digit when data inputting.

HOLD / ENTER ● : Confirming Key. Used to confirm present operation.

Technical Specifications

Common:

Power supply: **DC24V±5%**
Working temperature: **-10～40℃**
Max humidity: **90%R.H without dew**
Power consumption: **About 10W**
Dimension: **110×89×60（mm）**

Analog:

Load cell power: **DC5V   200mA（MAX）**
Input impedance: **10MΩ**
Zero steady range: **0.00～12mV(Load cell 3mV/V)**
Input sensitivity: **0.1uV/d**
Input range: **0.00～15mV(Load cell 3mV/V)**
Transfer mode: **Sigma - Delta**
A/D conversion speed: **15, 30, 60, 120, 480, 960 times/sec**
Non-linearity: **0.01% F.S**
Gain drift: **10PPM/℃**
Display Precision: **1/100,000**

Digital:

Weight display: **6 digits red high-brightness LED**
Minus display: **" "**
Overload display: **"OFL"**
Decimal point: **5 kinds (optional)**
Function keys: **4 keys soniferous keypad**

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2 Installation and Wiring

Connection of Power Supply

M02 weighing indicator connects DC24V power supply as follows:
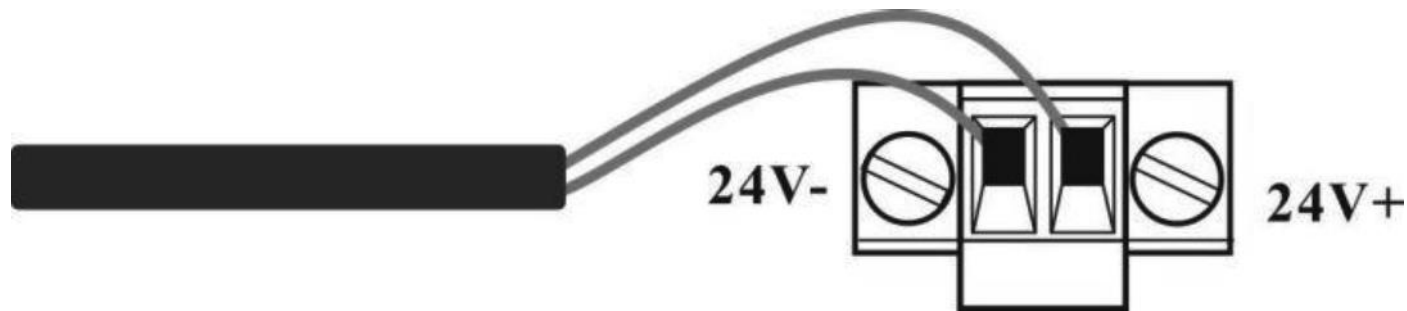
Power supply connection

Connection of Load Cell

M02 weighing indicator connects bridge type resistance strain gauge load cells by 6 wires or 4 wires as follows. When you use 4-wired load cells, you must bridge the SN+ with EX+ and bridge the SN- with EX-.
The signal definition of each port of the load cell connector is as follows:

EX+: Excitation+ **EX-**: Excitation-   **SN+**: Sense+   **SN-**: Sense-   **SIG+**: Signal+   **SIG-**: Signal-

6 wires	EX+	SN+	EX-	SN-	SIG+	SIG-	Shield
4 wires	EX+		EX-		SIG+	SIG-	Shield

6 wires connection
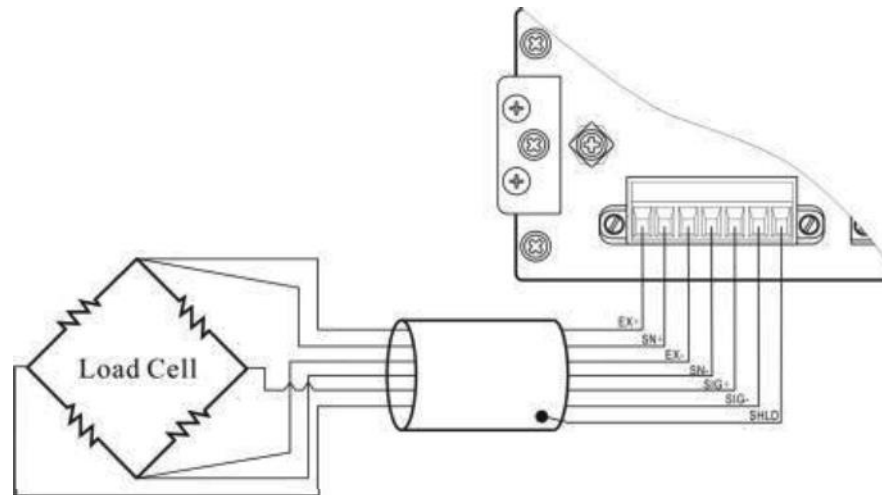
Note:

1. As load cell output sensitive analog signal, please use shield cable to separate with other cables, especially AC power.

2. 4 wires connection is suitable for short distance and stable temperature or low precision field, otherwise use 6 wires connection.

3. For more load cells parallel connection, their sensitivity (mV/V) should be same.

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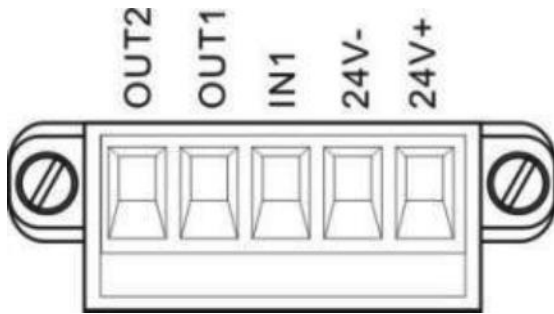
I/O terminals

I/O tolerant definition as follows:

Output		Input	
OUT1	Stable	IN1	Reset all
OUT2	OFL		

Indicator input terminal connection:

Indicator input terminal connection:

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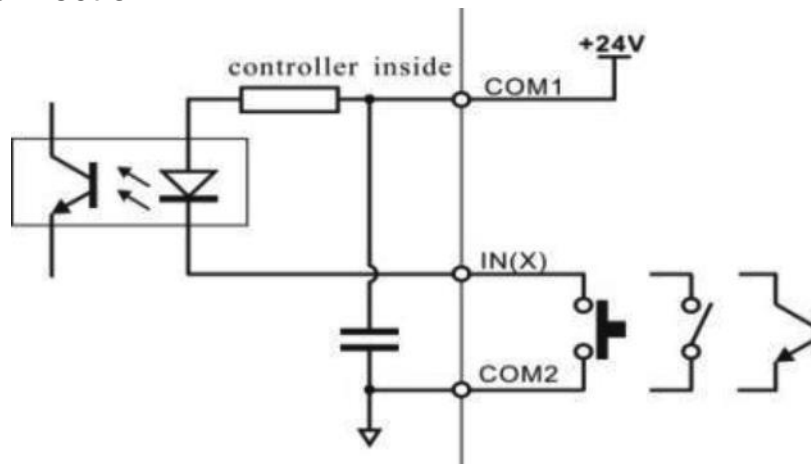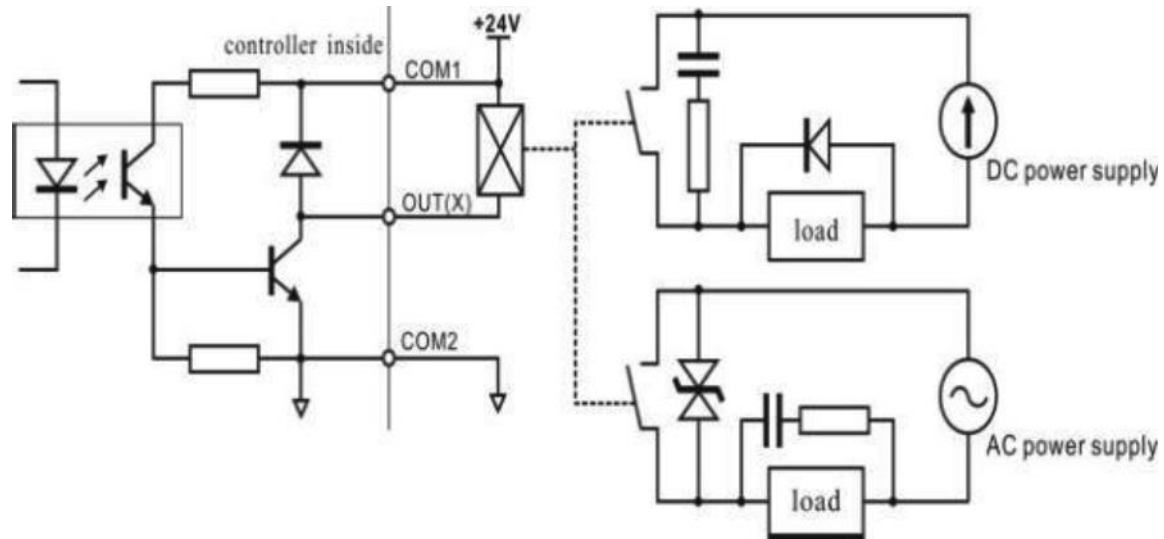
Optional Expansion Board Output

M02 weighing indicator supports analog output, RS232 or RS485 as optional output function, please confirm it when place orders.

Analog Output (Optional)

At normal displaying status, press to check the analog output.

The definition of analog output as below:

GND RXD/A TXD/B GND I+ I- V+ V-
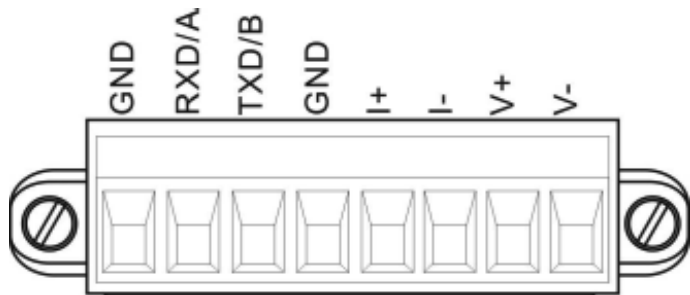
The definition of analog output:
V+: voltage-output+, **V-**: voltage-output-
I+: current-output +, **I-**: current-output -

Analog output two types:
1) Voltage output: 0-5V/0-10V is optional .
2) Electric current output: 4-20mA/0-20mA/0-24mA is optional.
3) User-define function, users can define analog output type and output range.

The analog output has been calibrated before the delivery of the indicators, so users do not need to make calibration. If analog output is abnormal, users can calibrate by themselves as follows: （Suggestion: please calibrate under the instruction of professionals)

Normal display status

MODE ▶

SET UP
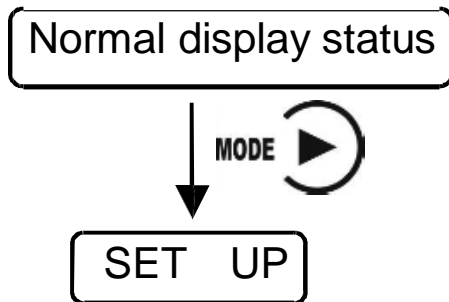
Note: only support calibration under current mode. 4 points must be finished for current calibration.

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MODE ▶ and OPTION ▲

Current calibration interface ⟷ `1. 4.0.0.0.` ⇔ In this interface the multimeter measured should be 4.000mA.

If not,press HOLD/ENTER ⬤

`8. 1.0.8.0.0.` ← Measured **4.000mA**

⇕

This interface is current DA

D/A,press MODE ▶ to adjust the value, and the current value measured will vary accordingly.To adjust it when the measured value to be 4.000mA, then

press HOLD/ENTER ⬤ to save and exit.

Then press MODE ▶ to calibrate 12.000mA.

If yes,press MODE ▶

`1. 1.2.0.0.0.` ⇔ In this interface the multimeter measured should be 4.000mA.

Finish the calibration referring to the process of 4.000mA calibration, and the same for the calibration of 20mA.

This interface is the highest point calibration of analog output.

In the interface of highest point calibration, press $\overline{\text{HOLD}}$ ENTER ⬤ to enter into analog display value interface, the display will be 5 digits (initial value is **24000,** means

24.000mA), press $\overline{\text{HOLD}}$ ENTER ⬤ to input the value measured by the multimeter.

Note: Analog output calibration, highest point must be calibrated.

Serial Interface RS485 Output

Serial Interface RS485 output is optional, please refer to chapter 6.0 for communication protocol.

RS485 serial interface connection:
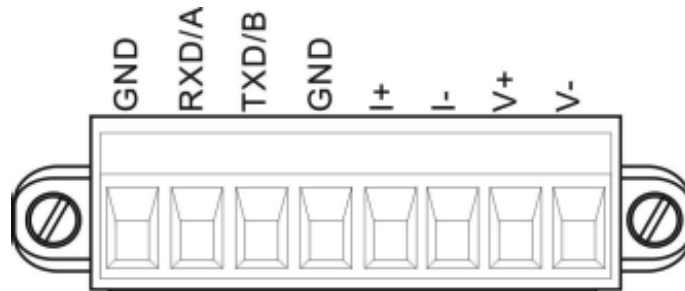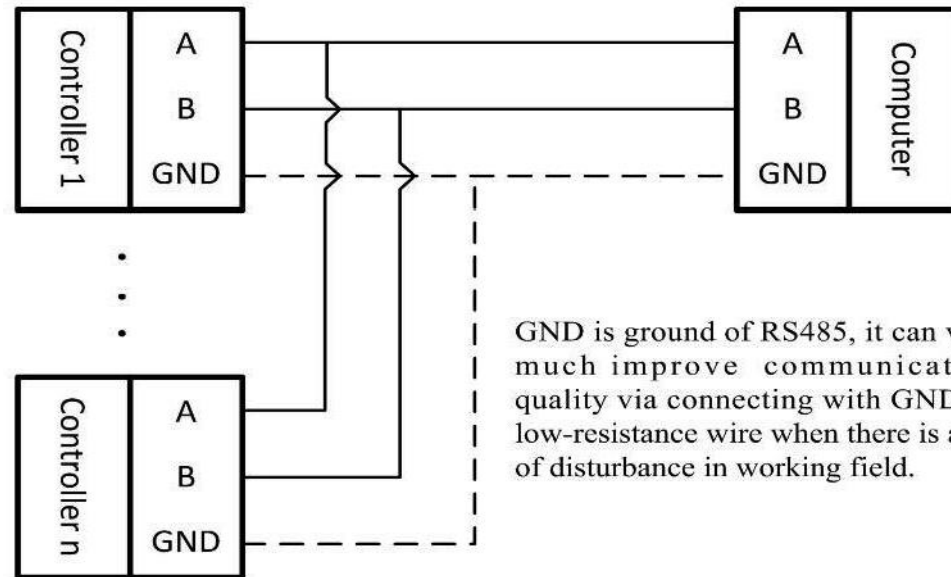
GND is ground of RS485, it can very much improve communication quality via connecting with GND by low-resistance wire when there is a lot of disturbance in working field.

2.4.3 Serial Interface RS232 output (Optional)

RS232 serial interface connection:
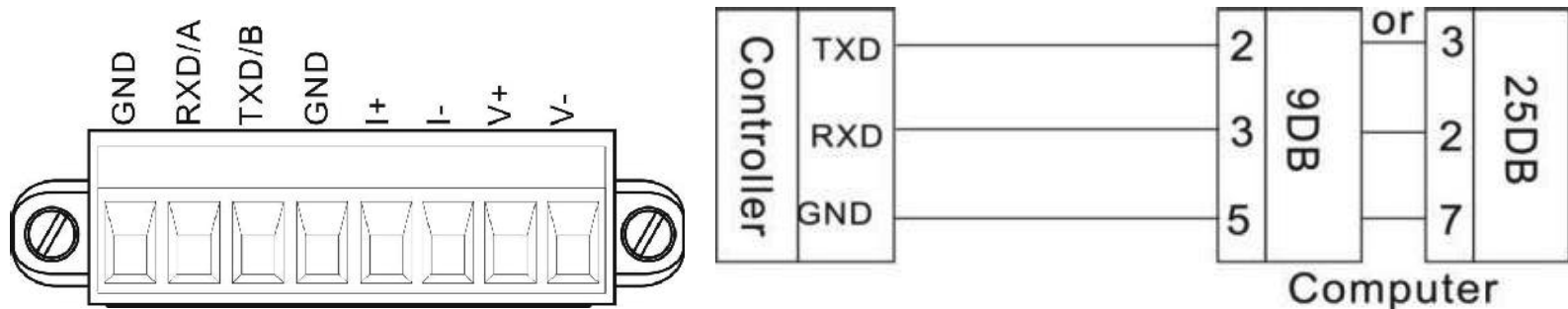
3 Calibration

Instruction

（1）Calibration procedure must be executed when a M02 indicator is put in use at the first time, the preset parameters may no longer meet the user's needs, and any part of the weighing system was changed. Position of decimal point, minimum division, maximum capacity, zero, and gain can be set and confirmed through calibration.

（2）If you want to set only one parameter, please press ![HOLD ENTER] to save parameter's value and then press ![ZERO ESC] to exit.

（3）Please see section **3.7** for parameters' instruction.

（4）Please record each value in the blank table in section 3.4 during calibration for the emergency use in future.

（5）See chapter **9** for error alarm message that may be displayed during calibration.

Flow Chart of Calibration

888818 ⟺
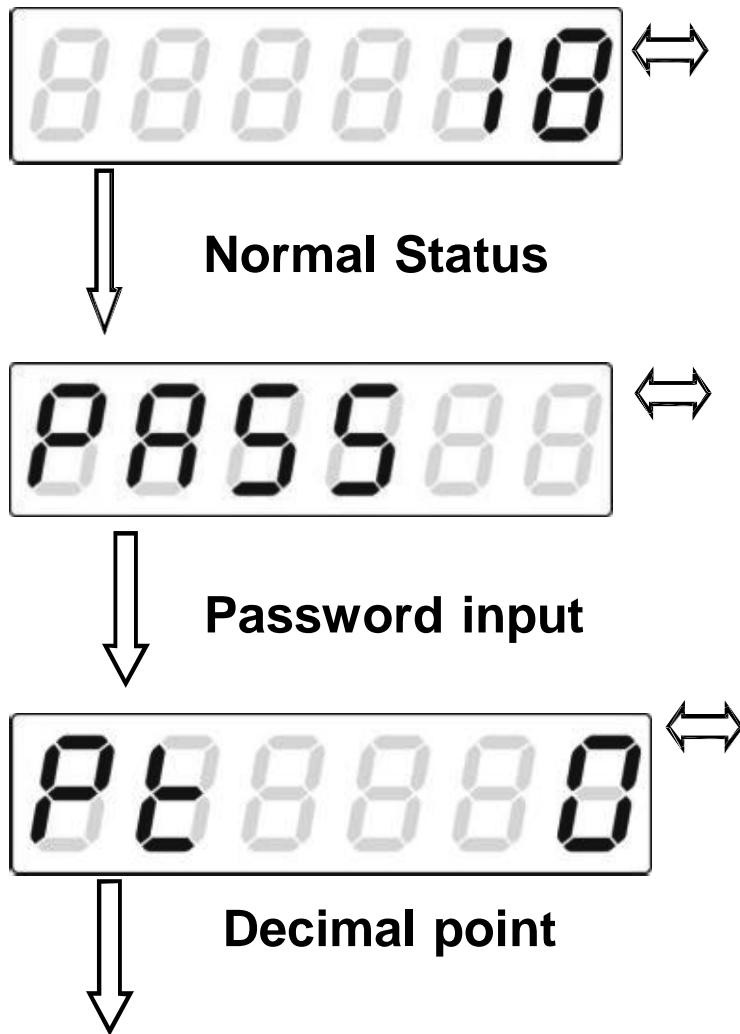
1. Under this status, press MODE ▶ (twice), indicator will display **CAL**, then

press HOLD/ENTER ⬤ to enter password input.

Normal Status

2. After password is input, the indicator will

PASS88 ⟺

display **CALON** for one second, then go to

next step.

Password input

3. Press OPTION ▲ to select a desired value for decimal point among **0,**
0.0, 0.00, 0.000 and **0.0000, and then**

Pt8888 ⟺

press HOLD/ENTER ⬤ to save it and enter next step.
If there's no need to change the value,

press HOLD/ENTER ⬤ directly to enter next step.

Decimal point

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Min. divistion
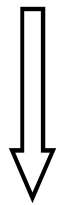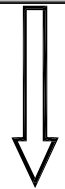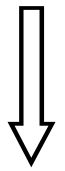
4. Press ⟨OPTION ▲⟩ to select a desired value for min. division among **1**,**2**, **5**,**10**,**20** and **50**, and then to save it and enter next step.
If there's no need to change the value, then press ⟨HOLD ENTER ●⟩ directly to enter next step.

Max. capacity

5. Input max. capacity(≤min. division×**100000**), press ⟨HOLD ENTER ●⟩ to save it and enter next step.
If there's no need to change the value, then press ⟨HOLD ENTER ●⟩ directly to enter next step.

Millivolt value display

6. Under this status, press ⟨HOLD ENTER ●⟩ to enter zero calibration.
Display value near the output value in millivolt between **SIG+/SIG-** of load cell.
See section **3.3** for details about this function.

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Zero calibration

7.Unloaded scale first, when **STAB** lamp is on, press $\overline{\text{HOLD}}$/**ENTER** to finish zero calibration.

If there's no need to calibrate zero, press $\overline{\text{ZERO}}$/**ESC** directly to enter gain calibration.

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8. The process of gain calibration is as follows. If there's no need to do gain calibration, press

ZERO / ESC ■ directly to enter serial ports calibration switch setting.

Gain Calibration
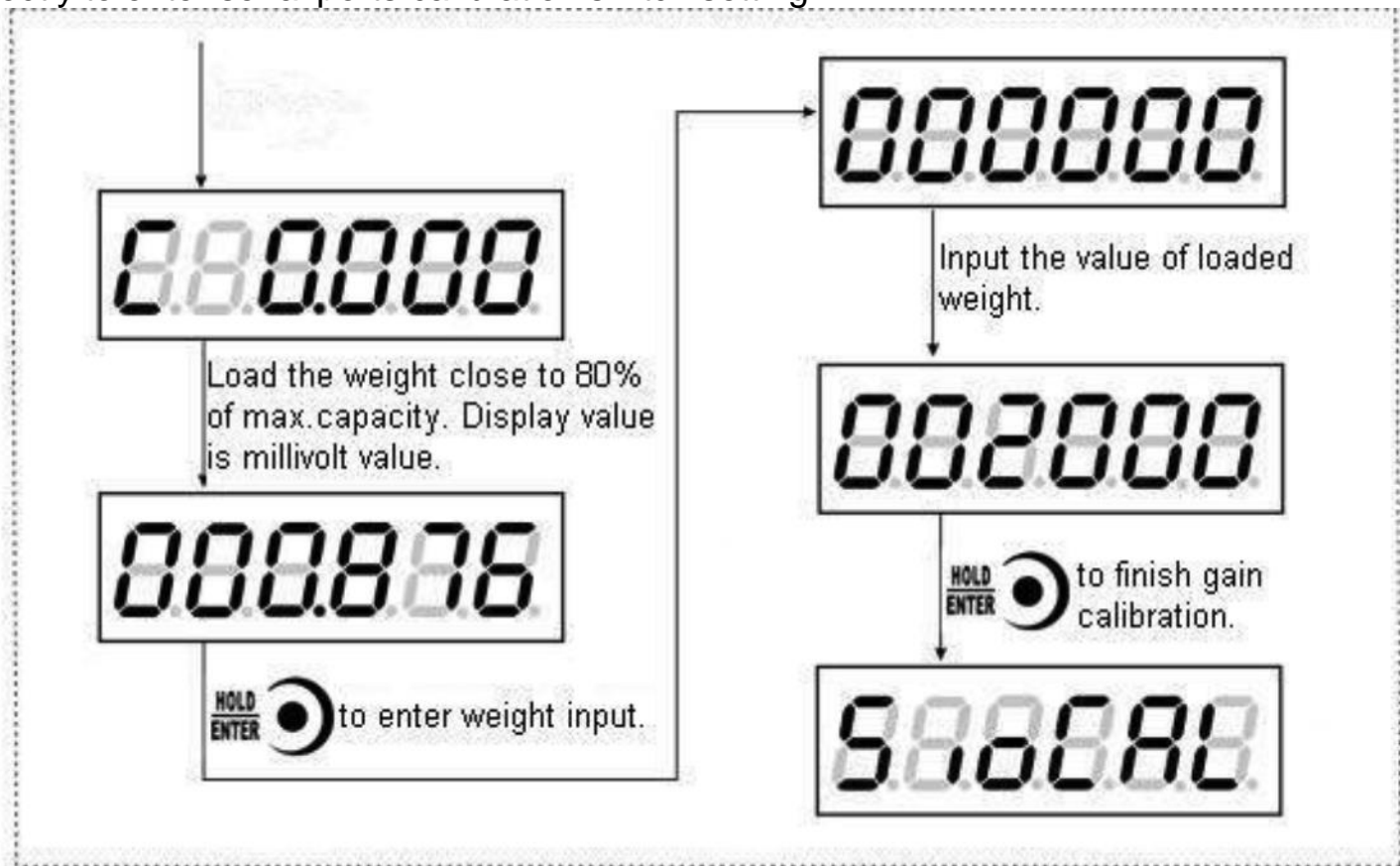
`0.0.0.000`

Load the weight close to 80% of max.capacity. Display value is millivolt value.

`000.876`

HOLD/ENTER to enter weight input.

`000000`

Input the value of loaded weight.

`002000`

HOLD/ENTER to finish gain calibration.

`5.0.0.8.0.0`

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Serial ports calibration switch

$5_ioC\ RL$

9. Press HOLD/ENTER ● to enter setting interface, press OPTION ▲ to choose the switch position, press HOLD/ENTER ● to set password。 If don't need to set switch position, then press ZERO/ESC ■ to enter password setting.

Password setting

$PRSS$

10. See section **7.2** for reference to set password. If there's no need to set password, press ZERO/ESC ■ directly to go back to normal status.

Normal status

888200

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Millivolt Value Display

This function is mainly used for system test, position-error test for weighing mechanism and linearity test for load cell.

1. System Test

(1) If display data changes with loaded weight changes, it shows that connection of load cell is correct and weighing mechanism works well.

(2)If display value is OFL (or −OFL), it means that loaded weight on load cells is too large (or too small). Please unload the weight (or load more), if display value is still OFL (or ⊖FL), the possible reasons are as follows:

a. There is something wrong with weighing mechanism, please check and clear.

b. The connection of load cell is incorrect, please check and clear.

c. Load cells may be damaged, please replace.

2. Position-error Test for Weighing Mechanism

Load a same weight on each corner of weighing mechanism and record displayed millivolt value respectively. If differences among these values are obvious, please adjust weighing mechanism.

3. Linearity Test for Load Cell

Load same weight for several times, and record displayed value every time. If one or two values are obviously much larger or smaller than any others, it means that the linearity of load cell is   bad.

*NOTE: You must use   ZERO ESC ■   **to zero display data before weight is loaded for each time.**

Calibration with Weights

During calibration with weight, please record the zero millivolt value, gain millivolt value and the loaded weight value in the blank table below. If it is not convenient to load a weight to calibrate, these values can be used for calibration without weights.

	Zero millivolt value(mV)	Gain millivolt value(mV)	Loaded Weight	Date	Remarks
1					
2					
3					
4					
5					

Millivolt Calibration

When it is not convenient to load a weight to calibrate, calibration can be done without weights using recorded data in the table in section 3.4.

However, this method is just used for some emergencies, it will make calibration result incorrect if load cells, or indicator has been replaced.

OPTION ▲

Input zero millivolt value recorded
in the table in section 3.4

HOLD
ENTER ● to finish zero calibration

OPTION ▲

`000000`

Input gain millivolt value recorded in the table in section 3.4

`000.876`

HOLD
ENTER ●

`000000`

Input loaded weight recorded in the table in section 3.4

`002000`

HOLD
ENTER ● to finish calibration

`SABCAL`

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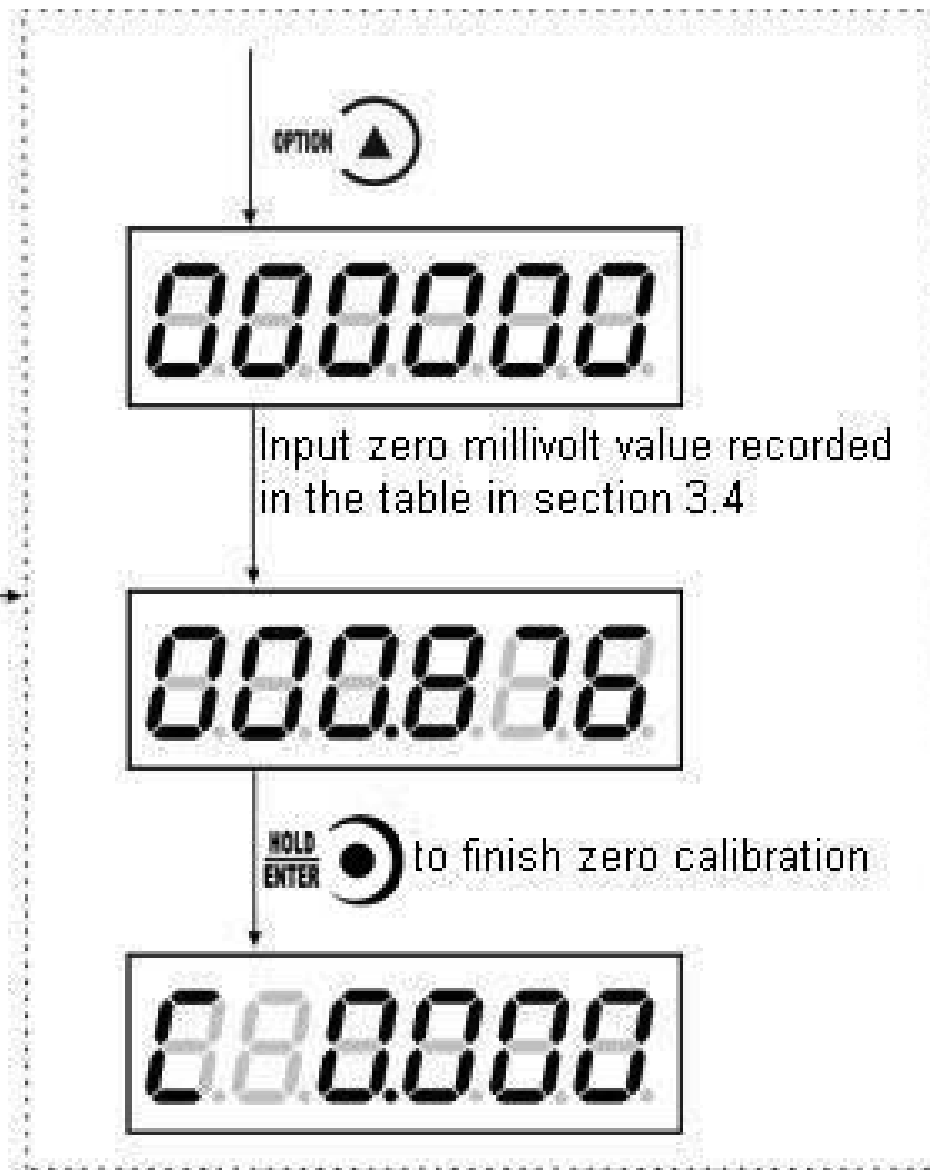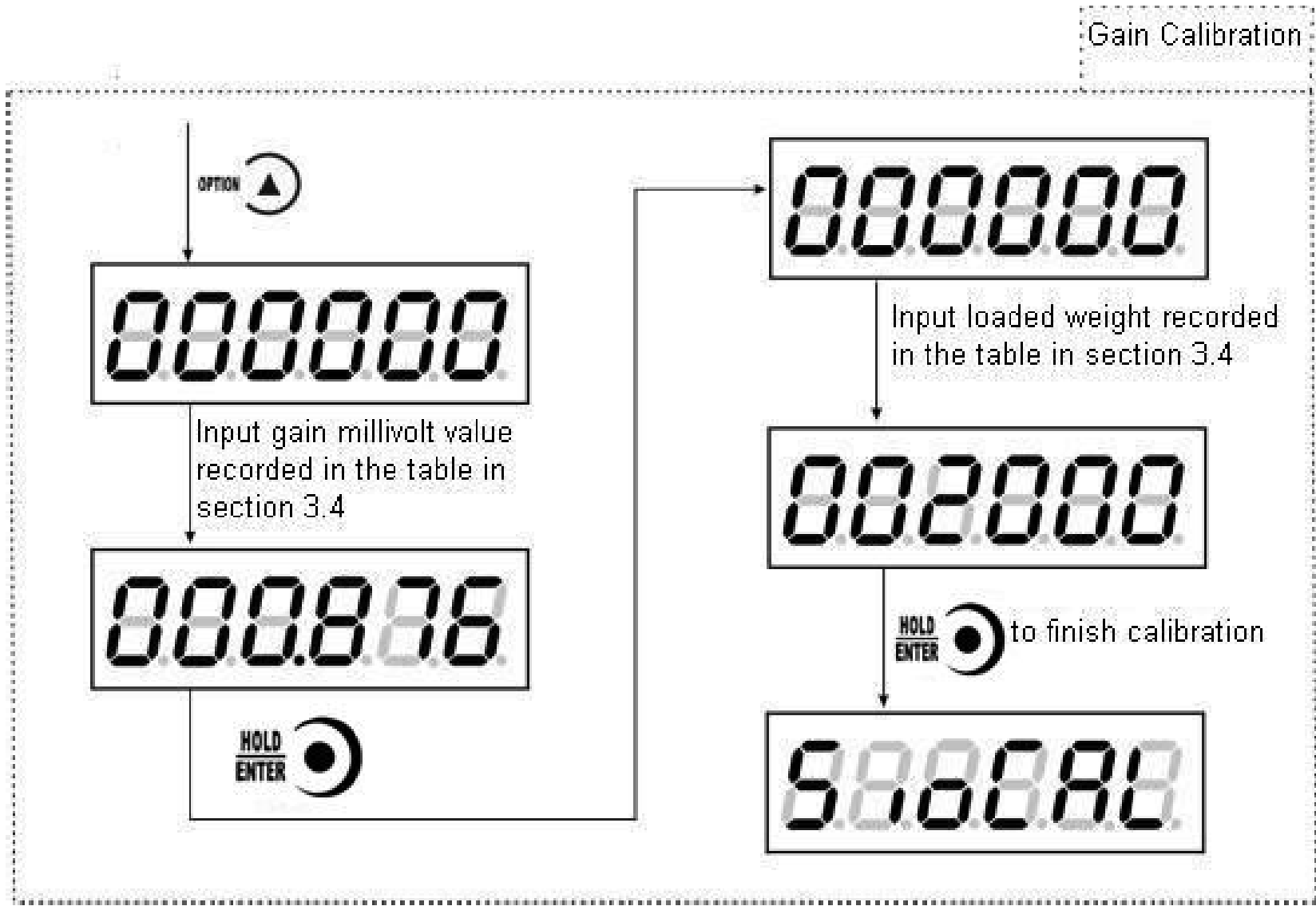
Calibration Switch for Communication Interface

When calibrate the transmitter through serial port(Rs、SP1 or Modbus), must set to "ON" status for the calibration switch for communication interface.

Explanation for Calibration Parameters

Symbol	Parameter	Types	Value of parameter	Default
Pt	Decimal Point	5	0　0.0　0.00　0.000　0.0000	0
1d	Min. Division	6	1　2　5　10　20　50	1
CP	Max. Capacity		≤Min. Division×**100000**	10000
t	Millivolt Value			
o	Zero			
C	Gain			
SIOCAL	Switch for Calibration via serial interface			OFF
PASS	Password Setting			000000

Log Table for Calibration Parameters

Parameter	Calibrated Value	Date	Remarks
Decimal Point			
Min. Division			
Max. Capacity			
Load cell sensitivity			
Password			

4 Working Parameters Setting

Flow Chart of Working Parameters Setting

Normal Status

MODE ►

SET   UP ⟺ If F**4.1**(Password Switch) is ON, you should input password first.

HOLD ENTER ●

F1 → **HOLD ENTER** ● → F1.1 ⋯ **MODE** ► ⋯► F1.7

MODE ►

1 .Use **MODE** ► to select between the same level. Switch from display **F1** to **F2,** press **MODE** ► .

F2 — HOLD/ENTER → F2.1 — MODE ⋯⋯→ F2.7

F2 — MODE ↓

2 .Press **HOLD/ENTER** to enter into sub-selection, press **ZERO/ESC** to return back to previous menu.

When it displays **F2**,press **HOLD/ENTER** to enter into **F2.1.**

F3 — HOLD/ENTER → F3.1 — MODE ⋯⋯→ F3.2

F3 →

F3 ↓

F4 — HOLD/ENTER → F4.1

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Parameter Setting Method

M02 has 2 kinds of working parameters: Selection type and data type. For

selection type parameters, press OPTION ▲ to choose. For data type parameter in

parameter interface, press MODE ▶ to choose digit position, presst OPTION ▲ se value.

Selection:

F1.1 → HOLD ENTER ● Enter setting status → OFF → OPTION ▲ Change **OFF** to **ON** → ON → HOLD ENTER ● Confirm the change → F1.1

Data:

F1.4 → HOLD ENTER ● Enter setting status → 5<u>0</u> → MODE ▶ Move the flashing from **0** to **5** → <u>5</u>0 → OPTION ▲ Adjust value → <u>6</u>0 → HOLD ENTER ●

Confirm change

F1.4

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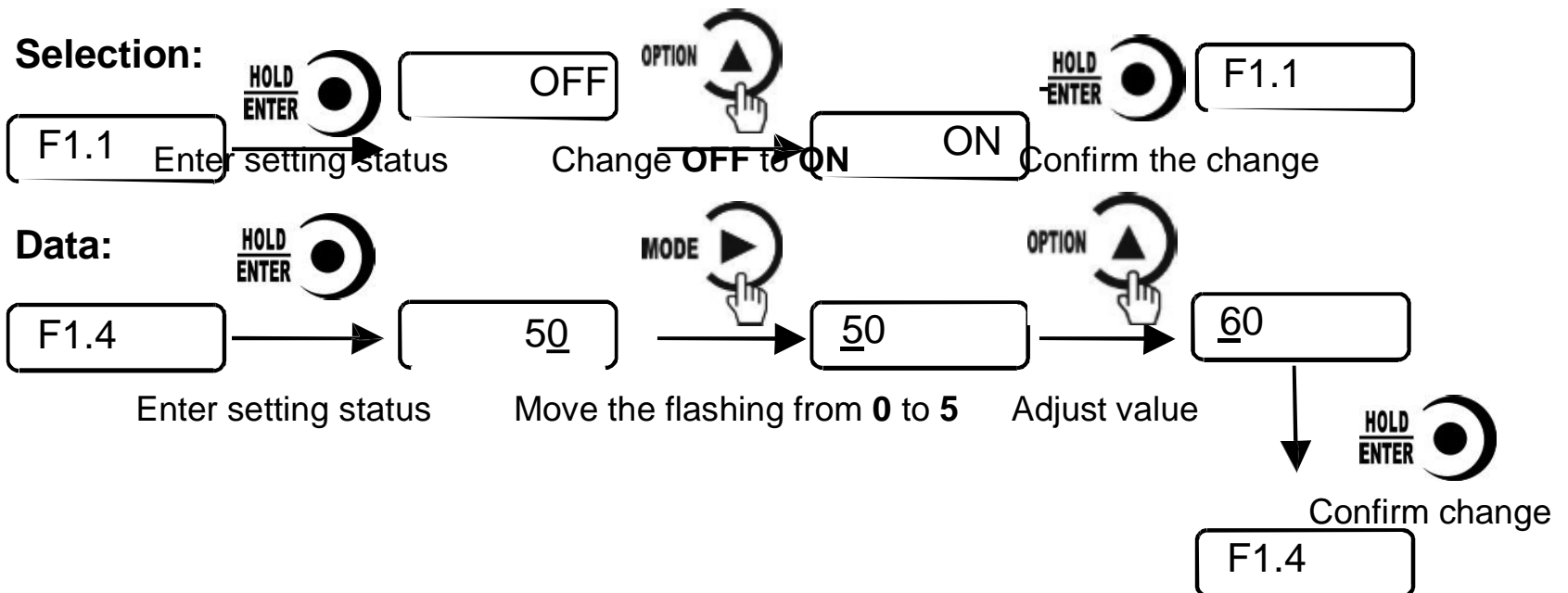
Descriptions of Operation Parameters

Code	Default	Description
F1	Null	**The first major term of working parameter.**
F1.1	OFF	Switch for Auto-Zeroing when power-on, OFF: disabled ON: enabled
F1.2	0	Zero-tracking Range（0～9d optional）. This parameter is for automatic calibration, disabled when is set "0".
F1.3	1	Motion Detecting Range（1～9d optional)
F1.4	50	Zeroing Range（00%～99% of Maximum capacity）
F1.5	5	Digital filtering parameter: (1-9 as optional) 0: without filtering 9: strongest digital filtering
F1.6	0	Stable filter parameter（the second filter based on the first filter）: (1-9 as optional) 0: without filtering 9: strongest digital filtering
F1.7	0	A/D conversion rate: 120,480,960,15,30,60 as optional

F2	Null	The second major term of working parameter.
F2.1	01	Scale no., indicator no.
F2.2	9600	Baud rate of serial port
F2.3	Cb920	Serial ports communication mode: **Modbus-RTU：MODBUS RTU mode;** **r-Cont:SP1 continuous mode;** **r-SP1: SP1 command mode；** **tt:TOLEDOcontinuous mode；** **Cb920：Cb920 continuous mode。** **rE-Cont:rE continuous mode；** **rE- rEAd:rEcommand mode；**
F2.4	7-E-1	**Data format:** **7-E-1：7** data bits，even parity check，**1** stop bit； **7-O-1：7**data bits，odd parity check，**1** stop bit； **8-E-1：8** data bits，even parity check，**1** stop bit； **8-O-1：8** data bits，odd parity check，**1** stop bit； **8-n-1：8** data bits，no parity check，**1** stop bit； **8-n-2：8** data bits，no parity check，**2** stop bit；

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F2.5	HiLo	**MODBUS dual-byte register storage turn**，**Hi Lo**：High byte in the front, low byte at the back；**Lo Hi**：Low byte in the front, high byte at the back
F2.6	nonE	Cont mode automatic sending time interval
F2.7	0	**tt**(**TOLEDOcontinuous mode**)If send the checksum。**0**：not send, **1**：send.
F3	Null	**The third major term of working parameter.** (For analog output only)
F3.1	0-5	**Analog output:** **4-20**：**4-20mA** **0-20**：**0-20mA** **0-24**：**0-24mA** **0-5**：**0-5V** **0-10**：**0-10V** **I_out**：Current customized **V_out**：Voltage customized In customized mode,**F3.2-F3.5** parameters available
F3.2	3920	Minimum output
F3.3	4000	Zero point output

F3.4	20000	Maximum capacity output
F3.5	20020	Maximum output
F4	Null	**The fourth major term of working parameter.**
F4.1	OFF	Parameters password setting switch.
F4.2	000000	Parameters password setting:**Valid when F4.1 is ON**

Set point parameters

Code	Default	Description
P1-P4	**Null**	**The first term of working parameters**
PX.1	**OFF**	Change of state if need stable
PX.2	**0.0**	Change of state minimum duration
PX.3	**P1.3=1** **P2.3=5** **P3.3=0** **P4.3=0**	Condition of validity： 0： forbid； 1： <； 2： <=； 3： ==； 4： >=； 5： >；

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		6：!=； compare to minimum value
		7：_<>_outside the range, need to set 2 edge value
		8：=<_>=inside the range, need to set 2 edge value
		9：external trigger. If it's IO，do 1 state change for 1 trigger, if it's command, then decide according to valid or invalid command.
PX.4	**0**	Set value 1（Set value 1 and set value 2, choose the minimum to compare）
PX.5	**0**	Set value 2

Set point has **4** major terms which are user defined.

5 I/O Definition

I/O Definition

Output/Input code table:

Output		
Code	**Definition**	**Description**
O0	None	No definition
O1	Stable	Effective output in stable status.
O2	Overflow	Effective output when overflow.
O3	Sp**1**	Effective output when set point **1** status output.
O4	Sp**2**	Effective output when set point **2** status output.
O5	Sp**3**	Effective output when set point **3** status output.
O6	Sp**4**	Effective output when set point **4** status output.

Input		
Code	**Definition**	**Description**
I0	None	No definition
I1	Zeroing	Effective input for zeroing, pulse input signals
I2	Sp**1**	If this signal is valid, Sp**1** status will be regarded as invalid. Output valid state when comparision condition turns to invalid, and be effective again.
I3	Sp**2**	If this signal is valid, Sp**2** status will be regarded as invalid. Output valid state when comparision condition turns to invalid, and be effective again.
I4	Sp**3**	If this signal is valid, Sp**3** status will be regarded as invalid. Output valid state when comparision condition turns to invalid, and be effective again.
I5	Sp**4**	If this signal is valid, Sp**4** status will be regarded as invalid. Output valid state when comparision condition turns to invalid, and be effective again.

I6	Reset all	Reset all paramater value when this signal is valid.

I/O testing
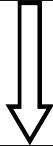
 ⟺ Under weighing status,press **MODE ▶**（**5 times**） then display **TESTio**，press **HOLD ENTER ●** enter into I/O testing interface.

Normal Status

 ⟺ Press **OPTION ▲** **OUT1** status flash, press **MODE ▶** **OUT2** status flash.

 ⟺ This interface shows:**IN1** input valid, **OUT1** output valid.

6 Serial Communication

M02 has RS232 or RS485 as optional to realize communication with upper computer。Support r-Cont、r-SP1、Modbus(bus)、tt TOLEDO、Cb920、rECont protocols and rErEAD protocol.

Serial communication terminal please refer to chapter **2.4.2、2.4.3.** Baud rate and communication format setting please refer to **F2.2、F2.3 and F2.4.**

※Under main display（display weight value), long press to enter into serial communication checking interface, it will display '----- 'if no communication, and '----- ' will flash if there's communication.

r-Cont

Indicator will send weighing data to host computer without command.

Data Format:

STX	Scale no.	Channel no.	Status	Value	CRC	CR	LF

Here:

STX —— 1bit，start character **02H**

Scale no. —— 2bits，**00~99**

Status —— **2**bits，high byte:**40H**；low byte definition as follows:

D6	D5	D4	D3	D2	D1	D0
Null	Null	G./N. weight	+/-	Zero point	OFL	Stable
1	0	0	0：+ 1：-	0：non/zero 1：zero	0：normal 1：OFL	0：not stable 1：stable

Weight Value —— **6** bits；when weight is+ （-）overflow,return to"space space **OFL** space"

CRC —— **2** bits,check sum

CR —— **1** bit，**0DH**

LF —— **1** bit，**0AH**

For example:

02 30 31 31 4041202020373030 32 34 0D 0A

Means: stable,positive data,present weight **700**

r-SP1

Code : **ASCII**

Operation code supported: **W**，**write**；**R, read**；**C**，**calibrate**；**O, zero**

Parameters Code Chart

Operation code	Para. code	Para. Name	number of character
R	WT	Read current status and weight	8
R	SP	Read set point status	4
W	DC	Write mini. Divistion and max. capacity	8
R/W	PT	Decimal point digit	1
R	DD	Minimum division	2
R	CP	Maximum capacity	6
R/W	AC	Auto. Zeroing switch	1
R/W	TR	Zero tracking range	1
R/W	MR	Stable range	1
R/W	ZR	Zeroing range	2
R/W	FL	digital filtering para.	1
R/W	VC	steady filtering	1
R/W	AD	AD sample rate	1
R	PO	Set point output status	4
R/W	P1M~P4M	Set point to judge if need stability	1
R/W	P1T~P4T	Set point minimum duration time	3
R/W	P1F~P4F	Set point comparison condition to judge	1
R/W	P1L~P4L	Set point lower edge	6

R/W	P1H~P4H	Set point upper edge value to judge	6
R	AM	Absolute millivolt	**7: D6D5D4D3D2D1D0;** **D6:+;D5-D0:** corresponding **ASCII** for **6** digits millivolt,Decimal point is fixed to **3 digits**
R	RM	Relative zero point on millivolt	**7：D6D5D4D3D2D1D0** **D6：** +/-;**D5-D0**:corresponding **ASCII** for **6** digits，Decimal point is fixed to **3 digits**
C	ZY	Zero calibration with weight	
C	ZN	Zero calibration without weight	6
C	GY	Gain calibration with weight	6
C	GN	Gain calibration without weight	12
O	CZ	Zero clearing command	
O	P1S~ P4S	Setting the corresponding set point	Valid when 9,command valid when external trigger and 1 status change for 1 external Trigger
O	P1C~P4 C	Clear the corresponding set point	

Note: the top cell before "R/W" row reads "value to judge".

Error Code Explanation

    1：CRC check error

    2：Operation code error

    3：Parameters code error

    4：Write data error

    5：Operation invalid

    6：Channel no. error

Note：Default channel no. of this indicator : **1**（**31H**）

    Command

Indicator will send weighing data to host computer after received command.

Host computer read present status

Send command:

STX	Scale no.	Channel No.	R	WT	CRC	CR	LF

Correct response:

STX	Scale no.	Channel No.	R	WT	Status	Value	CRC	CR	LF

Wrong response:

STX	Scale no.	Channel No.	R	WT	E	Error code	CRC	CR	LF

Here：

STX ── **1**bit，start character，**02H**

R──1 bit，**52H**

WT──2 bit，**57H 54H**

E──1 bit，**45H**

Status ── **2**bits，high byte: **40H**；low byte definition as follows:

D6	D5	D4	D3	D2	D1	D0
Null	Null	G./N. weight	+/-	Zero point	OFL	Stable
1	**0**	**0**	**0**：+ **1**：-	**0**：non/zero **1**：zero	**0**：normal **1**：OFL	**0**：not stable **1**：stable

Weight Value ── **6** bits；when weight is+ （-） overflow,return to"space space **OFL** space"

For example:

02 30 31 31 <u>525754</u> 30 31 0D 0A

Correct response： **02 30 31 31 52 57 54 <u>4041303033373533</u> 33 36 0D 0A** （**stable**present value **3753**）

Wrong response: **02 30 31 31 52 57 54 <u>4531</u> 31 39 0D 0A** （CRC check error）

Read other parameters

Send command:

STX	Scale no.	Channel No.	R	Para. code	CRC	CR	LF

Correct response:

STX	Scale no.	Channel No.	R	Para. code	Value	CRC	CR	LF

Wrong response:

STX	Scale no.	Channel No.	R	Para. code	E	Error code	CRC	CR	LF

Here:

Para. Value—— **1**bit

Para. code——**2** bits，

For example:

02 30 31 31 <u>524D52</u> 3839 0D 0A

Correct response：**02 30 31 31 52 4D 52 <u>36</u> 34 33 0D 0A**（**stable range：6**）

Wrong response:**02 30 31 31 53 4D 52 <u>4532</u> 30 39 0D 0A**（Operation code error）

Write max. Capacity and min. Division

Send command:

STX	Scale no.	Channel No.	W	DC	Division value	Max. capacity	CRC	CR	LF

Correct response:

STX	Scale no.	Channel No.	W	DC	O	K	CRC	CR	LF

Wrong response:

STX	Scale	Channel	W	DC	E	Error code	CRC	CR	LF

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	no.	No.							

Here:

DC——**2** bits，**44H 43H**

O——**1** bit，**4FH**

K——**1** bit，**4BH**

Division value——**2 bits**，**1/2/5/10/20/50**

Max. capacity——**6 bits**

For example:

02 30 31 31<u>**5744433035303130303030**</u> **36 30 0D 0A(**division value **5**, Max capacity **10000)**

Correct response: **02 30 31 31 57 44 43 4F 4B 32 34 0D 0A**

Wrong response: **02 30 31 31 57 44 43 <u>4535</u> 39 32 0D 0A** （Operation can't execute）

Write other parameters

Send command:

STX	Scale no.	Channel No.	**W**	**Para. code**	Para. value	**CRC**	**CR**	**LF**

Correct response:

STX	Scale no.	Channel No.	**W**	**Para. code**	**O**	**K**	**CRC**	**CR**	**LF**

Wrong response:

STX	Scale	Channel	**W**	**Para.**	**E**	Error	**CRC**	**CR**	**LF**

	no.	No.		**code**		code			

For example:

02 30 31 31<u>575A523530</u> 30 38 0D 0A（Write zeroing range to 50）

Correct response: **02 30 31 31 57 5A 52 4F 4B 36 31 0D 0A**

Wrong response: **02 30 31 31 57 5A 53 <u>4533</u> 32 38 0D 0A（Para. Code error）**

Calibration Zero

1）Calibrate zero as per current weight（with weight）

Send command:

STX	Scale no.	Channel No.	**C**	**ZY**	**CRC**	**CR**	**LF**

Correct response:

STX	Scale no.	Channel No.	**C**	**ZY**	**O**	**K**	**CRC**	**CR**	**LF**

Wrong response:

STX	Scale no.	Channel No.	**C**	**ZY**	**E**	Error code	CRC	**CR**	LF

Here:

Z——1 bit，5AH

Y——1 bit，59H

For example:

02 30 31 31 <u>435A59</u> 39 34 0D 0A

Correct response:**02 30 31 31 43 5A 59 4F 4B 34 38 0D 0A**

Wrong response:**02 30 31 34 43 5A 59 <u>4536</u> 32 30 0D 0A（channel no. error）**

2）Input millivolt calibration zero in the chart（without weight）

Send command:

STX	Scale no.	Channel No.	C	ZN	Zero millivolt value	CRC	CR	LF

Correct response:

STX	Scale no.	Channel No.	C	ZN	O	K	CRC	CR	LF

Wrong response:

STX	Scale no.	Channel No.	C	ZN	E	Error code	CRC	CR	LF

Here:

ZN──2 bits，5AH4EH

Zero millivolt value──**6** bits

For example:

02 30 31 31 <u>435A4E303132363130</u> 38 31 0D 0A

Correct response:**02 30 31 31 43 5A 4E 4F 4B 33 37 0D 0A**

Wrong response:**02 30 31 31 43 5A 4E <u>4534</u> 30 34 0D 0A**（Write data error）

Gain calibration

1）With weights

Send command:

STX	Scale no.	Channel No.	C	GY	Weight value	CRC	CR	LF

Correct response：

STX	Scale no.	Channel No.	C	GY	O	K	CRC	CR	LF

Wrong response:

STX	Scale no.	Channel No.	C	GY	E	Error code	CRC	CR	LF

Here:

GY——2 bits，47H 59H

Weight value——**6 bits**: Write in weight value

For example:

02 30 31 31434759303030323030 36 35 0D 0A（Write in: weight value **200**）

Correct response: **02 30 31 31 43 47 59 4F 4B 32 39 0D 0A**

Wrong response: **02 30 31 35 43 47 59 4536 30 32 0D 0A**（Channel no. error）

2）Without weights

Send command:

STX	Scale no.	Channel No.	C	GN	Gain millivolt	Weight value	CRC	CR

Correct response:

STX	Scale no.	Channel No.	C	GN	O	K	CRC	CR	LF

Wrong response:

STX	Scale no.	Channel No.	C	GN	E	Error code	CRC	CR	LF

Here:

Gain millivolt——**6 bits**

Weight value——**6bits**

For example:

02 30 31 3143474E30303139343030303030323030 35 36 0D 0A (Write in:

weight value **200**， corresponding gain millivolt **0.194**）

Correct response: **02 30 31 31 43 47 4E 4F 4B 31 38 0D 0A**

Wrong response: **02 30 31 31 43 48 4E 4533 38 35 0D 0A**（Para. Code error）

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Zeroing

Send command:

STX	Scale no.	Channel No.	O	CZ	CRC	CR	LF

Correct response:

STX	Scale no.	Channel No.	O	CZ	O	K	CRC	CR	LF

Wrong response:

STX	Scale no.	Channel No.	O	CZ	E	Error code	CRC	CR	LF

For example:

02 30 31 31 4F 43 5A 38 34 0D 0A

Correct response: **02 30 31 31 4F 43 5A 4F 4B 33 38 0D 0A**

Wrong response: **02 30 31 31 4F 43 5A 4535 30 36 0D 0A** （Operation can't execuate）

CRC computation

All the values in front of the parity bit add together and convert to decimal data, then convert the last 2 bits to **ASCII** code (decade in front and the unit at the back).

For example

The following is a frame of data:

0	3	3	3	4	4	5	3	3	0	0

Add 02~5A: **180**(**Hex**),convert to decimal data: **384.** We can calculate from this

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that the check code is **38,34** for the data frame.

6.3 tt TOLEDO Protocol

When choose "tt" protocol in working parameter F2.3,   indicator will send datas in continuous mode with TOLEDO protocol.

Continuous sending mode format as below:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
STX																0D	

‿   **A**   **B**   **C**   display weight(**6 bits**)   6 个 **30H**   Checksum

Here:start character is standard **ASII** start character **02(STX)**

status byte **A** definition as below:

D0	0	1	0	1	0
D1	1	1	0	0	1
D2	0	0	1	1	0
Decimal point	x	.x	.xx	.xxx	.xxxx

D3   **D4**   **D6** 为 **0(not change)**   **D5** is **1**(not change)

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status byte **B** definition as below:

D6	D5	D4	D3	D2	D1	D0
Status			Stable	Overflow	symbol	G.W.
Is 0 (not change)	Is 1 (not change)	Is 1 (not change)	**1**-unstable **0**-stable	**1**-overflow **0**-normal	**1**-negative **0**-positive	Is 0 (not change)

status byte **C is reserved, output 20H.**

6.4 Cb920

When **F2.3=Cb920** in working parameter, indicator will send weighing data continuously without command under **Cb920** protocol.

Data format：

Status	，	G.W.	**0/1**	Symbol	Display	Unit	CR	LF

Here：
Status —— 2 bits，OL：（4FH 4CH) OFL；ST：（53H 54H)Stable；US：（55H 53H)unstable

， —— **1 bit，** separator **2CH**

G.W. —— **2 bits， GS: gross weight 47H 53H**

0/1 —— **1 bit，(30H/31H)** interleaved transmission

Symbol —— **1 bit, 2BH（+）, 2DH（-）**

Display —— **7 bits，** including decimal point

Unit —— **2 bits， blank space（20H 20H）**

CR —— **1 bit， 0DH**

LF —— **1 bit， 0AH**

For example: When indicator send the following automatically:

53 54 2C 47 53 31 2B 20 20 31 39 30 2E 31 20 20 0D 0A

Means: Stable、G.W.、Data value is positive、current weight is **190.1**

rECont

Indicator will send weighing data to the upper computer continuously without any command.

Return data frame format specification：

Status	,	GS	,	+/-	Display	Unit	CR	LF

2bits	2C	47 53	2C	2B/2D	7bits	6B 67	0D	0A

Here:

Status ~~2 bits~~ **OL**(OFL):**4FH 4CH; ST**(stable):**53H 54H; US**(unstable):**55H 53H**

Display value ——**7bits**, including decimal point, high bit is blank if no decimal point.

For example: When indicator send the following automatically:

<u>**5354**</u> **2C 47 53 2C** <u>**2B3031312E313230**</u> **6B 67 0D 0A**

Means：Stable，Data value is positive，display value is **11.120kg**

rEREAD

Indicator will send weighing data to the upper computer under command.
Data format：

Data	R	E	A	D	CR	LF
explain	52H	45H	41H	44H	0DH	0AH

The return data frame is the same with that of **rECont** protocol, please refer to **rECont.**

Modbus

Indicator uses **RTU mode** to communicate, every 8-bit byte of the message are divided into 2pcs of 4-bit hexadecimal characters to transmit at binary code.
Code: Binary

Function code:

Function code	Definition	Description
03	read the register	
06	preset single register	
16	preset several registers	Command only support preset double registers.
01	read coil	The length unit is bit.
05	**write coil**	

Exception code response

Code	Definition	Description
02	Illegal data address	Data address received from error code is not allowed
03	Illegal data value	Data wrote in is not in permissible range
04	machine fault	When indicator is trying to execuate operation required, unrecoverable error is produced.
07	Unsuccessful	Command received can't be execuated under current

	programming request	condition.

Modbus communication address

PLC addr.	Display addr.	Description
The following items are only-read register(code 0x03)		
40001	**0000**	Present weight value(4bits including sign characters, the
40002	**0001**	high bit is in the front)
40003	**0002**	**D15 D14..D5 D4 D3 D2 D1 D0** **All is 0 0:+ 0:non-zero 0:normal 0:unstable** **1:- 1: zero 1:OFL 1:stable**
40004	**0003**	
......	**......**	Reserve(permit to read, reading value is 0)
40006	**0005**	
The following items are two bytes and are available to read and write **(write code 0x06, read code 0x03）**		
40007	**0006**	Zeroing(zeroing when write in non-zero value)
40008	**0007**	Automatically zeroing when power on（**0：OFF；1：ON**）
40009	**0008**	Zero tracking range （**0-9d**）

40010	0009	Stable range （**1-9d**）
40011	0010	Zeroing range （**0%-99%**）
40012	0011	Digit filter parameters**(0-9)**
40013	0012	Stability filter series**(0-9)**
40014	0013	**AD sample rate**：**0:15/s 1:30/s 2:60/s 3： 120 /s 4:480/s 5:960/s**
40015~ 40018	0014~ 0017	**Reserved**
40019	0018	Decimal point place （**0:0bit,1:1bit,2:2bits,3:3bits,4:4bits** ）
40020	0019	Minimum division （**1/ 2/ 5/ 10/ 20/ 50**）
The following items are available to read and write (writing code 0x10， read code 0x03）		
40021	0020	Maximum capacity （max.capacity≤mini.division×**100000**）
40022	0021	
40023	0022	Zero calibration with weights: write in 1 and calibrate zero with the current weight. Read: Absolute millivolt of current load cell
40024	0023	
40025	0024	Zero calibration without weights: Write millivolt value at zero；Write in range （load cell **3mV/V**:millivolt value range within **0.02-12.000mV)** millivolt value at zero when read.
40026	0025	

40027	0026	Gain calibration with weights. Write weight value(≤max. capacity). Return millvolt at present weight value when read
40028	0027	
40029	0028	Gain calibration without weights； input gain millivolt(load cell **3mV/V:0.000** ＜ millivolt<**15.000mV** zero millivolt).Read: millivolt value for gain calibration.
40030	0029	
40031	0030	Gain calibration weight without weights. input gain millivolt(≤max. capacity) Read: weight value for gain calibration.
40032	0031	
40033~40040	0032~0039	**reserved**
40041	0040	Set point **1 stable or not**（**0：no；1：yes**）
40042	0041	Set point **1** min. duration time （**0-999 : 0-99.9sec.**）
40043	0042	Set point **1 valid condition**
40044~40045	0043~0044	Set point **1** set value 1
40046~40047	0045~0046	Set point **1** set value2
40048	0047	Set point **2 stable or not**（**0：no；1：yes**）
40049	0048	Set point **2** min. duration time （**0-999 : 0-99.9sec.**）
40050	0049	Set point **2 valid condition**
40051~40052	0050~0051	Set point **2** set value1
40053~40054	0052~0053	Set point **2** set value2

40055	0054	Set point **3 stable or not**（**0：no；1：yes**）	
40056	0055	Set point **3** min. duration time（**0-999 : 0-99.9sec.**）	
40057	0056	Set point **3 valid condition**	
40058~40059	0057~0058	Set point **3** set value 1	
40060~40061	0059~0060	Set point **3** set value 2	
40062	0061	Set point **4 stable or not**（**0：no；1：yes**）	
40063	0062	Set point **4** min. duration time（**0-999 : 0-99.9sec.**）	
40064	0063	Set point **4 valid condition**	
40065~40066	0064~0065	Set point **4** set value 1	
40067~40068	0066~0067	Set point **4** set value 2	
40069	0068	Output 1 user-defined	
40070	0069	Output 2 user-defined	
40071	0070	Input 1 user-defined	
40072	0071	I/O output value	Note: available only when coil address 00016 is valid.
40073	0072	I/O input value	Input write 1 valid，0 invalid. Read 1 valid，0 invalid
The following items are bit read only.　（read code: 0x03）			
49001	9000	Version no.	If display10024，formatXX XXXX,main

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49002	9001		version no., hardware no., software no..So main version no.01， hardware no. 00，software no. 24
49003	9002	**Develop time**	If display 141024, means 24th Oct., 2014
49004	9003		

The following items are bit read only. （**read code： 0 x 0 1**）		
00001	**0000**	**0**： unstable； **1**： stable
00002	**0001**	**0**： normal； **1**： OFL
00003	**0002**	**0**： non-zero； **1**： zero
00004	**0003**	**0： +； 1： -**
00005	**0004**	**Reserved**
00006	**0005**	**Reserved**

The following item are available to read and write（**read code： 0x01， writing code： 0x05**）		
00007	**0006**	Automatically zeroing when power on（**0： OFF； 1： ON**）
00008	**0007**	**Reserved**
00009	**0008**	**Reserved**
00010	**0009**	Reset all

00011	0010	Reset calibration	
00012	0011	Reset paramaters	
00013	0012	Reset I/O	
00014	0013	**Reserved**	
00015	0014	**Reserved**	
00016	0015	I/O testing switch	
00017	0016	Set point 1 status	Only read：
00018	0017	Set point 2 status	0:invalid，1:valid
00019	0018	Set point 3 status	
00020	0019	Set point 4 status	
00021~ 00032	0020~ 0031	**Reserved**	

7 Password Input and Setting, Reset

Password Input

（**1**）Indicator calibration and working paraters setting default password: **000000.**

（2）User can set password in parameters when **F4.1** is "**ON**".

（3）When display is "PASS ", need to input correct password to enter parameters.

Note:

（1）When input password, if first time wrong, it will go to the second chance for password input(display from [display] turn to [display]).

（2）If second input wrong, it will enter into interface for inputting password the third time

(Display change from [display] to [display]).

（3）If Input wrong for three times, main display show "Error4 "and self-lock, but user can operate when power on again.

Password Setting

（1）User can set password in parameters when **F4.1** is "**ON**".

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（2）User must input same new password twice in setting password,If not same, main display show"**Error**"one second and return to **PASS** again.
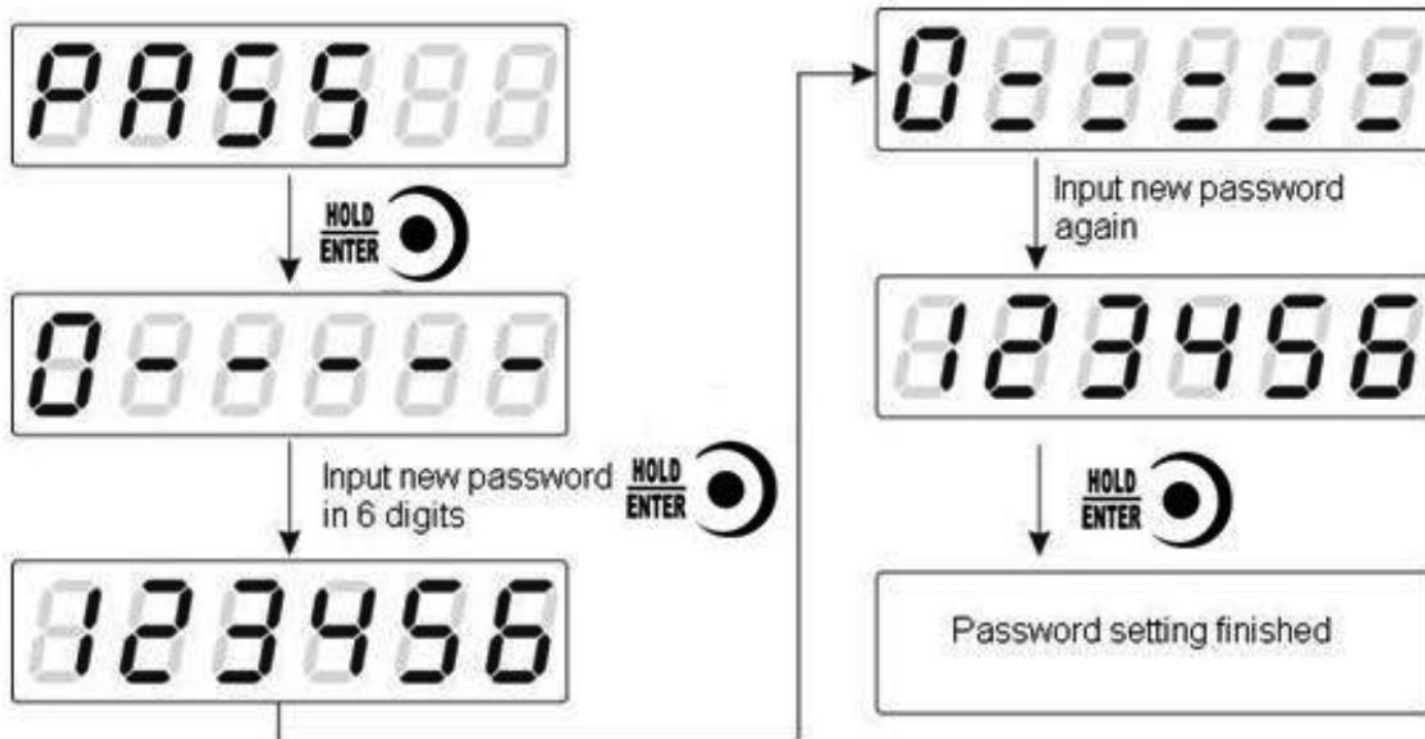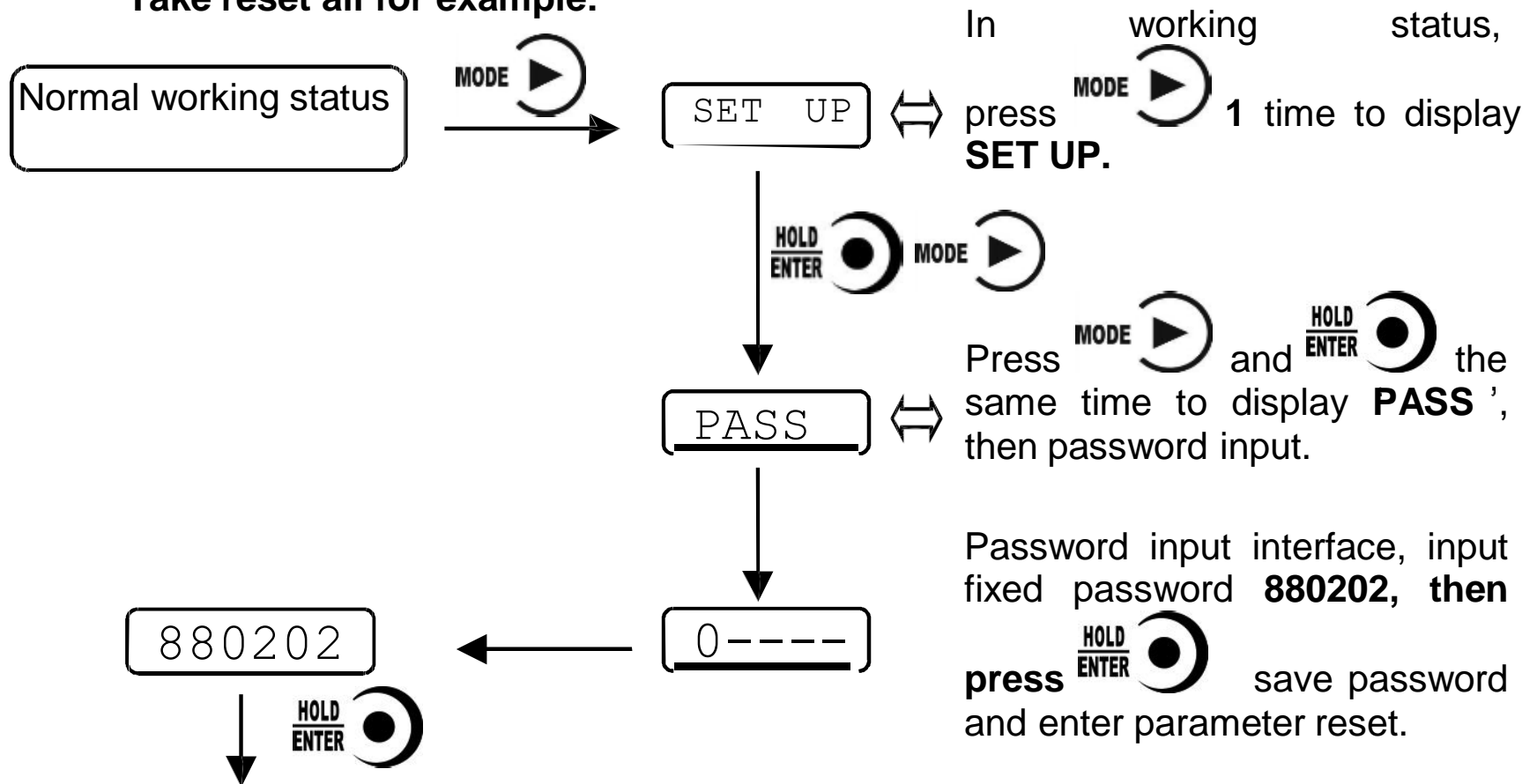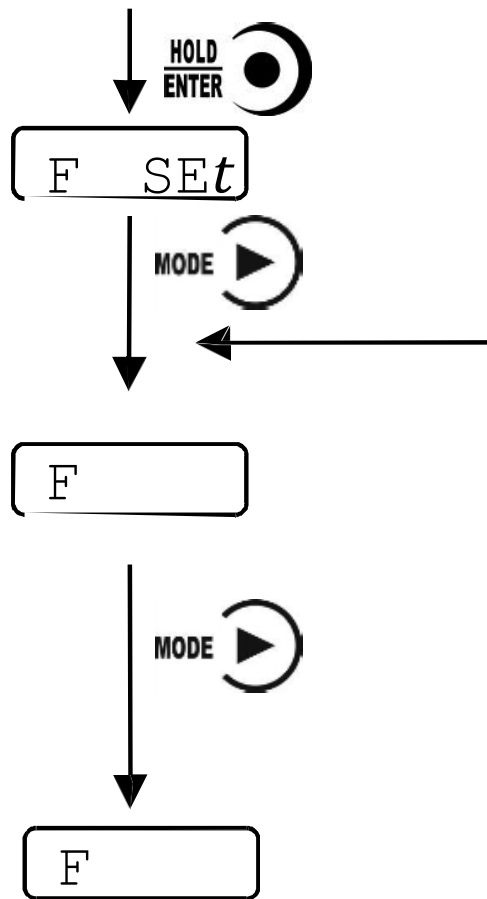
Factory Reset

Note: Factory reset is only for special technicists, which will reset all of parameters and will maybe cause not working.

Take reset all for example:

In working status, press MODE ▶ **1** time to display **SET UP.**

| Normal working status | → | SET UP | ⇔ |

Press MODE ▶ and HOLD/ENTER ● the same time to display **PASS** ', then password input.

| PASS | ⇔ |

Password input interface, input fixed password **880202, then** press HOLD/ENTER ● save password and enter parameter reset.

| 880202 | ← | 0----- |

F SEt

F

F

1）In **F SEt** interface, press [HOLD ENTER] to reset working parameters, enter into reset calibration paramters interface.

2）In **F SEt** interface, press [MODE], not to make working parameter reset, enter into calibration para. Reset interface.

1）In **F CAL** interface, press [HOLD ENTER] to reset calibration para., enter into reset all interface.
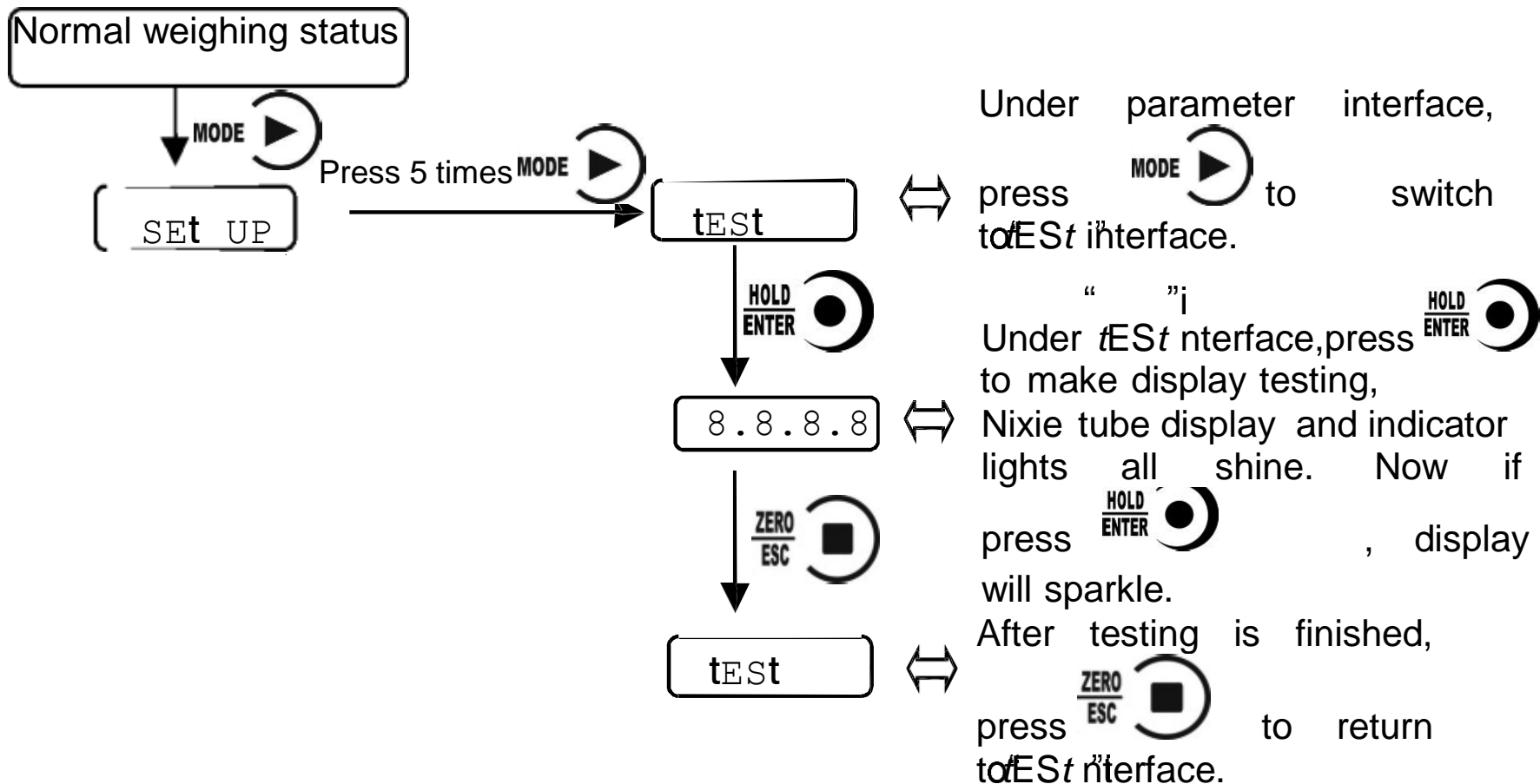
2）In **F CAL** interface, press [MODE], not to make calibration para. reset, enter into reset all interface.

1）In **F ALL** interface, press [HOLD ENTER] to make reset all of the paramters including working para., calibration para., I/O etc..

Note: In all reset interfaces, press [ZERO ESC] **to exit and return to weighing interface.**

8 Display Testing

The following flow chart is to test lights on main-display and status lights.

Normal weighing status

MODE ▶

Press 5 times **MODE** ▶

SEt UP

tESt

⟺ Under parameter interface, press **MODE** ▶ to switch to tESt interface.

HOLD ENTER ●

8.8.8.8

⟺ Under tESt interface, press **HOLD ENTER** ● to make display testing, Nixie tube display and indicator lights all shine. Now if press **HOLD ENTER** ●, display will sparkle.

ZERO ESC ■

tESt

⟺ After testing is finished, press **ZERO ESC** ■ to return to tESt interface.

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9 Errors and Alarm Messages

Error　①Input error.

②wrong data beyond parameter range.

Error　2　The present weight value is out of zeroing range.

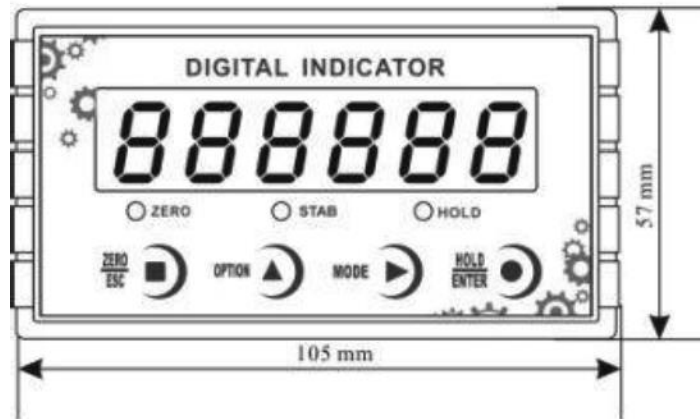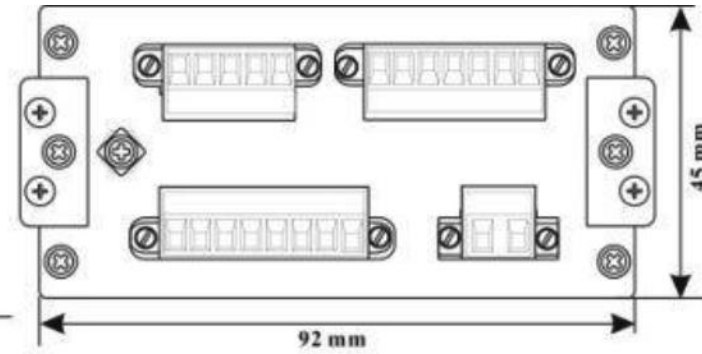**Error 3**　Scale platform is not stable when zeroing.

Error　4　Input wrong password more than 3 times.

OFL　Weighing value is positive overflow.

-OFL　Weighing value is negative overflow.

10 Dimension of Indicator

Dimension of rear panel:**92×45(mm)** ⇨

45 mm

92 mm

DIGITAL INDICATOR

888888

○ ZERO   ○ STAB   ○ HOLD

ZERO
ESC ■   OPTION ▲   MODE ▶   HOLD
ENTER ●

57 mm

105 mm

⇦ Dimension of front panel:**105×57(mm)**

Panel cutout dimension:**93×46(mm)** ⇨

46±0.5 mm

93±0.5mm