



# T2

## Weighing Display Controller

## OPERATION MANUAL

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# Chapter I General information

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## 1. Overview

The weighing instrument adopts advanced single-chip technology, 20-bit sigma-delta A/D converter design. It has benefits of high speed conversion, high precision, powerful and outstanding for its functions and long-term stability.

## 2. Characteristics

- 1-6 levels digital filtering combined with T3.0 version of stability program makes weighing fast and stable;
- With animal weighing function;
- With automatic counting function;
- With manual accumulative and automatic accumulative functions;
- Automatic detection of battery power, with low voltage alarm function.

## 3. Technical Performance

- Input signal range: -19-+19mV
- Nonlinear:  $\leq 0.0015\%F.S.$
- Gain error drift: 1ppm/°C
- Excitation voltage: DC5V/150mA
- Minimum resolution: 0.1 $\mu$ V/d
- Display divisions:  $\leq 100000d$
- Display: 6-bit 1.0-inch word height LCD display
- Serial communication interface: RS-232A, RS-232B
- Baud rate: 1200/2400/4800/9600bps optional
- Printer interface: RS232A, baud rate 9600
- Operating temperature: -10-+40°C
- Relative humidity:  $\leq 85\%R.H$
- Power supply: DC12V/1A, built-in 7.4V/2.0Ah lithium battery
- Overall dimension: 200  $\times$  170  $\times$  66mm
- Weight: 1.3kg
- Number of verification scale interval: 6000

# Chapter II Interface Definition

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## 1. Load Cell Interface (with 5-bit terminal block)

**Connected to 4-wire sensor connection**

-SIG	+SIG	-EXC	+EXC	SHLD
Signal negative	Signal positive	Supply bridge negative	Supply bridge positive	Shield wire

## 2. RS232C Serial Communication Port (with 5-bit terminal block)

232T	GND	232R	232T	GND
Serial printer interface Baud rate 9600		RS-232 interface		

# Chapter III Serial Communication Protocol

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## 1. RS-232 Communication Protocol

### ◆ Communication Protocol 1 (F2.2=0)

Continuous transmitting weighing value, baud rate: 1200/2400/4800/9600bps optional

Serial communication data format: 11 bits; 1 start bit, 8 data bits, 2 stop bits

The weight data sent by serial communication is BCD code; 5 bytes each time. It is defined as following:

Byte 1: start bit (OFFH)

Byte 2: status word

Byte 3: 6 weight value low BCD code

Byte 4: 6 weight value median BCD code

Byte 5: 6 weight value high BCD code

**Status word:**

D7	D6	D5	D4	D3	D2	D1	D0
	0						

D3=gross weight is 0, net weight is 1

D4=dynamic is 0, non-dynamic is 1

D5=weight value positive is 0, negative is 1

D7=less than range is 0, overload is 1

**Decimal point:**

		X	.X	.XX	.XXX	.XXXX
D2	=	0	0	0	1	1
D1	=	0	1	1	0	0
D0	=	1	0	1	0	1

## ◆ Communication Protocol 2 (F2.2=1)

Continuous transmitting weighing value, baud rate: 1200/2400/4800/9600bps  
optional

Serial communication data format: 10 bits; 1 start bit, 8 data bits, 1 stop bit

The weight data sent by serial communication is ASCII code; 12 bytes each time. It is defined as following:

Byte 1: start bit (02H)

Byte 2: status word A

Byte 3: status word B

Byte 4: status word C

Byte 5: 6 high weight value

...

Byte 10: 6 low weight value

Byte 11: CR (0DH)

Byte 12: LF (0AH)

### Status word A:

D7	D6	D5	D4	D3	D2	D1	D0
0	0	1	0	0			

### Decimal point:

		X	.X	.XX	.XXX	.XXXX	.XXXXX
D2	=	0	0	1	1	1	1
D1	=	0	1	0	0	1	1
D0	=	0	1	0	1	0	1

### Status word B:

D7	D6	D5	D4	D3	D2	D1	D0
0	0	1	1				0

D1=weight value positive is 0, negative is 1

D2=less than range is 0, overload is 1

D3=non-dynamic is 0, dynamic is 1

**Status word C=20H**

## 2. RS-232B interface MODBUS-RTU Communication Protocol (F2.4-6)

Baud rate: 1200/2400/4800/9600 optional

Serial communication data format: 10 bits; 1 start bit, 8 data bits, 1 stop bit


MODBUS RTU communication method:


Register Address	Function Code	Instruction	Note
4000H	03H	Gross weight	4 byte signal read only
4002H	03H	Tare weight	4 byte signal read only
4004H	03H	Net weight	4 byte signal read only
4006H	06H	Zero	FF01H
4006H	06H	Tare	FF02H
4006H	06H	Clear	FF03H

# Chapter IV Basic Operation

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## 1. Power On and Shutdown

Under the shutdown state, hold on  for 1 second, the instrument enters into the self-testing procedure, the display successively shows [000000] to [999999] and the voltage of built-in battery, and then the screen displays [-----]. After a few seconds, the instrument enters into the weighing state and automatically executes the boot reset procedure.

In the boot state, hold on  for a few seconds and display [OFF] for 1 second, the instrument will automatically shut down.


when the battery is about to run out, the battery symbol light on the instrument display screen will turn to red. At this time an external power supply need to be connected as soon as possible , [AC] indicator lights on, and the instrument will charge the built-in battery at the same time, the battery symbol indicator light will flash red. When it finishes the charging, the battery symbol light remains green, otherwise the instrument will automatically shut down when the battery is exhausted.

## 2. Zero

### ◆ Automatically set to zero when power on

After the instrument is turned on, it will automatically execute the boot zero-setting procedure. If the weight is within the zero-setting range, the instrument will be automatically zeroed; otherwise, the automatic zero-setting procedure will be skipped.

### ◆ Press button to set zero

After pressing , if the weight is within the button zero-setting range, the instrument will be automatically zeroed; otherwise, the automatic zero-setting procedure will be skipped.


❖ The boot zero-setting range and the button zero-setting range are set




during the procedure of calibration debugging.

### 3. Tared Operation and Clean Tare Weight

#### ◆ Tared operation

In weighing state, the gross weight is greater than 0, press , the instrument will take the current gross weight value as the tare weight value, store it in the tare weight unit, and display the net weight value, and the [NET] indicator light will be on.

#### ◆ Clean tare weight


Under the tared state, press , the instrument will automatically clean tare weight and display gross weight, the [NET] indicator light will be off.

### 4. Weight Unit Selection

Weight display unit kg and lb conversion (**when F1.7=1, the weight unit is lb**)

### 5. Cumulative Weight (effective if F4.0=0)

#### ◆ Manual accumulation (effective if F3.0=0)

In the weighing state, when the net weight value is greater than 0, press , the instrument will automatically accumulate the current net weight value to the net weight value accumulation unit for storage, and the instrument will return to the weighing state after displaying the number of accumulated times [n xxxx] for 1 second. One time weighing can only be accumulated once. The next accumulation can only be performed after the net weight returns to 0. When F2.2=7-8, the instrument will print the weight at the same time.

#### ◆ Automatic accumulation 1 (effective if F3.0=1)

In the weighing state, when the weight is greater than 20d, the weight will be automatically accumulated to the accumulative unit for storage after the weight value is stable, the instrument will display the number of accumulated times [n xxxx] and the buzzer will beep at the same time, and it will return to the weighing state after 1 second. One time weighing can only be accumulated once. The next


accumulation can only be performed after the weight returns to less than 20d. When F2.2=7-8, the instrument will print the weight at the same time.

◆ **Automatic accumulation 2 (effective if F3.0=2)**


In the weighing state, when the weight is greater than 20d and then returns to less than 20d, the instrument automatically accumulates the last stable weight to the accumulative unit for storage, and the instrument will display the number of accumulated times [n xxxx] and the buzzer will beep at the same time, and it will return to the weighing state after 1 second. One time weighing can only be accumulated once. When F2.2=7-8, the instrument will print the weight at the same time.

## 6. About Number of Cumulative Times and Weight




◆ **Number of cumulative times and weight display (effective if F2.2=0-6)**

In the weighing state, press , the instrument will display number of weighing times [n xxxx] for 1 second and it will show cumulative weight. After 2 seconds, it will return to the weighing state.


◆ **Number of cumulative times and weight print (effective if F2.2=7-8)**

In the weighing state, press , the instrument will print number of weighing times [n xxxx] and cumulative weight.

◆ **Clear number of cumulative times/weight**

In the weighing state, press , the instrument will display [yorn] and jump into the clean procedure. Press  to clean number of cumulative times and cumulative weight storage unit and automatically back to the weighing state; or press  to exit the clean procedure and back to the weighing state.

7. Print operation (effective if F2.0=1、 2)












Under weighing status, press  to print the weighing list when the weight of goods is stable


8. Power Saving Mode (effective if F3.1=1)

The weight will always be displayed under the dynamic mode, and it will enter the power saving mode after more than 20 seconds in the steady state. Once there is any key operation or changes of the weight value, the instrument will automatically exit the power saving mode.




















9. Counting Function (effective if F4.0=1)

Counting sampling (when the counting indicator light and weight unit indicator light are on, and PCS indicator light is off)













NO.	Button	Display	Introduction
1	     	xxxxxx PCS 00 PCS 20	In the weighing state, after loading weights and the displayed value is stable, press  for 2 seconds to input number of samples setting, the first digit on the left flashes, press     to input number E.G. the number of samples is 20
2		100	Back to the weighing state

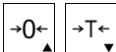
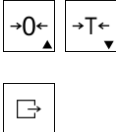
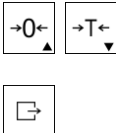
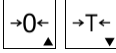
In the counting state, press , to switch the display between weight and quantity.








## 10. Date/Time Setting

NO.	Button	Display	Introduction
1		Set 0	Under weighing state, press and hold
			 for 2 seconds, release the button
		**.*.*.*	until displaying [Set 0] Display current date
	  	22.09.01	First digit on left side flicks, press 
			  to input date E.G. 22.09.01
2		**.*.*.*	Display current time:
	  	10.15.01	First digit on left side flicks, press 
			  to input time E.G. 10.15.01
3			Back to the weighing state

## 11. Function Setting

NO.	Button	Display	Introduction
1	    	Set 0  Set 1  F2.0 x  F2.0 0	<p>Under weighing state, press and hold  for 2 seconds, release the button until displaying [F2.0 x]</p> <p>External serial port printing selection: 0-2  F2.0=0-2;  0-not print  1-Record mode printing  2-Duplicate form printing  IF F2.0=1 or 2, jump to F2.3  E.G. F2.0=0</p>
2	  	F2.1 x  F2.1 3	<p>RS-232A baud rate selection:  F2.1=0-3; 0-1200bps, 1-2400bps,  2-4800bps, 3-9600bps  E.G. F2.1=3; baud rate is 9600bps</p>
3	  	F2.2 x  F2.2 0	<p>RS-232A Communication format selection:  <b>F2.2=0-8</b>; 0-Precizio, 1-Toledo 8142-07,  2-Toledo 17-bit, 3- A9, 4-  Keli ZXFS, 5-GSE, 6-EXCELL/FORMATI,  7-AD4321 ( EVEN ) ,8-Rice Lake ( EVEN )  E.G. F2.2=0; select Precizio format</p>








4		F2.3 x F2.3 0	RS-232B interface baud rate selection: F2.3 = 0—3、0—1200、1—2400、2—4800、 3—9600 G. F2.3=3
5		F2.4 x F2.4 0	RS-232B interface communication format selection: <b>F2.2=0-9</b> ; 0-Precizio, 1-Toledo 8142-07, 2-Toledo 17-bit, 3- A9, 4- Keli ZXFS, 5-GSE, 6-EXCELL/FORMATI, 7-AD4321 ( EVEN ) , 8-Rice Lake ( EVEN ) , 9-MODBUS-RTU When choose 9, please set communication address as ADR01-99 E.G. F2.4=0; select precizio format
6		F2.6 x F2.6 1	Peak hold function Settings: F2.6=0-1; 0- Disables the peak hold function 1- Enable the peak hold function E.G. F2.6=1; Enable the peak hold function
7		F3.0 x F3.0 0	Accumulation method selection: F3.0=0-2; 0-manual accumulation, 1-Automatic accumulation 1, 2-Automatic

			accumulation 2 E.G. F3.0=0; select manual accumulation
8	  	F3.1 x  F3.1 0	Power saving mode selection:  F3.1=0-1; 0-off, 1-on  E.G. F3.1=0; turn off power saving mode
9	  	F4.0 x  F4.0 0	Counting mode selection:  F4.0=0-1; 0-general weighing mode, 1-counting weighing mode  E.G. F4.0=0; use general weighing mode
10			Back to the weighing state




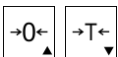

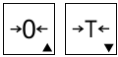

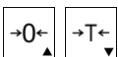

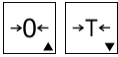
# Chapter V Calibration Mode














Before calibration debugging of the instrument, it is necessary to carefully check if the connection between the various parts is correct. If the connection has no problem, to open the calibration cover in the back cover and press calibration button lightly and the instrument will enter into calibration debugging state.

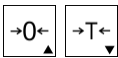



## 1. Parameter Setting

NO.	Button	Display	Introduction
1		CAL 1	In weighing mode, press calibration button in the back cover for 2 seconds and enter into calibration state and displays [CAL 1]  CAL=1 parameter setting  CAL=2 weight calibration  CAL=3 compensation calibration
2	  	d xx  d 10	Weighing scope:  d=01, 02, 05, 10, 20, 50  E.G. d=10; weighing scope is 10
3	  	dC x  dC 0	Decimal point:  dC=0-4; 0-0, 1-0.0, 2-0.00, 3-0.000, 4-0.0000  E.G. dC=0; reserved to single digits

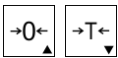
















4	 	xxxxxx 050000	Scale's range: The first digit on the left flashes, press  to input weight number E.G. scale's range is 50000kg
5	 	FLt x FLt 2	Filtering levels: FLt=1-6 (the higher the number, the better the filtering effect) E.G. FLt=2; filtering level is 2
6	 	F1.0 x F1.0 3	Zero point tracking speed: F1.0=1-9s E.G. F1.0=3s; zero point tracking speed is 3s
7	 	F1.1 x F1.1 2	Zero point tracking range: F1.1=0-9; 0-0.0d, 1-0.5d, 2-1.0d, 3-1.5d, 4-2.0d, 5-2.5d, 6-3.0d, 7-3.5d, 8-4.0d, 9-4.5d E.G. F1.1=2; zero point tracking range is 1.0d
8		F1.2 x F1.2 5	Boot zero-setting range: F1.2=0-5; 0-without zero, 1-2%, 2-4%, 3-20%, 4-50%, 5-100%

			E.G. F1.2=5; boot zero-setting range is 100%
9	  	F1.3 x F1.3 5	Button zero-setting range: F1.3=0-5; 0-without zero, 1-2%, 2-4%, 3-20%, 4-50%, 5-100% E.G. F1.3=5; button zero-setting range is 100%
10	  	F1.4 x F1.4 5 n xxx F1.4 5	Creep tracking setting: F1.4=0-9; 0-no tracking, 1-0.1d, 2-0.2d, 3-0.3d, 4-0.4d, 5-0.5d, 6-0.6d, 7-0.7d, 8-0.8d, 9-0.9d E.G. F1.4=5; creep tracking is 0.5d
11	  	F1.5 x F1.5 1	Calibration mode selection: F1.5=1; 1-5 stage nonlinear correction E.G. F1.5=2; select 2 stage nonlinear correction
12	  	F1.6 x F1.6 0	Weighing state selection: F1.6=0-1; 0-general weighing, 1-animal weighing E.G. F1.6=0; select general weighing
13		F1.7 x	kg/lb weight unit selection:














	  	F1.7 0  CAL 1	F1.7=0-1; 0-kg,1-lb  E.G. F1.7=0; select kg
14			Back to weighing status


## 2. Weight Calibration

NO.	Button	Display	Introduction
1	  	CAL 1  CAL 2	In weighing mode, press calibration button in the back cover for 2 seconds and enter into calibration state and displays [CAL 1]  CAL=2 weight calibration
2		xxxxxx  0	Display internal codes in empty scale, if display steady, press 
3		xxxxxx	Add standard weight G in weighing platform, if display steady, press 
4	   	000000  010000	The first digit on the left flashes, press    to input weight number  Input standard weight G  E.G. G=10000kg
5		CAL 1	















6		10000	Back to weighing status
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























### 3. Compensation Calibration












NO.	Button	Display	Introduction
1	  	CAL 1  CAL 3	In weighing mode, press calibration button in the back cover for 2 seconds and enter into calibration state and displays [CAL 1]  CAL=3 compensation calibration
2		xxxxxx	Add standard weight G in weighing platform, if display steady, press 
3	   	000000  010000	The first digit on the left flashes, press    to input weight number  Input standard weight G  E.G. G=10000kg
4		CAL 1	
5		10000	Back to weighing status

**NOTE:** in the above operation steps, users can press  at any time to exit and enter the next step.

#### 4. Multi-stage Weight Calibration (effective if F1.5=2, 3, 4, 5)

NO.	Button	Display	Introduction
1	  	CAL 1  CAL 2	In weighing mode, press calibration button in the back cover for 2 seconds and enter into calibration state and displays [CAL 1]  CAL=2 weight calibration
2		xxxxxx  1P  0	Display internal codes in empty scale, after 2 seconds of the first stage weight calibration, it displays 0
3		xxxxxx	Add standard weight G1 in weighing platform, if display steady, press 
4	   	000000  010000	The first digit on the left flashes, press    to input weight number  Input standard weight G1  E.G. G1=10000kg
5		2P  010000  xxxxxx	After 2 seconds of the second stage weight calibration, it displays weight value, add standard weight G2 in weighing platform, if display steady, press

			
6	    	000000  020000  xxxxxx	<p>The first digit on the left flashes, press     to input weight number</p> <p>Input standard weight G2</p> <p>E.G. G2=10000kg</p>
7		3P  020000  xxxxxx	<p>After 2 seconds of the third stage weight calibration, it displays weight value, add standard weight G3 in weighing platform, if display steady, press </p>
8	    	000000  030000  xxxxxx	<p>The first digit on the left flashes, press     to input weight number</p> <p>Input standard weight G3</p> <p>E.G. G3=10000kg</p>
9		4P  030000  xxxxxx	<p>After 2 seconds of the forth stage weight calibration, it displays weight value, add standard weight G4 in weighing platform, if display steady, press </p>
10	  	000000  040000	<p>The first digit on the left flashes, press     to input weight number</p>

			Input standard weight G4 E.G. G4=10000kg
11		5P  040000  xxxxxx	After 2 seconds of the fifth stage weight calibration, it displays weight value, add standard weight G5 in weighing platform, if display steady, press 
12	   	000000  050000	The first digit on the left flashes, press    to input weight number Input standard weight G5 E.G. G5=10000kg
13		CAL 1	
14		050000	Back to weighing status

## 5. Print format under different working mode

### ◆ Record format ( F2.0=1 )

#### WEIGHING SHEET

-----  
DATE            2022/09/25  
NET (kg)        NO. (PCS)  
2000            000050  
2000            000050  
2000            000050  
-----

F2.0            1  
F4.0            1

### ◆ Multiple format ( F2.0=2 )

#### WEIGHING SHEET

-----  
DATE            2022/09/25  
TIME            15:53:49  
GROSS           2000kg  
TARE            0 kg  
NET             2000kg  
WEIGHT         40kg  
-----

F2.0            2  
F4.0            1



◆ **Record format ( F2.0=1 )**

WEIGHING SHEET

-----

DATE	2022/09/27	
NO.	TIME	NET (kg)
-----		
001	10:10	10000
002	10:10	20000
003	10:10	10000
004	10:11	10000

-----

COUNT	0004
TOTAL	50000kg

-----

F2.0	1
F4.0	0

◆ **Multiple format ( F2.0=2 )**

WEIGHING SHEET

-----

NO.	0001
DATE	2022/09/27
TIME	10:12:21
GROSS	10000kg
TARE	0kg
NET	10000kg

-----

F2.0	2
F4.0	0

# Chapter VI Information Tips

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## 1. Error Information

Display Content	Introduction
Err 01	no weights is loaded during calibration
Err 02	weight cannot be 0 when counting sampling

## 2. About Built-in Battery

The instrument is powered by a built-in 7.4V/2.0Ah lithium battery, and the instrument will automatically charge the built-in battery when using AC power. After using the built-in battery for power supply, immediately to use the external power supply to charge the built-in battery, otherwise the built-in battery will be damaged. Once charge time should not be less than 6 hours nor more than 10 hours. Since the built-in battery will self-discharge, if the instrument is not in use, the built-in battery should be charged once every two weeks with the external power supply, so as to avoid damage to the built-in battery and permanent failure to charge. The battery is a consumable item and is not covered by the warranty.