GENERAL MEASURE

Model no.: M02

User's Manual

110609010023
V01.00.06_01

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Website: http://www.szgmt.com.cn

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1 General Description

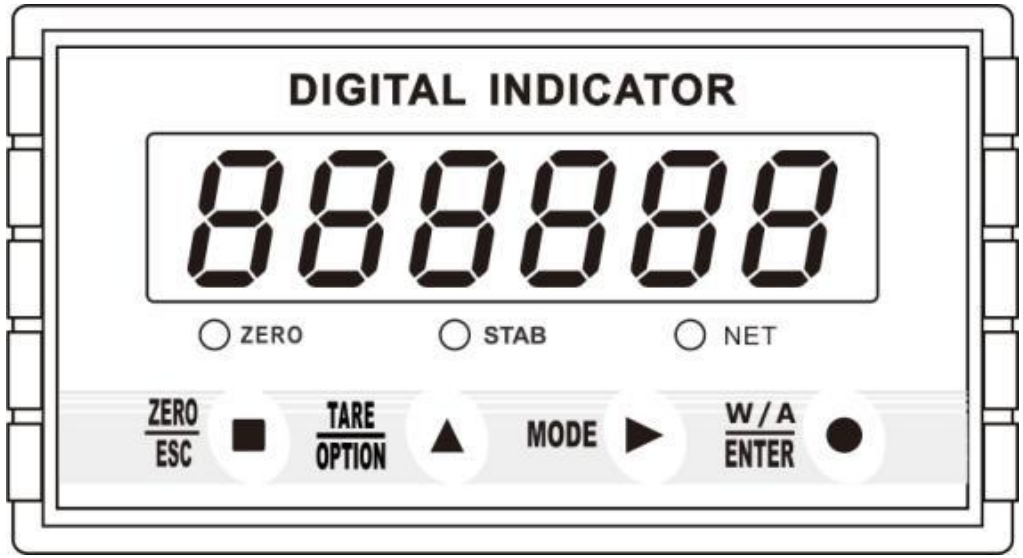
M02 digital indicator is specially designed for weight transmitting in industrial fields.

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. .

1.1 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
- Optional communication interface:RS232 or RS485
- Calibration via serial interface or Ethernet

1.2 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. the state of I10.
- **STAB:** Light on when changes of weight values are within the range of motion detecting during motion detecting time.
- **NET:** Light on when indicator is in net weight status.

Keypad:

: Zero/Esc, exit from current operation or go previous. Long press the ZERO button to calibrate the ZERO point function. The calibration range of the ZERO point in the main interface is limited by the ZERO clearing range, and cannot exceed the zeroing range, but it is not limited by

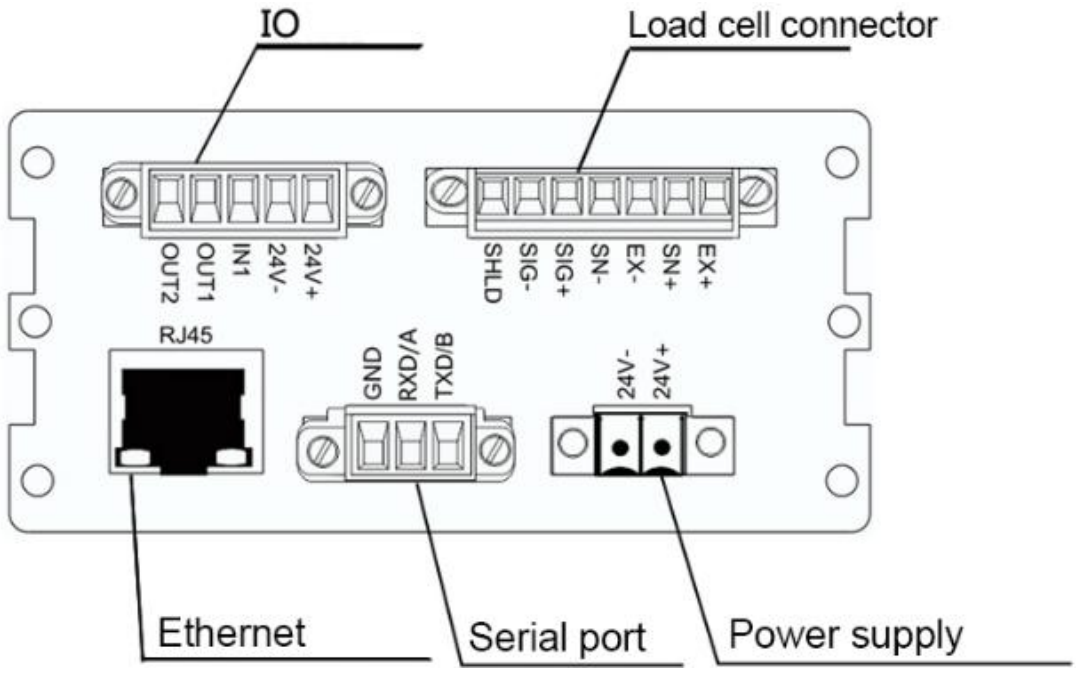
: Scroll optional values of parameter and to make flashing digit increase 1 while data inputting. Long press Tare key will proceed data transmission, and the light will be flicker, and update the F1.8 parameters

: Function selecting key, make flashing position move to the right digit when data inputting.

: Confirming Key. Confirm setting parameters or calibration and input data.

Note: Under the status of gross weight, user could remove tare by pressing OPTION key, and if press Esc key in net weight mode, it will add tare weight, while it is zeroing under the status of net weight. It will show net weight value after tare, meanwhile the NET light is on.

1.3 Rear Panel



1.4 Technical Specifications

1.4.1 Common:

Power supply: **DC24V±5%**
Working temperature: **-10～40**℃

Max humidity: **90%R.H without dew**
Power consumption: **About 10W**
Dimension: **105×89×57（mm）**

1.4.2 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**

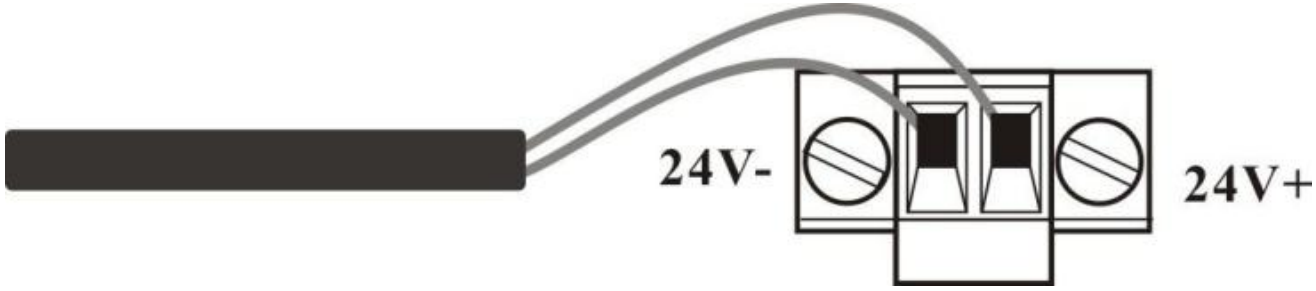
1.4.3 Digital:

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

2 Installation and Wiring

2.1 Connection of Power Supply

M02 digital indicator connects DC24V power supply as follows:



Power supply connection

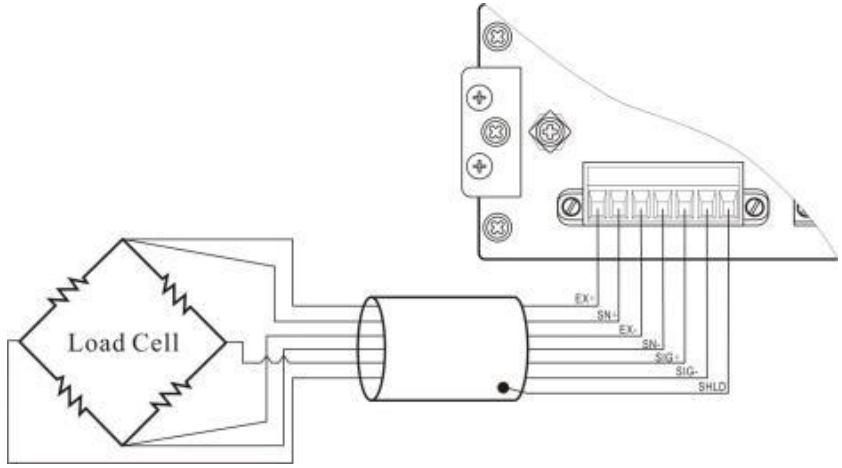
2.2 Connection of Load Cell

M02 digital 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**

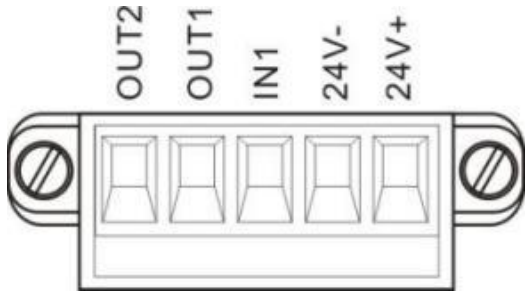
2.2.1 6 wires connection



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.

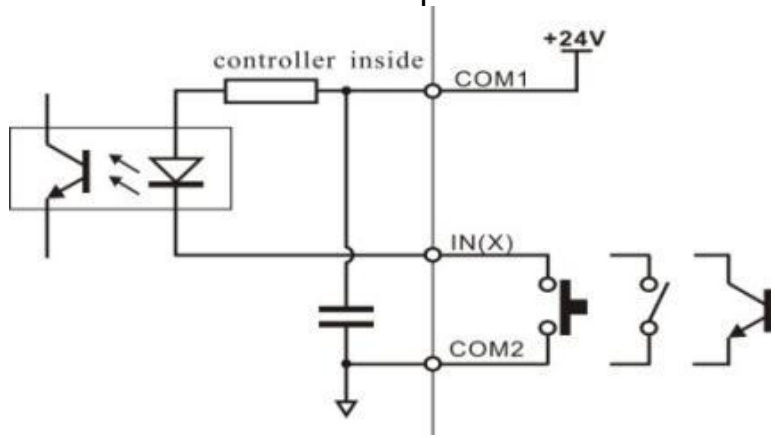
2.3 I/O terminals



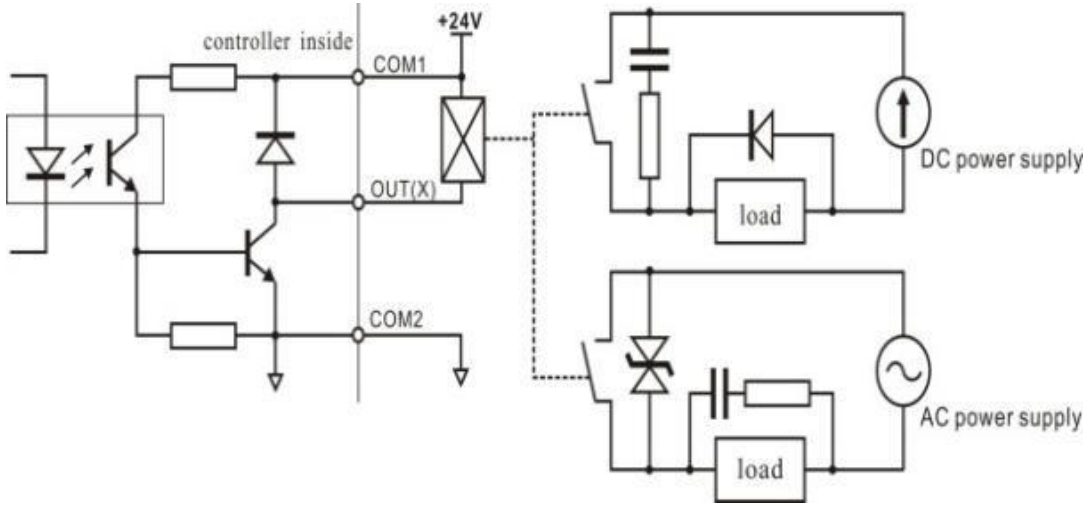
I/O tolerant definition as follows:

Output		Input	
OUT1	Stable	IN1	Reset all
OUT2	OFL		

Indicator input terminal connection:



Indicator input terminal connection:



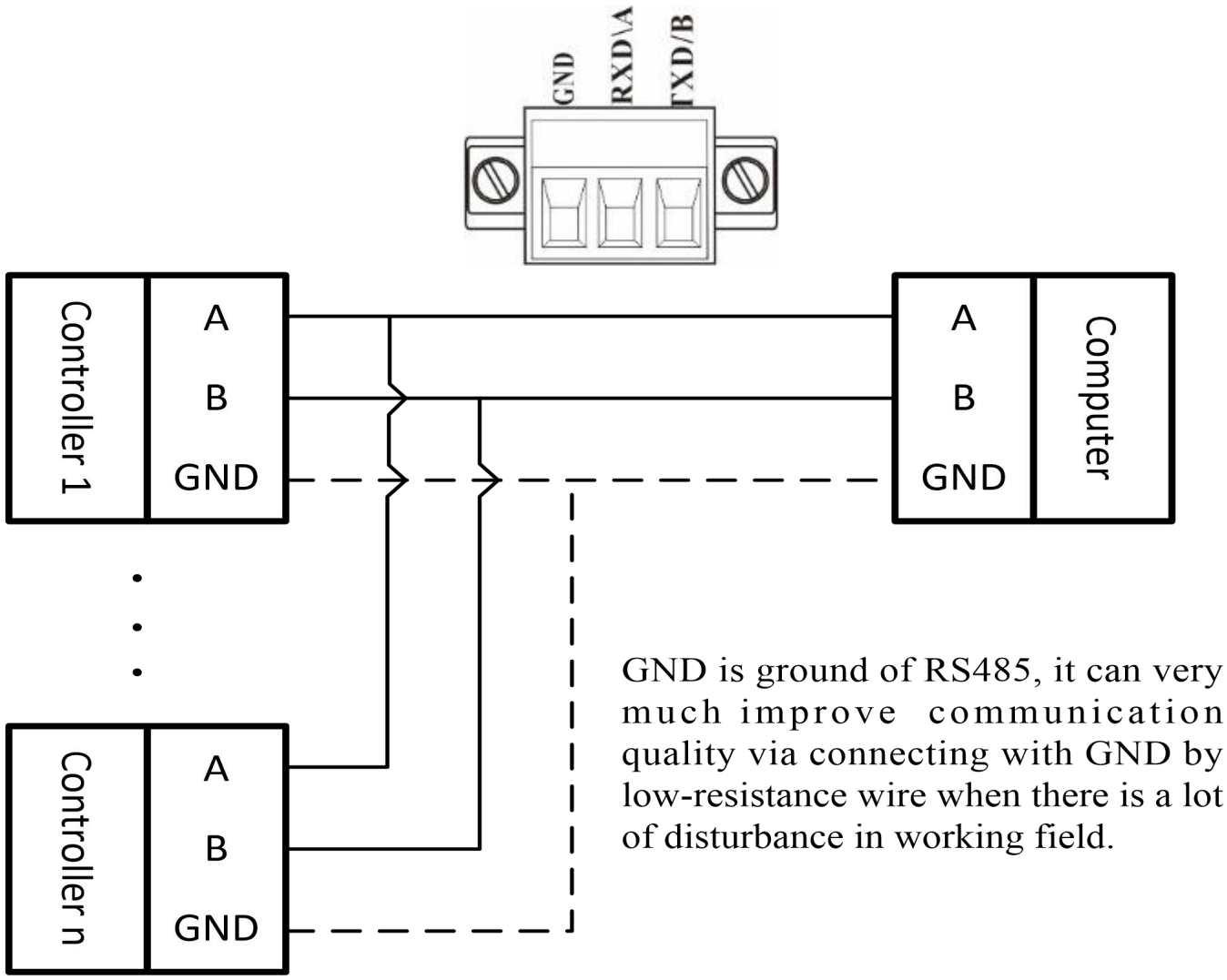
2.4 Optional Expansion Board Output

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

2.4.1 Serial Interface RS485 Output

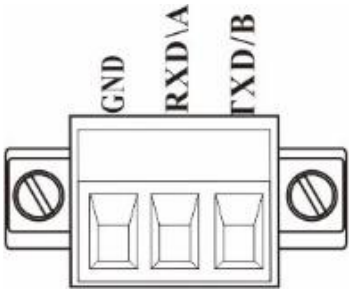
Serial Interface RS485 output is optional, please refer to chapter 6.0 for communication protocol.

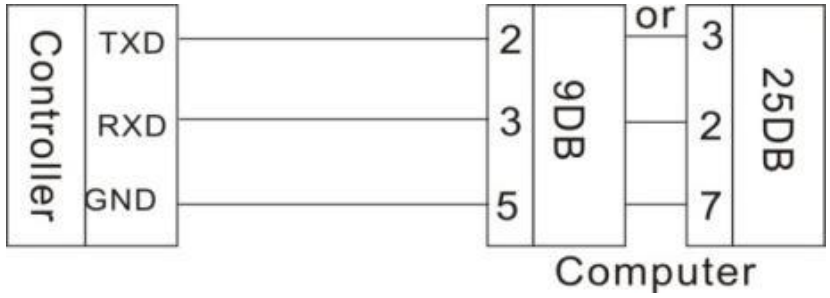
RS485 serial interface connection:


GND
RXD\A
TXD/B
Controller 1
A
B
GND
A
B
GND
Computer
Controller n
A
B
GND
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.

2.4.2 Serial Interface RS232 output (Optional)

RS232 serial interface connection:





3 Calibration

3.1 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 

to save parameter's value and then press 

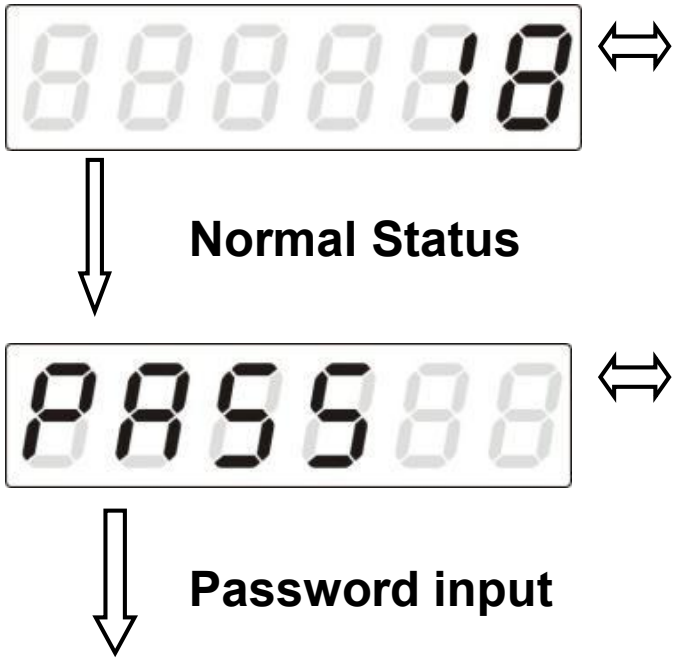
to exit.

（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.

3.2 Flow Chart of Calibration



1. Under this status, press MODE (twice), indicator will display **CAL**, then press HOLD ENTER to enter password input.

2. After password is input, the indicator will display **CALON** for one second, then go to next step.

Decimal point

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

Min. division

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.

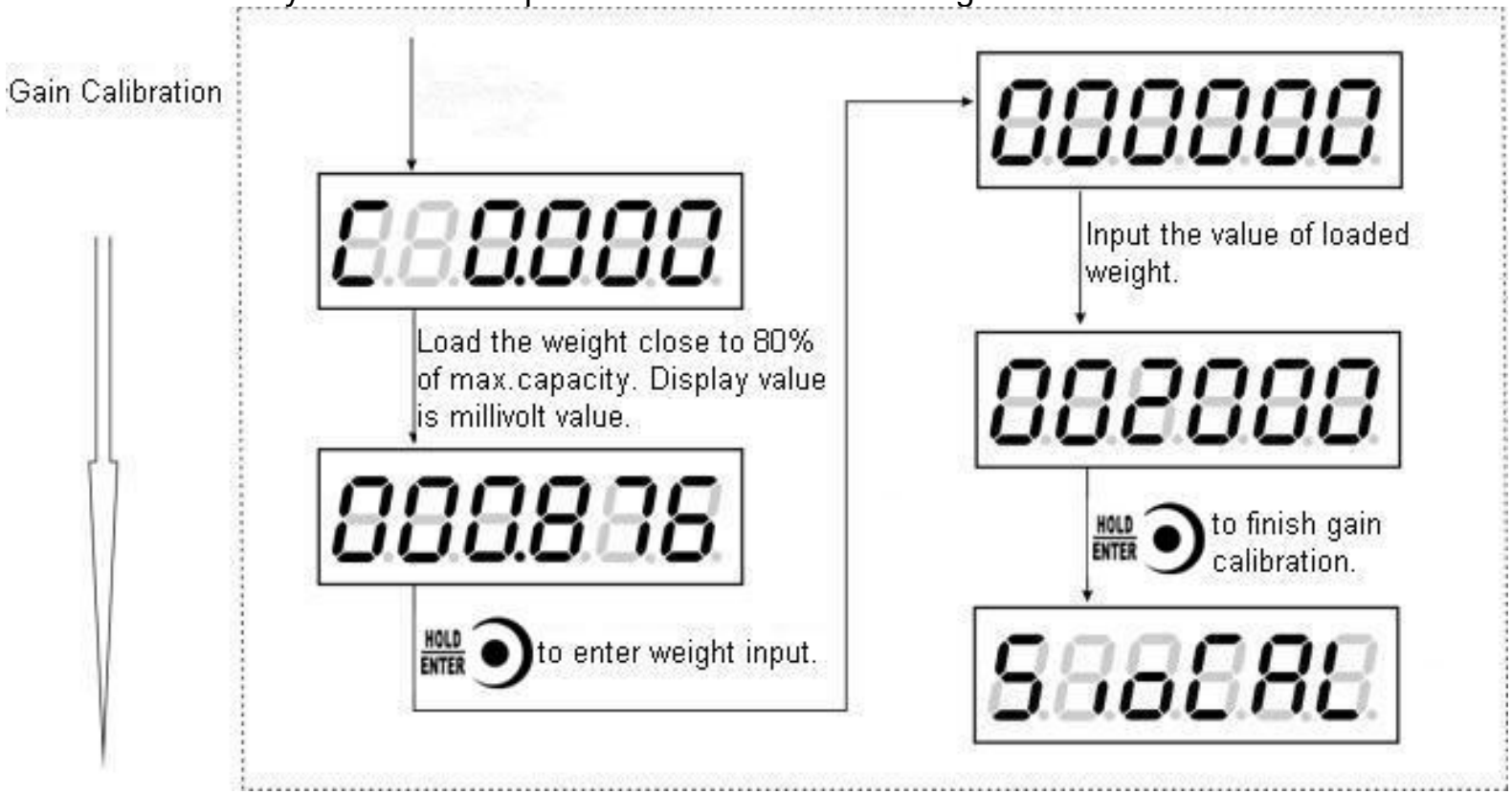
⇔ **6.** Under this status, press HOLD ENTER to enter zero calibration.
Display value near the output value in millivolt between **SIG+/SIG-** of load cell.
See section **3.3** for details about this function.

Millivolt value display

⇔ **7**.Unloaded scale first, when **STAB** lamp is on, press HOLD ENTER to finish zero calibration.
If there's no need to calibrate zero, press ZERO ESC directly to enter gain calibration.

Zero calibration

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.



Serial ports calibration switch

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

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

3.3 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 –OFL), 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: Press** 

to zero every time before weight is loaded.

3.4 Calibration with Weights

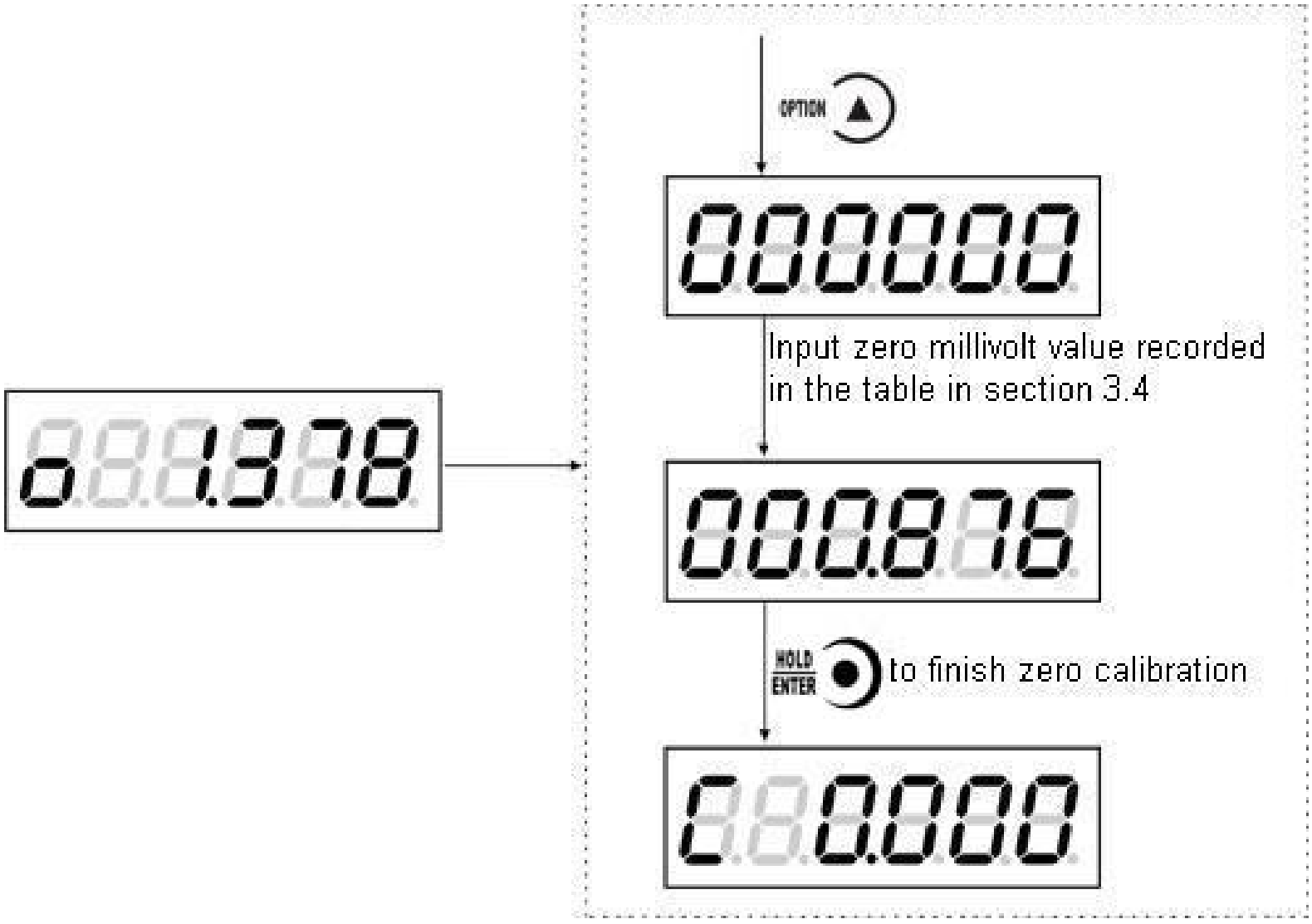
During calibration with weight， please record the zero millivolt value, gain millivolt value and the loaded weight value in the blank table below. If it is not convenient to load a weight to calibrate, these values can be used for calibration without weights.

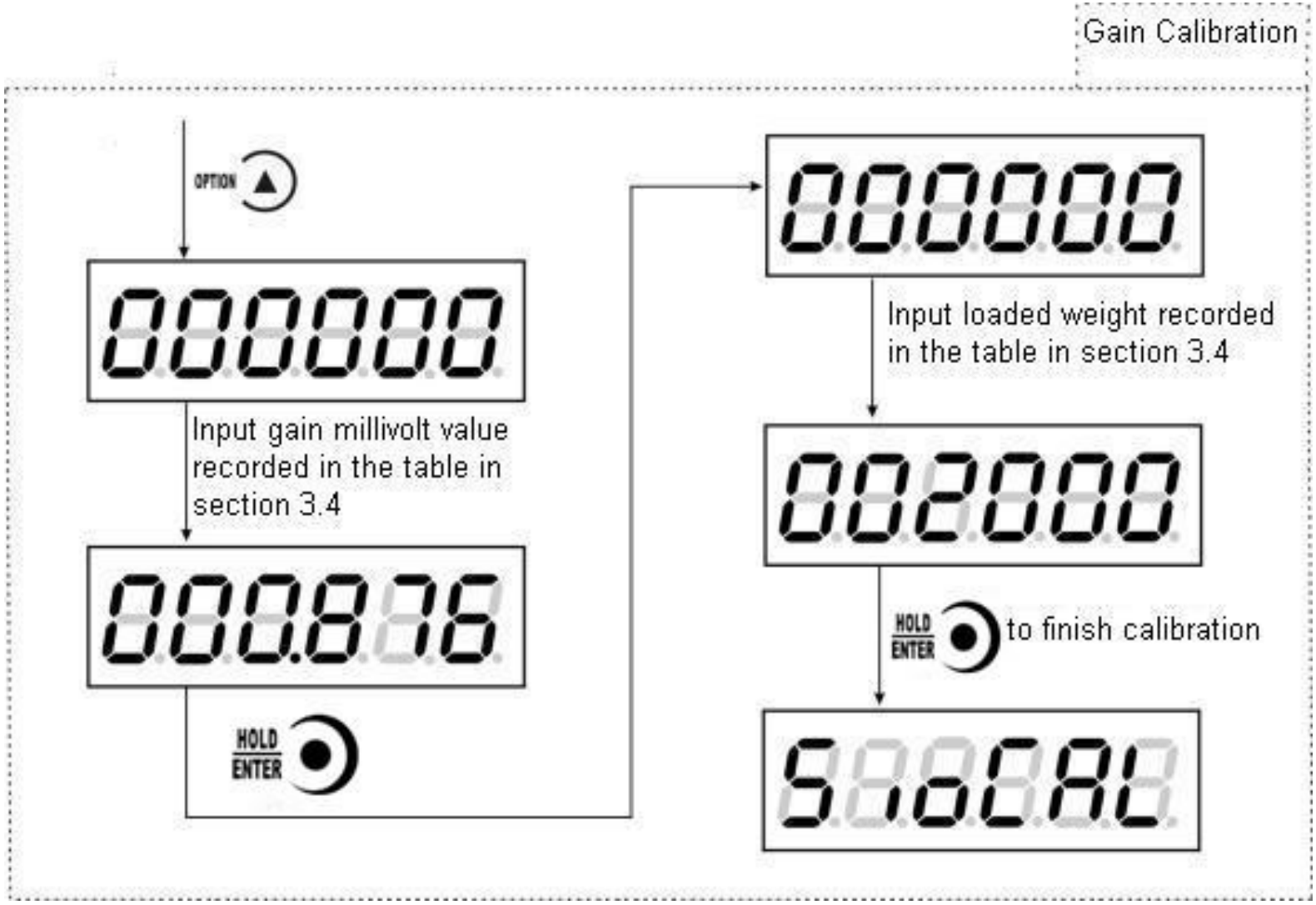
	Zero millivolt value(mV)	Gain millivolt value(mV)	Loaded Weight	Date	Remarks
1					
2					
3					
4					
5					

3.5 Millivolt Calibration

When it is not convenient to load a weight to calibrate，alibration 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


Gain Calibration
OPTION
000000
Input gain millivolt value recorded in the table in section 3.4
000876
HOLD ENTER
000000
Input loaded weight recorded in the table in section 3.4
002000
HOLD ENTER
to finish calibration
SAVECAL

3.6 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.

3.7 Explanation for Calibration Parameters

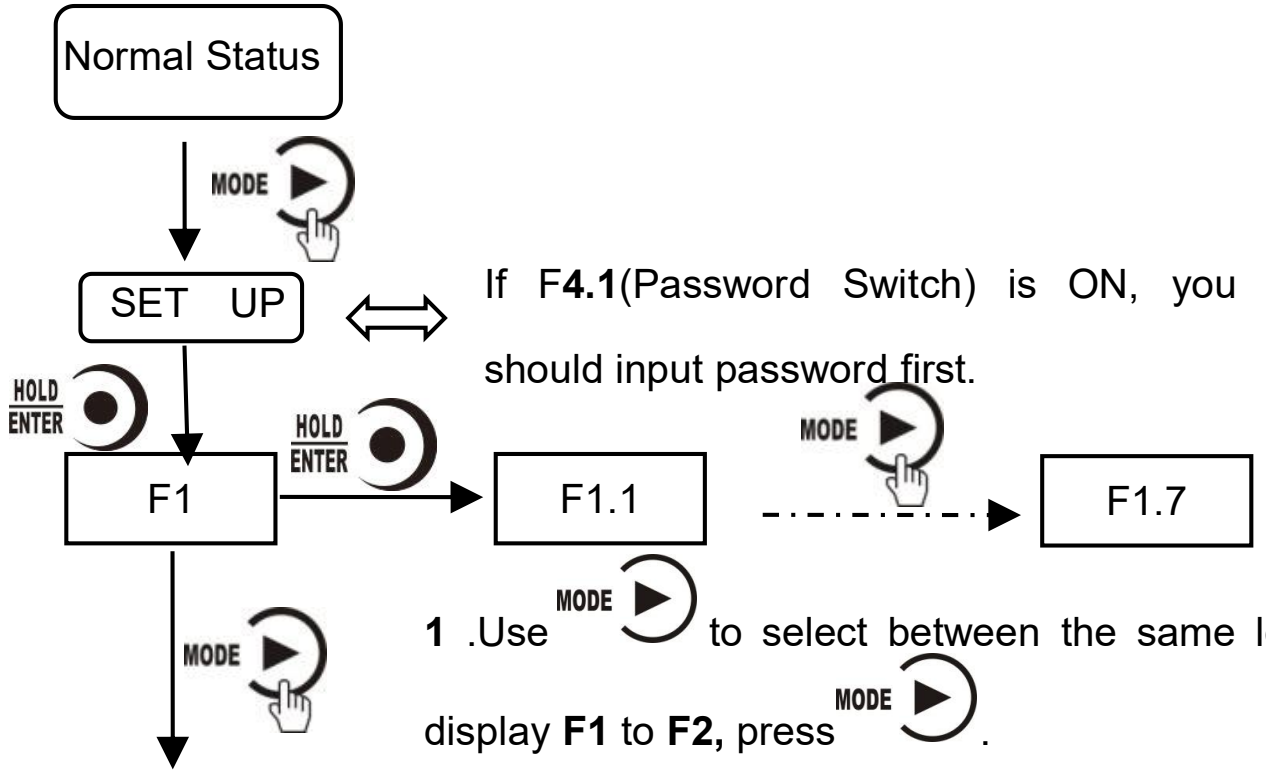
Symbol	Parameter	Types	Value of parameter	Default
Pt	Decimal Point	**5**	**0 0.0 0.00 0.000 0.0000**	**0**
1d	Min. Division	**6**	**1 2 5 10 20 50**	**1**
CP	Max. Capacity		≤Min. Division×**100000**	**10000**
t	Millivolt Value			
o	Zero			
C	Gain			
SIOCAL	Switch for Calibration via serial interface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

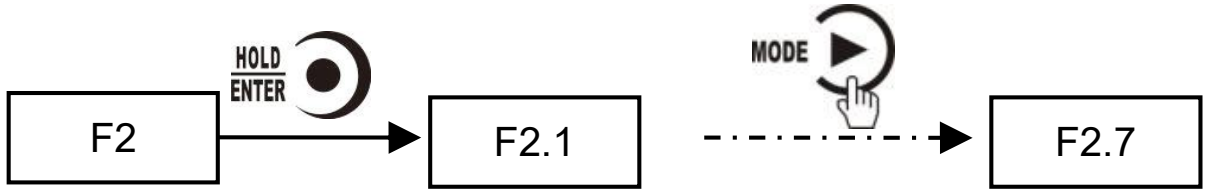
4 Working Parameters Setting

4.1 Flow Chart of Working Parameters Setting



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

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



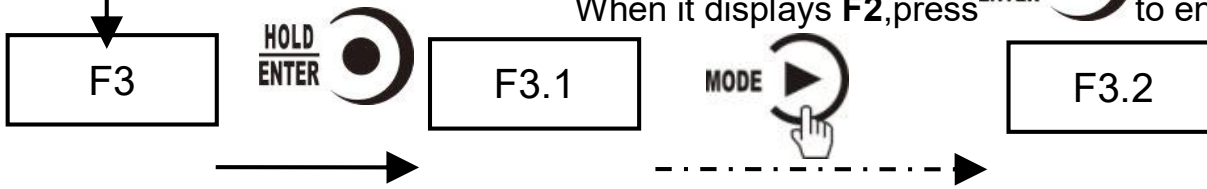
2 .Press 

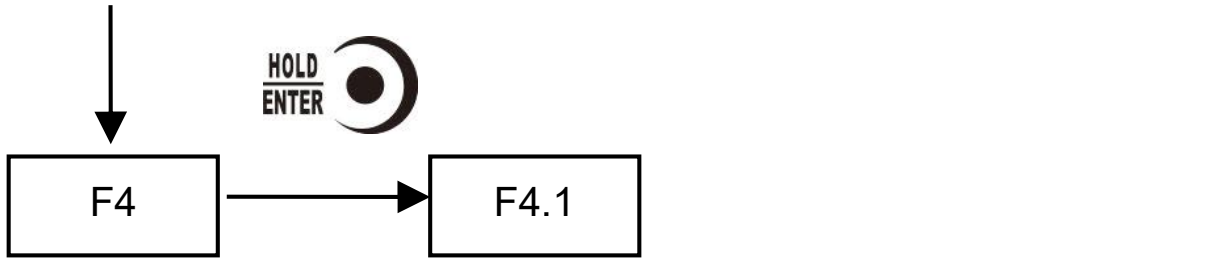
to enter into sub-selection, press 

to return back to previous menu.

When it displays **F2**,press 

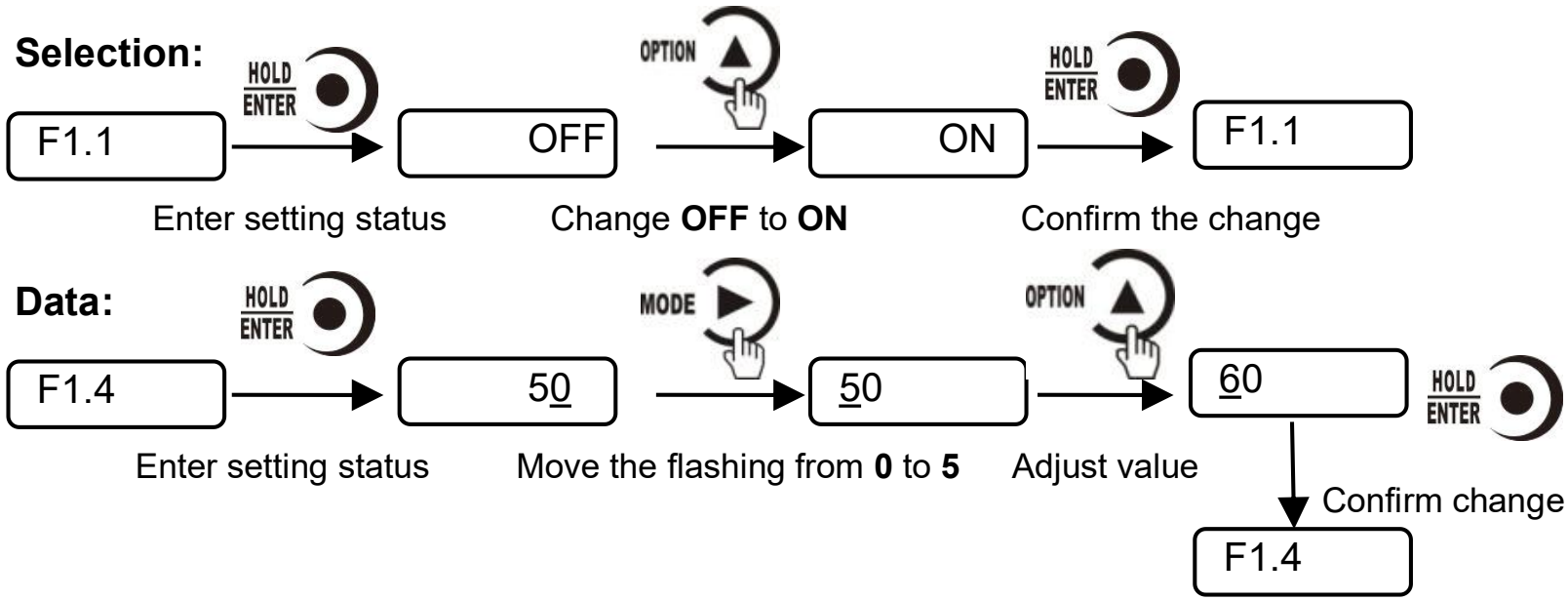
to enter into **F2.1.**





4.2 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, press OPTION se value.



4.3 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	**0**	Motion Detecting Range（0～9d optional) It is stable if the change is within range.
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

F1.8	**0**	0： NET indicating net weight； 1： NET indicating communication
F2	**Null**	**The second major term of working parameter.**
F2.1	**01**	Scale no., indicator no.
F2.2	**9600**	Baud rate of serial port:1200 / 2400 / 4800 / 9600 / 19200 / 38400 / 57600
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 bit，even parity check，**1** stop bit； **7-O-1：7**data bit，odd parity check，**1** stop bit； **8-E-1：8** data bit，even parity check，**1** stop bit； **8-O-1：8** data bit，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 bits；
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**(**TOLEDO continuous mode**)If send the checksum。 **0**：not send, **1**：send.
F3	**Null**	**The third major term of working parameter.**
F3.1	**0-255**	The first paragraph of IP, initial vale 192
F3.2	**0-255**	The second paragraph of IP, initial vale 168
F3.3	**0-255**	The third paragraph of IP, initial vale 1
F3.4	**0-255**	The fourth paragraph of IP, initial vale 1
F3.5	**1-65534**	Modbus-TCP communication port no., initial value 502
F3.6		Ethernet communication mode 0：b Tcp；1：Cont
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**

4.4 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：>； 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

5.1 I/O Definition

In the main display interface, press MODE ▶ 4 times to display iodEF in the indicator. In this interface, press W/A ENTER ● to enter the interface of custom setting of I/O module. If the password ON/OFF of working parameter F4.1 is set as ON, the password of working parameter needs to be entered before entering the custom setting of I/O module.

Operation steps of I/O module customization: After entering the interface of I/O module customization,

1) Press W/A ENTER ● to modify the definition of OUT1
2) Press TARE OPTION ▲ to select the meaning code of I/O module
3) Press W/A ENTER ● to confirm and return to the OUT1 interface

4) Press MODE ▶ to define the next I/O module, then press MODE ▶ to skip the current I/O module definition (keep the original definition) to set the next I/O module. The definition method is the same as the above three steps, which will not be repeated here. Press ZERO/ESC ■ to exit when the setup is complete.

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 parameter value when this signal is valid.
I7	Tare/Add tare	Tare when the first valid signal. Add tare when second.
I8	Tare	Tare when the signal is valid.
I9	Add tare	Add tare when the signal is valid.
I10	I/0 define	IO calibration lock, when I10 is defined, cannot be calibrated if the input is invalid.

5.2 I/O testing

Normal Status

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

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 host computer and 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.

6.1 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 —— 1byte，start character **02H**

Scale no. —— 2bytes，**00~99**

Status —— **2**bytes，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** bytes；when weight is+（-）overflow,return to“space space **OFL** space”

CRC —— **2** bytes,check sum

CR —— **1** byte，**0DH**

LF —— **1** byte，**0AH**

For example:

02 30 31 31 40 41 20 20 20 37 30 30 32 34 0D 0A

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

6.2 r-SP1

Code : **ASCII**

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

6.2.1 Parameters Code Chart

Operation code	Para. code	Para. Name	number of character
R	**WT**	Read current status	**8**

		and weight	
R	**SP**	Read set point status	**4**
W	**DC**	Write mini. Division 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 value to judge	**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	
R	**ID**	**Read ID No.**	**6**

6.2.2 Error Code Explanation

In the communication mode, if the weight transmitter receives a data frame error, there will be an error code in the data frame sent to the computer. The error code is described as follows：

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**）

6.2.3 Command

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

6.2.3.1 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	Channel	**R**	**WT**	**E**	Error code	**CRC**	**CR**	**LF**

	no.	No.							

Here:

STX —— **1**byte，start character，**02H**

R——**1** byte，**52H**

WT——**2** byte，**57H 54H**

E——**1** byte，**45H**

Status —— **2**bytes，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** bytes；when weight is+（-）overflow,return to“space space **OFL** space”

For example:

02 30 31 31 52 57 54 30 31 0D 0A

Correct response：**02 30 31 31 52 57 54 40 41 30 30 33 37 35 33 33 36 0D 0A**（**stable** present value **3753**）

Wrong response: **02 30 31 31 52 57 54 45 31 31 39 0D 0A**（CRC check error）

6.2.3.2 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

Para. Value—— **1**byte

Para. code——**2** bytes，

For example:

02 30 31 31 <u>52 4D 52</u> 38 39 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>45 32</u> 30 39 0D 0A**（Operation code error）

6.2.3.3 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 no.	Channel No.	W	DC	E	Error code	CRC	CR	LF

Here:

DC——2 bytes，**44H 43H**

O——1 byte，**4FH**

K——1 byte，**4BH**

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

Max. capacity**——6 bytes**

For example:

02 30 31 31 57 44 43 30 35 30 31 30 30 30 30 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 45 35 39 32 0D 0A**（Operation can't execute）

6.2.3.4 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 no.	Channel No.	**W**	**Para. code**	**E**	Error code	**CRC**	**CR**	**LF**

For example:

02 30 31 31 57 5A 52 35 30 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 45 33 32 38 0D 0A**（Para. Code error）

6.2.3.5 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 byte，5AH

Y——1 byte，59H

For example:

02 30 31 31 43 5A 59 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 45 36 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 bytes，5AH4EH

Zero millivolt value——**6** bytes

For example:

02 30 31 31 43 5A 4E 30 31 32 36 31 30 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 45 34 30 34 0D 0A**（Write data error）

6.2.3.6 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 bytes，47H 59H

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

For example:

02 30 31 31 43 47 59 30 30 30 32 30 30 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 45 36 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	LF

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 bytes**

Weight value——**6bytes**

For example:

02 30 31 31 43 47 4E 30 30 31 39 34 30 30 30 30 32 30 30 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 45 33 38 35 0D 0A**（Para. Code error）

6.2.3.7 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 45 35 30 36 0D 0A**（Operation can't execute）

6.2.3.8 CRC computation

All the values in front of the parity byte add together and convert to decimal data, then convert the last 2 bytes 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 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 bytes**) **6pcs 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 is 0(not change) D5 is **1**(not change)

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 bytes，OL：（4FH 4CH ）OFL；**ST：（53H 54H)**Stable；**US：（55H 53H)**unstable

，—— 1 byte，separator **2CH**

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

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

Symbol —— 1 byte, 2BH（+）, 2DH（-）

Display —— 7 bytes，including decimal point

Unit —— 2 bytes，blank space（20H 20H）

CR —— 1 byte，0DH

LF —— 1 byte，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**

6.5 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
2bytes	**2C**	**47 53**	**2C**	**2B/2D**	**7bytes**	**6B 67**	**0D**	**0A**

Here:

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

Display value —— **7bytes**, including decimal point, high byte is blank if no decimal point.

For example: When indicator send the following automatically:

53 54 2C 47 53 2C 2B 30 31 31 2E 31 32 30 6B 67 0D 0A

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

6.6 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.**

1) Zero clearing command: ZERO ON<CR><LF> : **5A 45 52 4F 20 4F 4E 0D 0A**

Return YES<CR><LF> or NO? <CR><LF>

2) Calibration zeroing command: TARE ON<CR><LF> : **54 41 52 45 20 4F 4E 0D 0A**

Return YES<CR><LF> or NO? <CR><LF>

3) Read ID no.: GET ID<CR><LF> : **47 45 54 20 49 44 0D 0A**

Return ASCII code with 6 digits ID no.

6.7 Modbus

Indicator uses **RTU mode or ModBus-TCP mode** to communicate, every 8-byte byte of the message are divided into 2pcs of 4-byte 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 byte.
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 execute operation required, unrecoverable error is produced.
07	Unsuccessful programming request	Command received can't be executed under current condition.

6.7.1 Modbus communication address

PLC addr.	Display addr.	Description
The following items are only-read register(code 0x03)		
40001	**0000**	Present weight value(4bytes including sign characters, the high byte is in the front)
40002	**0001**	

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 **……** **40006**	**0003** **……** **0005**	Reserve(permit to read, reading value is 0)
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（**0-9d**）
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	**0014**	**Reserved**
40016	**0015**	Communication indicating switch

		0：NET indicating net weight；1：NET indicating communication
40017~ 40018	**0016~ 0017**	**Reserved**
40019	**0018**	Decimal point place（**0:0,1:0.0,2:0.00,3:0.000,4:0.0000**）
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

40030	**0029**	cell **3mV/V:0.000** ＜ millivolt**<15.000mV** － zero millivolt).Read: millivolt value for gain calibration.
40031	**0030**	Gain calibration weight without weights. input gain millivolt(≤max. capacity) Read: weight value for gain calibration.
40032	**0031**	
40033	**0032**	Gross weight, with symbol.
40034	**0033**	
40035	**0034**	Net weight
40036	**0035**	
40037	**0036**	Tare weight
40038	**0037**	
40039~40040	**0038~0039**	**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. Input write 1 valid，0 invalid.
40073	**0072**	I/O input value	

			Read 1 valid，0 invalid
40074	**0073**	Ethernet communication mode	0：b tcp；1：Cont
Reserved			
40399	**0398**	**Current weight value(4 bytes floating-point number , high digit in front)**	
40400	**0399**		
40401	**0400**	**Current weight value(4 bytes with symbolic number, high digit in front)**	
40402	**0401**		
40403	**0402**	**D15—D14……D4 0 D3 0:+ 1:- D2 0:non-zero 1:zero D1 0:normal 1:OFL D0 0:Stable 1:Unstable**	
40404	**0403**	**0**	
40405	**0404**	**6 digits without symbolic number, user ID no.**	
40406	**0405**		
The following items are byte read only. （read code: 0x03）			
49001	**9000**	Version no.	If display10024，formatXX XXXX,main

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 byte 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 parameters	
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： 0:invalid，1:valid
00018	**0017**	Set point 2 status	
00019	**0018**	Set point 3 status	
00020	**0019**	Set point 4 status	
00021	**0020**	**Reserved**	
00022	**0021**		
00023	**0022**	**Tare (Write ON to proceed)**	
00024	**0023**	**Add tare (Write ON to proceed)**	
00025	**0024**	**Net weight (0: Gross weight, 1: Net weight)**	
00026~ 00032	**0025~ 0031**	**Reserved**	

7 Ethernet communication

M02 digital indicator can connect with RJ-45 cable to communicate with host computer or PLC by Ethernet port.

User need set IP address in F3 working parameters. For example, if IP is 192.168.101.106，then input 192 at F3.1，input 168 at F3.2，input 101 at F3.3，input 106 at F3.4； input port no. at F3.5

After cable connected, orange light is bright for good communication and green light is sparkle in communication. The DATA light will sparkle in Modbus/TCP communication and will be off if the communication is broken.

8 Password Input and Setting Reset

8.1 Password Input

（1）Indicator calibration and working parameters 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.

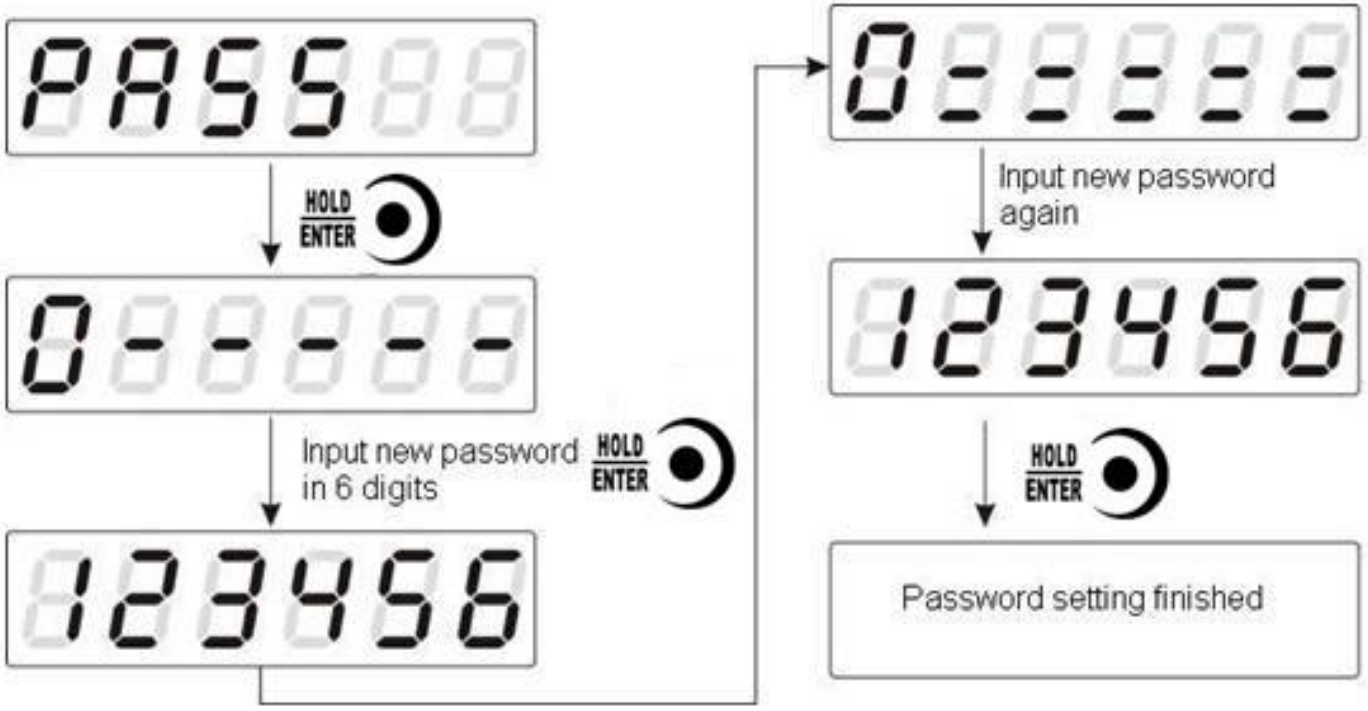
Note:

（1）When input password, if first time wrong, it will go to the second chance for password input(display from  turn to ).
（2）If second input wrong, it will enter into interface for inputting password the third time
(Display change from  to ).
（3）If Input wrong for three times, main display show “Error4” and self-lock, but user can operate when power on again.

8.2 Password Setting

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

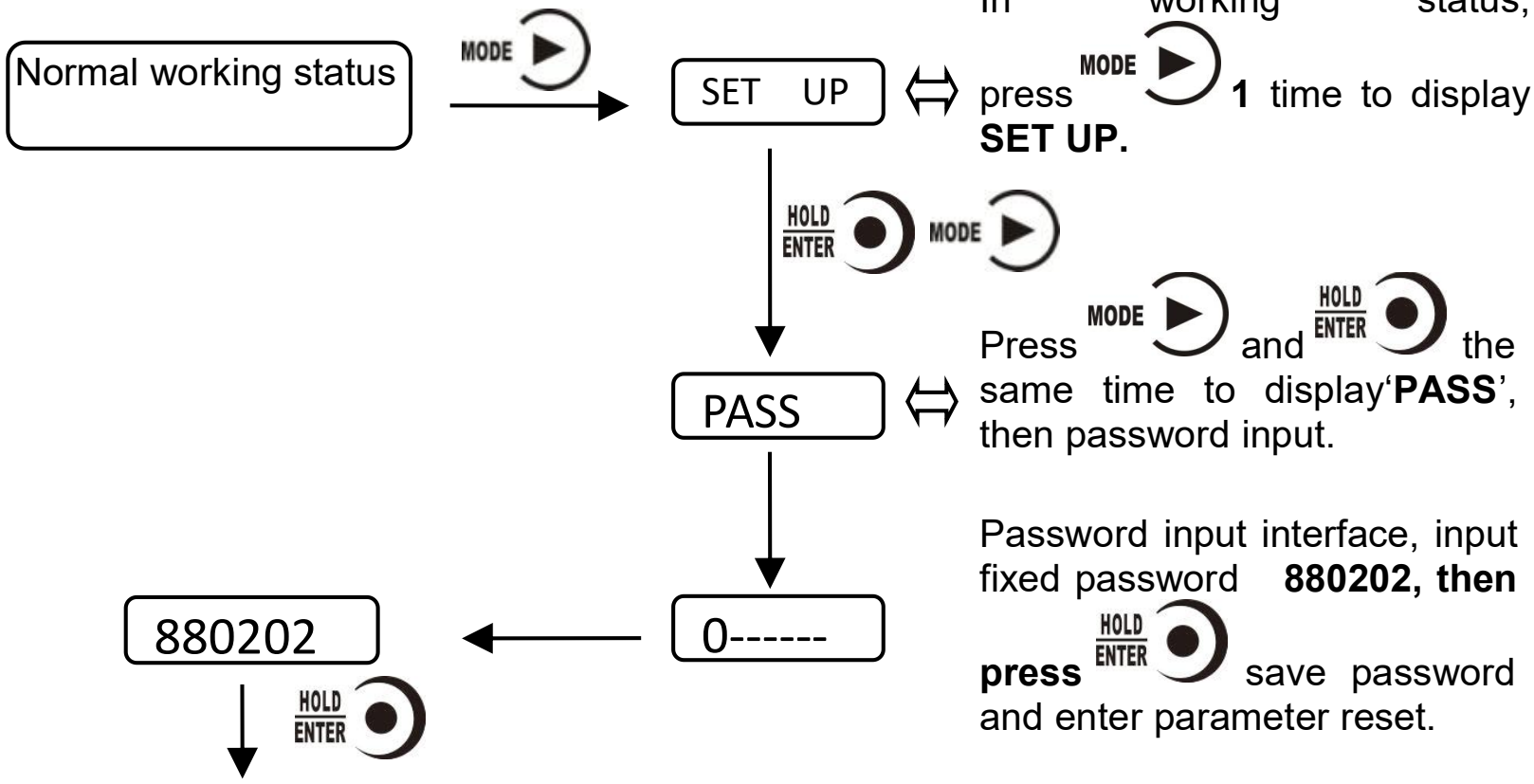
（2）User must input same new password twice in setting password,If not same, main display show“**Error**”one second and return to **PASS** again.

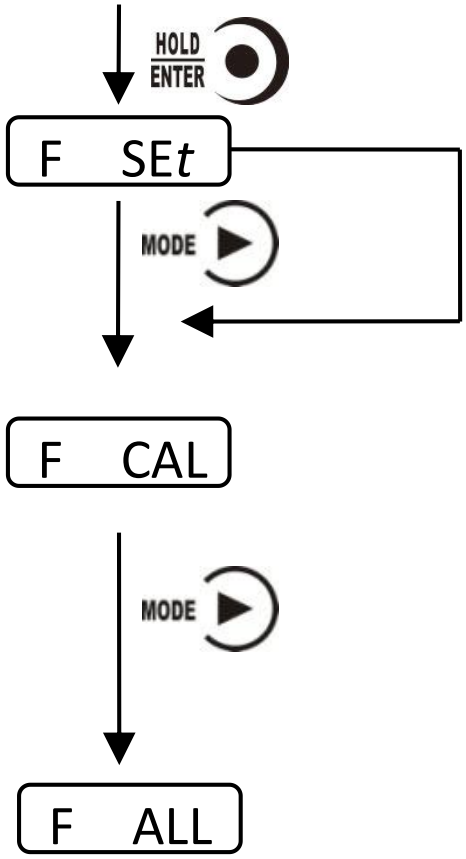


8.3 Factory Reset

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:





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

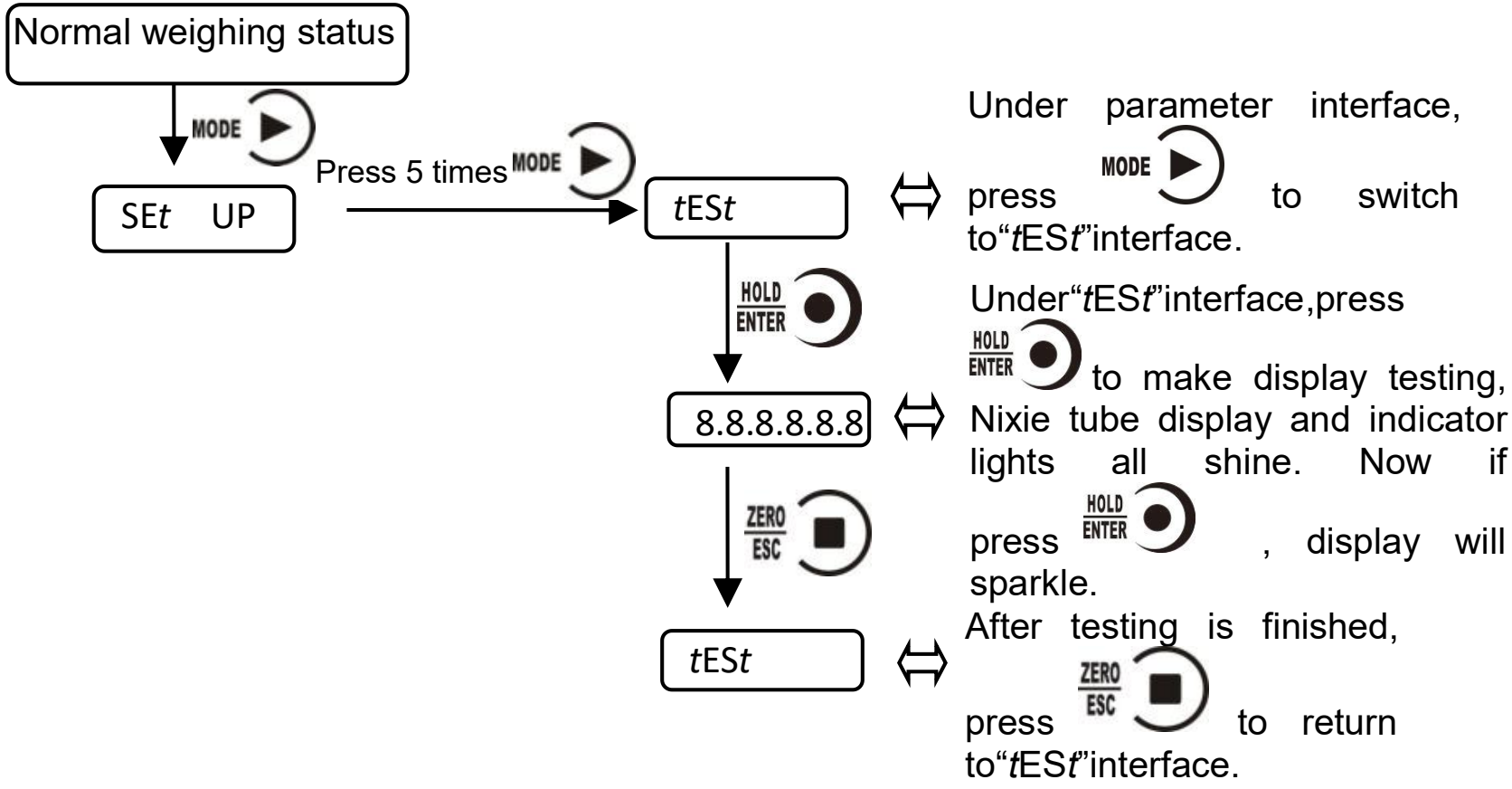
2）In **F CAL** interface, press MODE，not to make calibration para. reset, enter into reset all interface.

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

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

9 Display Testing

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



10 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.

Error 5 Overlimit when tare.

Error 6 Weight value is not stable when tare.

OFL Weighing value is positive overflow.

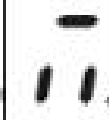
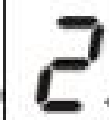
-OFL Weighing value is negative overflow.

11. Indicator model user-defined function

Long press MODE to display "LOGO" and enter the setting interface. Press ZERO to return to the setting menu

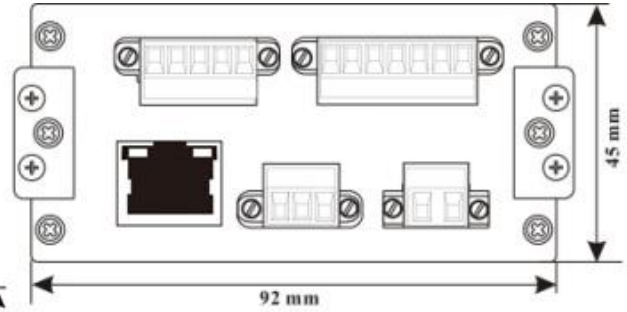
After saving, the next boot will show the newly edited model number.(ModbusTCP does not add a write function.)Add files such as "LogoSetupThread. C "and" logosetuthread. H ".

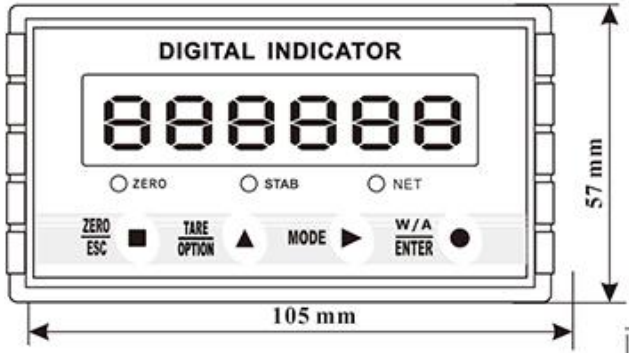
Displays character comparison table

a	b	c	d	e	f	g	h	i	j	k	l	m
												
n	o	p	q	r	s	t	u	v	w	x	y	z
												

12 Dimension of Indicator

Dimension of rear panel:**92×45(mm)**





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

Panel cutout dimension:**93×46(mm)**