East Tester®

ETX-2710 Temperature Calibrator
ETX-1710 Temperature Calibrator
Users Manual

Hangzhou Zhongchuang Electron Co., Ltd.

Contents

1 Basic Introduction

1.1 Function

- It allows you to measure DC V, DC mV, resistance ,TC and RTD.
- Outputs resistance, simulation of TC and RTD.
- Thermocouple(TC) measurement provides cold-junction compensation.
- Manual stepping, automatic stepping, 0～100% phase step and ramp output.
- Super-strong protection： The waterproof grade is IP67. Automatic protection against the signal terminals connect to the 220V.
- Support for PC communication

1.2 Summary of Source and Measure Functions

Function	Measure	Source
DC V	0～30V	Not available
DC mV	0～120mV	0mV～100mV
Resistance	0～3200Ω	0～3200Ω
RTD	Pt100, Pt1000, Cu50, Cu100	Pt100, Pt1000, Cu50, Cu100
TC	E,J,K,T,B,R,S,N	E,J,K,T,B,R,S,N
Others	Stepping output, ramp, phase step output, user-defined range	

1.3 Terminal Description

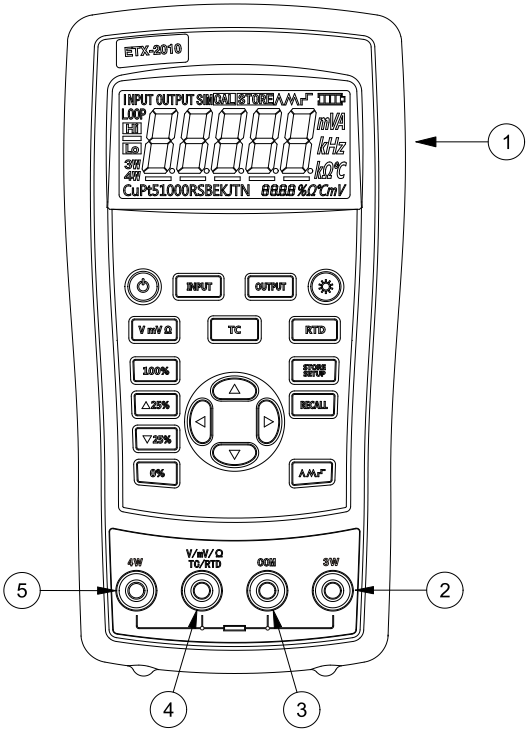

Figure 1.3-1

No.	Name	Description
①	Communication and charging connector	Connect power adaptor to charge batteries or connect the calibrator to the computer.
②	3W and 4W terminal	3-wire and 4-wire electric and thermal resistance measurement terminal.
③	COM Public terminal terminal	All measurement and output public terminal.
④	V, mV, Ω,TC and RTD terminal	Voltage and DC mV, 2-wire resistance, thermal-electric and resistance measurement as well as DC mV, resistance, thermocouple and thermal-resistance output terminal.
⑤	4W+ terminal	Resistance and thermal resistance 4-wire measurement terminal.

1.4 Key Description

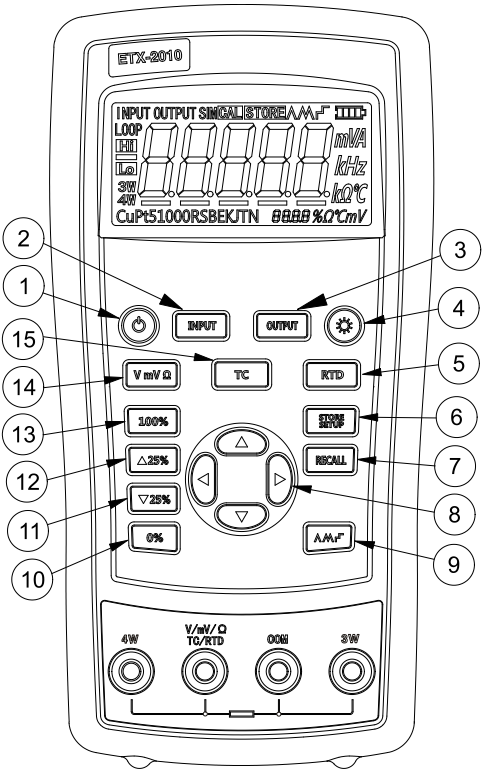

Figure 1.4-1

No.		Description
①	⏻	Turns the power on or off
②	INPUT	Selects the measurement mode
③	OUTPUT SIM	Selects output and analog transmitter mode.
④	☼	Enables backlight switch display during start, enters backlight brightness control mode.
⑤	RTD	Selects thermal resistance mode
⑥	STORE SETUP	Sets and saves calibrator parameters setting

⑦	RECALL	Recovers factory default setting
⑧	▲▼◀▶	Sets manual output
⑨	∧⋀⌐	Cycles through: ∧ slow repeating 0%-100%-0% ramp ⋀ Fast repeating 0 % - 100 % - 0 % ramp ⌐ Repeating 0 % - 100 % - 0 % ramp in 25 % steps
⑩	0%	Set output by 0% of span, Press and hold to store the source value as the 0 % value
(11)	▼25%	Decrements output by 25% of span.
(12)	▲25%	Increments output by 25% of span.
(13)	100%	Sets output by 100% of span, Press and hold to store the source value as the 100 % value.
(14)	V mV Ω	Sets voltage, DC mV and resistance mode
(15)	TC	Selects thermo-couple mode

1.5 Display Screen

Figure 1.5-1

2 Basic Operation

2.1 Measure and Source

This section acquaints you with some basic operations of ETX-2010/ ETX-1810.

Proceed as follows:

1. The connection of the calibrator as shown in Figure 2.1-1.

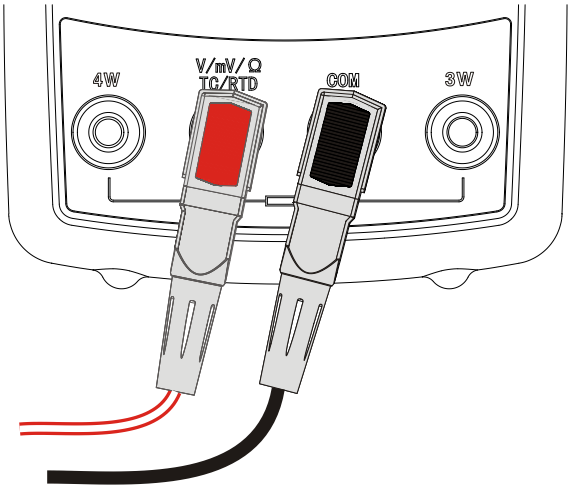

Figure 2.1-1

2. Press ⏻ more than 2 seconds to turn on the calibrator. The calibrator checks itself, including check on internal circuit and LCD, during which, LCD displays all contents for 1s as shown in Figure 2.1-2:

Figure 2.1-2

3. Then the product model（2010） and automatic shutdown time（30 min） will be displayed for 2 seconds as shown in Figure 2.1-3.

Figure 2.1-3

4. Then the default interface of boot will be displayed as shown in Figure 2.1-4:

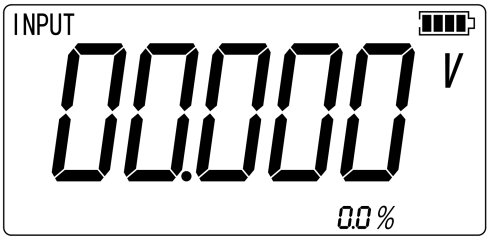

Figure 2.1-4

5. Press V mV Ω, switch to the voltage mode. Switching is not required for this series after starting-up.
6. Press OUTPUT to enter into output mode selection
7. Press V mV Ω to enter into DC mV output mode as shown in Figure 2.1-5.

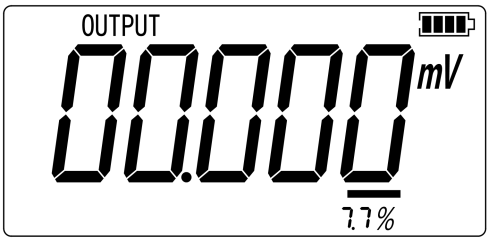

Figure 2.1-5

8. Press ▲ and ▼ to increase or decrease 1 of the horizontal line position (the number will be based on automatic stepping without change of horizontal line position); press ◀ or ▶ to change the position of horizontal line.
9. Press [0%] until the buzzer works and to enter 0mV as 0% value.
10. Likewise, press ▲▼◀▶ to increase output value to be 100mV, and then press ▼ until the buzzer works and enter 100mV as 100% value.
11. Press [▲25%] or [▼25%] to make output increase or decrease within the span of 0% to 100% based on 25% advance amplitude. The screen will display as shown in Figure 2.1-6.

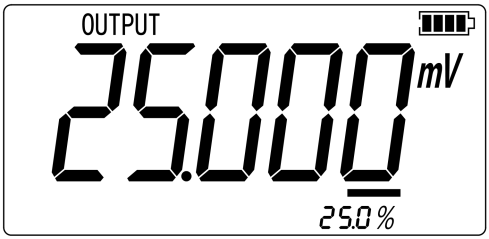

Figure 2.1-6

2.2 Shutdown Mode

The calibrator comes with the shutdown mode enabled for a time duration set to 30 minutes (displayed for about 2 seconds when the calibrator isinitially turned on). When the shutdown mode is enabled, the calibrator will automatically shutdown after the time duration has elapsed from the time the last key was pressed. To disable the

shutdown mode, press ⏻ and ◀ simultaneously. To enable the mode, press ⏻ and ▶ simultaneously. To adjust the time duration, press ⏻ and ▶ simultaneously, the screen will display as shown in Figure 2.2-1,then press ▲ and/or ▼ to adjust the time between 1 and 30 minutes and then press STORE SETUP to store the new time duration (Without pressing any key for 5 seconds, the calibrator will quit from the adjustment automatically).

Figure 2.2-1

2.3 Backlight Brightness Adjustment

To adjust the brightness of backlight, proceed as follows:

1. Please press ⏻ and ☼ simultaneously until the buzzer work, then the screen will display as shown in Figure 2.3-1:

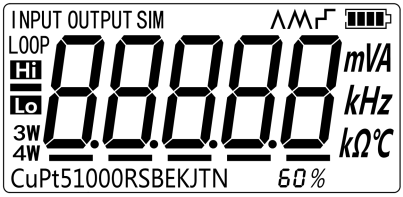

Figure 2.3-1

2. Press ▲ and▼ to adjust the brightness of backlight.
3. Press STORE SETUP to save brightness level, STORE will appear and then the calibrator will enter into the work mode(Without pressing key for 5 seconds, the calibrator will exit from the adjustment automatically).

3 Function Usage

3.1 DC V Measurement

The default function after turn on is DC V measurement. If it is required, press V mV Ω to re-select the voltage measurement (the display unit is V).Please connect the lines after all functions are selected. The connection mode and interface are shown in Figure 3.1-1:

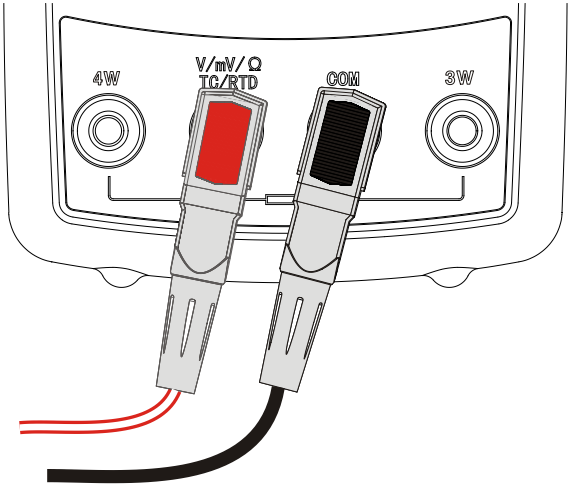

Figure 3.1-1

3.2 DC mV Measurement

Press [V mV Ω] to re-select the DC mV function (the display unit is DC mV), the connection mode is same to that of voltage measurement. The screen will display as shown in Figure 3.2-1.

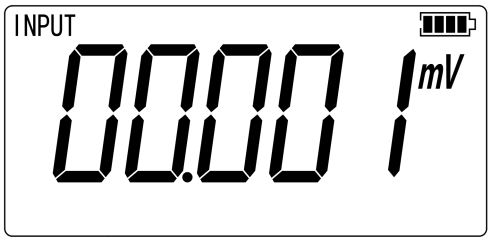

Figure 3.2-1

3.3 Resistance Measurement

Press [V mV Ω] to reselect the DC mV measurement function (Display unit is Ω)

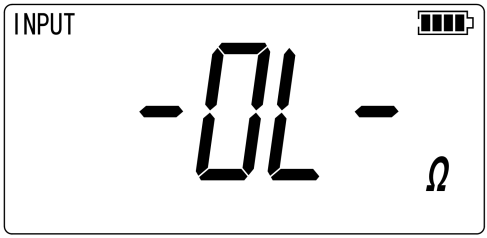

Figure 3.3-1

The Over Span Under Open Circuit

Resistance measurement supports the connection type of two-wire system, three-wire system and four-wire system. The calibrator can be switched to three-wire system or four-wire system according to actual connecting type. The respective connecting types are listed in Figure 3.3-2: Press ⌃ and ⌄ to select the connection mode forcibly.

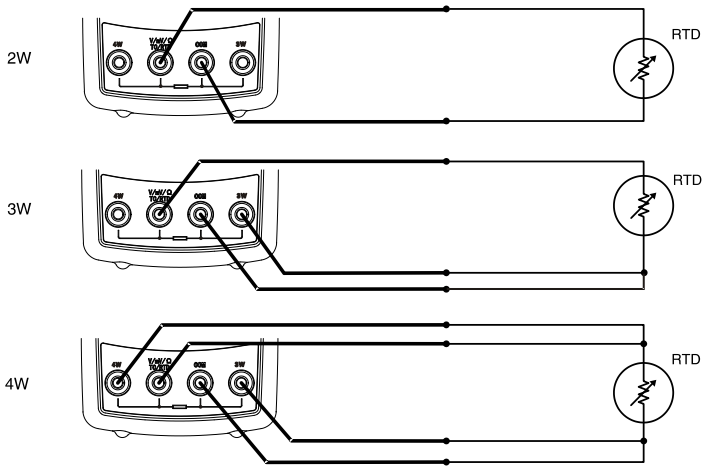

Figure 3.3-2

Press ⏶ or ⏷ to force the calibrator to adopt two-wire system, three-wire system or four-wire system. Afterwards, the calibrator will not detect connecting type automatically unless you quit the mode of resistance measurement and re-enter.

3.4 DC mV Output

Press [OUTPUT] and [V mV Ω] to select DC mV output function, the connection mode is same to that of voltage measurement. The screen will display as shown in Figure 3.4-1.

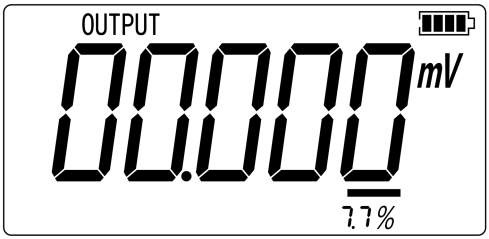

Figure 3.4-1

3.5 Resistance Output

Press [OUTPUT] and [V mV Ω] to select the resistance output function, the connection mode is same to that of voltage measurement.

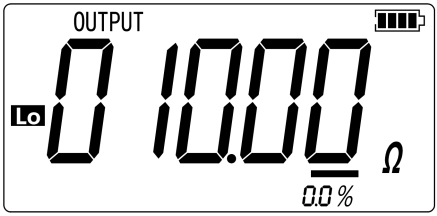

Figure 3.5-1

Lo *indicates the undersize of exciting current, meanwhile, the main value flashes*

Press [V mV Ω] to select resistance output at 3200Ω level.

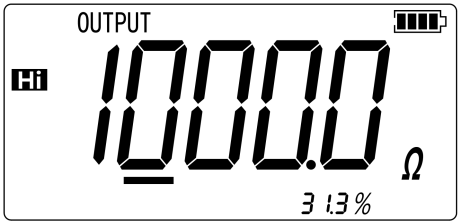

Figure 3.5-2

Hi *indicates the oversize of exciting current, meanwhile, the main value flashes*

4 Temperature Measurement

4.1 Using Thermocouple (TC)

The calibrator supports eleven standard thermocouples, including J, K, T, E, R, S, B, L, U and N. Lower table summarizes the ranges and characteristics of the supported thermocouples

Graduation	Positive lead material	Positive wire (H) color		Negative lead material	Specified span℃
		ANSI*	IEC**		
E	Chrome-nickel	Mauve	Purple	Constantan	-200～950
N	Nickel-chrome -silicon	Orange	Pink	Nickel-silicon-magne sium	-200～1300
J	Iron	White	Black	Constantan	-200～1200
K	Chrome-nickel	Yellow	Green	Alumel	-200～1370
T	Copper	Blue	Brown	Constantan	-200～400
B	Platinum (30% rhodium)	Grey		Platinum (6% rhodium)	600～1800
R	Platinum (13% rhodium)	Black	Orange	Platinum	-20～1750
S	Platinum (10% rhodium)	Black	Orange	Platinum	-20～1750

* Negative conductor (L) regulated as American National Standard (ANSI) is always red.
*Negative conductor (L) regulated as International Electro-technical Commission (L) is always white.

To measure temperature using thermocouple, the following steps shall be followed:

1. Connect the thermocouple to the calibrator as shown in Figure 4.1-1:

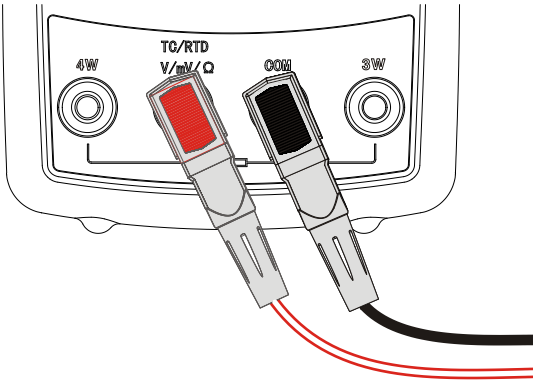

Figure 4.1-1

Attention:

Under different calibrator-thermocouple temperature environment, you shall wait for one minute to stabilize the plug temperature after connecting TC to input & output wiring.

2. Press [INPUT] to select measurement mode.
3. Press [TC] to display thermocouple reading as shown in Figure 4.1-2. If necessary, pressing [TC] continuously to select appropriate thermocouple type.

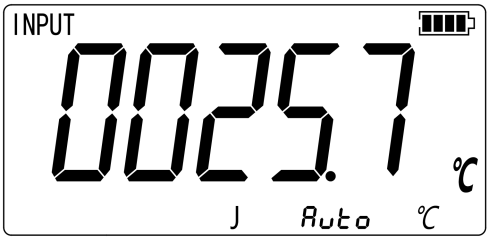

Figure 4.1-2

4. Press [INPUT] to display the DC mV value reading as shown in Figure 4.1-3. The DC mV value continue to display for 3s and then automatically return to the original display .

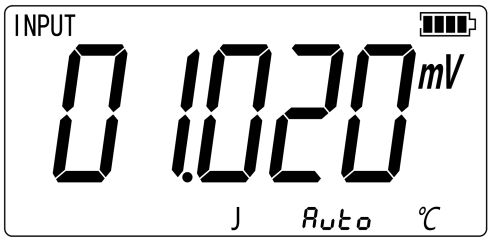

Figure 4.1-3

There are two kinds of cold end temperature compensation for thermocouple measurement, automatic compensation directly using machine internal cold end temperature compensation and manual compensation through the key to set the cold end temperature compensation by the user.

4.1.1 Automatic compensation

First entered the thermocouple measurement mode, the default of the cold end temperature compensation is automatic compensation reading as shown in Figure 4.1.1-1.The Auto sign represents that the current cold end temperature compensation is automatic compensation. If you need further view current automatic cold end temperature compensation value,you have to operation RECALL key. Reading as shown in Figure 4.1.1-1,after press RECALL key, the Auto sign is replaced for current automatic cold end temperature compensation value as 20.3 . The value 20.3 continue to display for 2s and then automatically return to the Auto sign.

Figure 4.1.1-1

4.1.2 Manual compensation

Manual compensation through the key to set the cold end temperature compensation by the user, the following steps shall be followed:

1. Press STORE SETUP key to enter the set mode, reading as shown in Figure 4.1.2-1, the appear of STORE sign shows that entering the setup mode, the assistant value 23.0 means the value of manual compensation.

Figure 4.1.2-1

2. If you need to adjust the manual compensation value, press ▲ ▼ ◀ ▶ keys to adjust.
3. Press STORE SETUP key to save the value of manual compensation and exit from the setup mode at the same time, reading as shown in Figure 4.1.2-2.

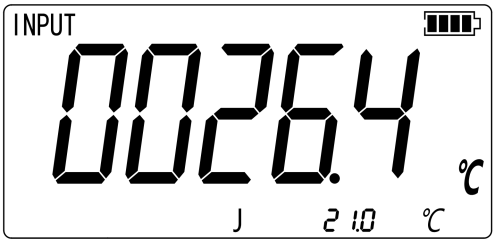

Figure 4.1.2-2

4. If necessary, press RECALL key return to automatic compensation.

4.2 Using Resistance Thermometer Detector (RTD)

The calibrator accepts Pt100, Pt1000, Cu50 and Cu100, etc. The calibrator accepts RTD measurements inputs in two-, three-, or four-wire connections, with the three-wire connection the most common. A four-wire configuration provides the highest measurement precision, and two-wire provides the lowest measurement precision.

To measure temperature using an RTD input, proceed as follows:

1. Press [INPUT] to select [INPUT] mode.
2. Press [RTD] for the RTD display. Then the screen will display as shown in Figure 4.2-1. If desired, continue pressing this key to select the desired RTD type.
3. Connect RTD to the corresponding port according to the connecting type of 'resistance measurement'.

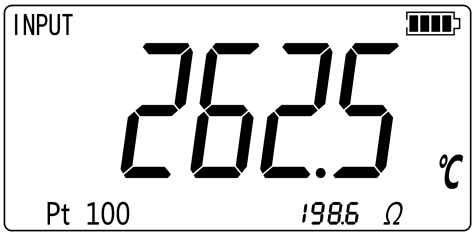

Figure 4.2-1

5 Simulation of temperature sensor

5.1 Simulating Thermocouples

Connect calibrator input/output terminal to the instrument to be tested using thermocouple. The connecting diagram is shown below, Proceed as follows to simulate a thermocouple:

1. Connect thermocouple to the TC input/output plughole of calibrator as shown in Figure 5.1-1.
2. If necessary, press [OUTPUT] to select output mode.
3. Press [TC] to select thermocouple function. If necessary, continue pressing the key to select thermocouple graduation.
4. Press ▲ or ▼ to select temperature. Press ◀ or ▶ to select digit.

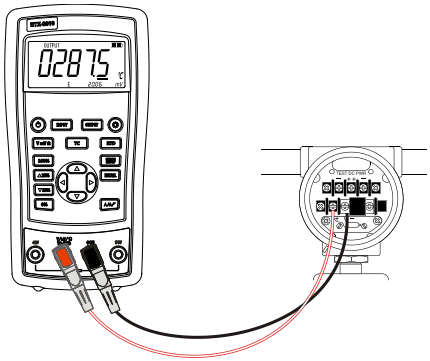

Figure 5.1-1

5. Press [OUTPUT] to display the DC mV value, which continue to display for 3s and

then automatically return to the original display .

Simulating Thermocouples also have two kinds of cold end temperature compensation, automatic and manual compensation.The method of operation is same to using thermocouple,please refer to 4.1 section for specific operation.

5.2 Application of Resistance Temperature Detector (RTD)

Connect the calibrator and the instrument to be tested according to the Figure 5.2-1. Simulation of RTD should be based on the following steps:

1. If necessary, press OUTPUT to select OUTPUT mode.
2. Press RTD to select RTD graduation.
3. Press ▲ or ▼ to select temperature. Press ◀ or ▶ to select digit.

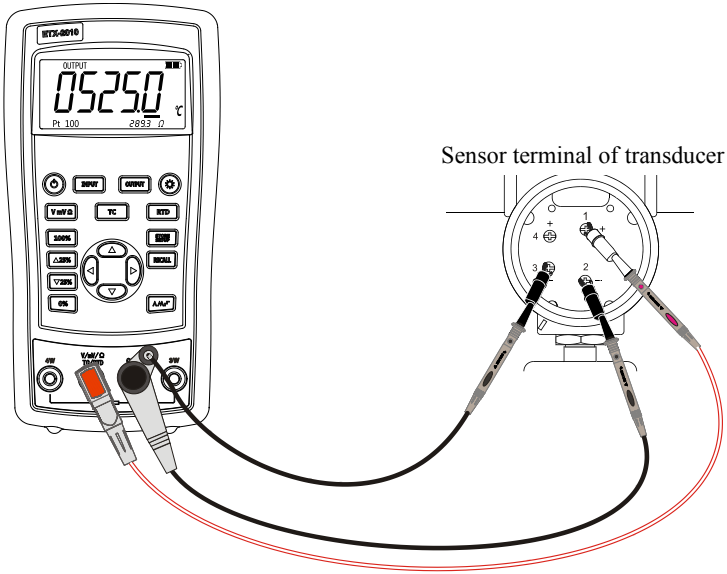

Figure 5.2-1

Three-wire (3 W) and four-wire (4 W) terminals are just for measurement, not output simulation. The calibrator can simulate a two-wire RTD output in the front panel. To be connected to a three-wire or four-wire transducer, use folding cable to provide extra wiring.

6 Advanced Application

6.1 Setting 0 % and 100 % output parameters

As for stepping operation and percentage display, 0% and 100% should be set before using. Some gear values have been set when delivered from the factory and set values are illustrated below:

Output Function	0% value	100% value
DC mV	0.00 mV	100.00 mV
Resistance 400Ω	0.00 Ω	400.00 Ω
Resistance 3200Ω	0.0 Ω	3200.0 Ω
Thermocouple J type	0.0 ℃	1000.0 ℃
Thermocouple K type	0.0 ℃	1000.0 ℃
Thermocouple T type	0.0 ℃	400.0 ℃
Thermocouple E type	0.0 ℃	800.0 ℃
Thermocouple R type	0 ℃	1500 ℃
Thermocouple S type	0 ℃	1500 ℃
Thermocouple B model	600 ℃	1800 ℃
Thermocouple N model	0.0 ℃	1000.0 ℃
Pt100	0.0 ℃	500.0 ℃
Pt1000	0.0 ℃	400.0 ℃
Cu50	0.0 ℃	150.0 ℃
Cu100	0.0 ℃	150.0 ℃

The default set values may not meet your requirements, so you can reset them. Then you can display the percentage with stepping or ramp output as well as display the percentage. Adjust the output value with keys  , press and hold  or  for a long time until the buzzer sends a “Ticking” sound to define the new 0% or 100% values. The new defined span value is saved in the calibrator storage automatically and remains effective after restart. The flowing operations are available with the setting:

- Press ▲25% or ▼25% for manual steeping (increase or decrease) output based on 25% increment.
- Press 0% or 100% instantly to make output jump within the span of 0% to 100%.

6.2 Auto Ramping the Output

Automatic ramping gives you the ability to continuously apply a varying stimulus from the calibrator to a transmitter, while your hands remain free to test the response of the transmitter.

When you press ∧M⌐, the calibrator produces a continuously repeating 0 % - 100 % - 0 % ramp in your choice of three ramp waveforms:

- ∧ 0%-100%-0% 40-second smooth ramp
- M 0%-100%-0% 15-second smooth ramp
- ⌐ 0%-100%-0% Stair-step ramp in 25 % steps, pausing 5 seconds at each step.

Exit the slop output function, please press any key.

6.3 Factory Reset

Factory reset consists of the following items:

- The working status recovers to the voltage measurement.
- Automatic shutdown time is reset to be 30 min, which is effective.
- LCD backlight brightness is set to be 60%.
- Output span is recovered to be factory default.

Start the calibrator and press RECALL until the buzzer works, and the recovery of factory default will enter working mode when the recovery is completed.

7 Power

The calibrator needs 6 disposable LR03 model (size 7) alkaline batteries or 6 R03 model (size 7) nickel-metal hydride batteries (or nickel-cadmium batteries). The longest service life of alkaline batteries can reach 50 hours.

A 12V/1A power adaptor is used for charging and providing working power for the calibrator.

7.1 Charge

When the battery indicator is pointed at  , the remaining electric quantity is less than 20%. Charge is necessary for normal operation of the calibrator. The LCD backlight will start operation and the  will display on the screen when the power adaptor is used. If the battery indicator  flashes, the calibrator will be in the charging process, after which the battery indicator  will stop flashing.

The calibrator will stop charge automatically in case of the following circumstances:

- Disposable batteries are used.
- Electric quantity is enough.

8 Specifications

Specifications are based on a one year calibration cycle and apply from +18℃ to +28 ℃ unless stated otherwise. All specifications assume a 10 minute warmup period.

8.1 DC Voltage Measurement

Range	Maximum measurement range	Resolution	Accuracy (% of reading + Counts)	
			ETX-1810	ETX-2010
30V	0V～31V	0.001V	0.05+2	0.02+2
100mV	-15mV～80mV	0.001mV	0.05+20	0.02+20
	80mV～125mV	0.01mV	0.05+2	0.02+2
-10℃～18℃，+28℃～55℃ temperature coefficient,±0.005%FS/℃. *Input resistance: ＞1MΩ.*				

8.2 DC Voltage Source

Range	Maximum output range	Resolution	Accuracy (% of reading + Counts)	
			ETX-1810	ETX-2010
100mV	-15mV～99.999mV	0.001mV	0.05+20	0.02+20
	100mV～125mV	0.01mV	0.05+2	0.02+2
-10℃～18℃，+28℃～55℃ temperature coefficient,±0.005%FS/℃. *Maximum load: 1mA or 1kΩ （It should be based on the lower load.）*				

8.3 Resistance Measurement

Range	Maximum measurement range	Resolution	Accuracy (Ω)			
			ETX-1810		ETX-2010	
			2-wire, 3-wire	4-wire	2-wire, 3-wire	4-wire
400Ω	0～440Ω	0.01Ω	0.25	0.15	0.15	0.10
3200Ω	420Ω～3600Ω	0.1Ω	1.5	1.0	1.0	0.5

-10℃～18℃，+28℃～55℃ temperature coefficient,±0.005%FS/℃.
Exciting current during measurement:
400Ω：1.0mA±10%;
3200Ω：0.2mA±10%;
Two-wire: Conductor resistance is excluded from errors.
Three-wire: Matching test line should be used. The total resistance of conductor should not be larger than 25Ω.

8.4 Resistance Output

Range	Maximum output range	Resolution	External exciting current	Accuracy (Ω)	
				ETX-1810	ETX-2010
400Ω	0～440Ω	0.01Ω	0.4mA～4.0mA	0.25	0.15
3200Ω	400～3600Ω	0.1Ω	0.1mA～0.5mA	1.0	0.50

-10℃～18℃，+28℃～55℃ temperature coefficient,±0.005%FS/℃.

8.5 Temperature, TC

Graduation	Range	Resolution	Accuracy (Ω)	
			ETX-1810	ETX-2010
J	-200℃～0℃ 0℃～1200℃	0.1℃	1.5℃ 1.0℃	1.0℃ 0.7℃
K	-200℃～0℃ 0℃～1370℃	0.1℃	1.8℃ 1.2℃	1.2℃ 0.8℃
T	-200℃～0℃ 0℃～400℃	0.1℃	1.8℃ 1.2℃	1.2℃ 0.8℃
E	-200℃～0℃ 0℃～950℃	0.1℃	1.5℃ 1.0℃	0.9℃ 0.7℃
R	-20℃～0℃ 0℃～500℃ 500℃～1750℃	0.1℃	4℃ 2.5℃ 2℃	2.5℃ 1.8℃ 1.4℃
S	-20℃～0℃ 0℃～500℃ 500℃～1750℃	0.1℃	4℃ 2.5℃ 2℃	2.5℃ 1.8℃ 1.5℃
B	600℃～800℃ 800℃～1000℃ 1000℃～1800℃	0.1℃	3.5℃ 2.5℃ 2℃	2.2℃ 1.8℃ 1.4℃
N	-200℃～0℃ 0℃～1300℃	0.1℃	2.0℃ 1.2℃	1.5℃ 0.9℃
Errors of cold-junction compensation are not included in the table. *Accuracy of cold-junction compensation: 1.5 ℃*				

8.6 Temperature, RTD

Graduation	Range	Resolution	Accuracy (℃)					
			ETX-1810			ETX-2010		
			2-wire 3-wire	4-wire	Output	2-wire 3-wire	4-wire	Output
Pt100	-200℃～ 850℃	0.1℃	0.7	0.4	0.7	0.4	0.3	0.3
Pt1000	-200℃～ 650℃		0.4	0.3	0.3	0.3	0.15	0.15
Cu50	-50℃～150℃		1.2	0.8	0.8	0.8	0.5	0.5
Cu100	-50℃～150℃		0.7	0.4	0.4	0.4	0.25	0.25

As for exciting current during measurement, please refer to resistance measurement function.

As for allowable external exciting current during output, please refer to resistance output function.

2-wire: Does not include lead resistance.

3-wire: Assumes matched leads with a total resistance not exceeding 25Ω.

9 Product Accessories

9.1 Standard Accessories

A set of ETX-2010/ETX-1810 calibrator also includes the following items:

- hard spot test leads (one set)
- alligator clip (one set)
- one 12V/1A power adaptor
- ETX-2010/ETX-1810 users manual

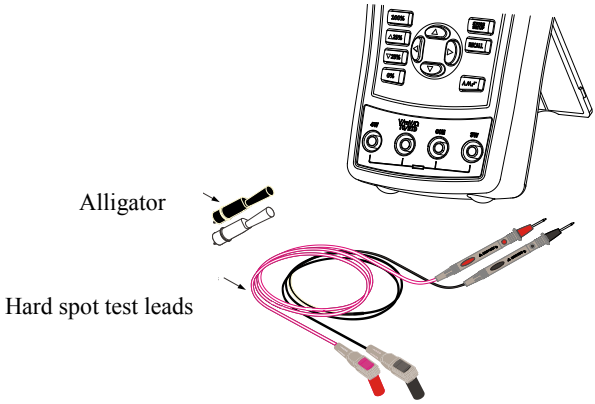

Figure 9.1-1

9.2 Optional accessories

- 6 R03-model rechargeable batteries
- 1 Metal Box
- Communication line

10 Warning

To avoid possible electric shock or personal injury:

- Test a given voltage to confirm its normal operation before using.
- Please follow all the safety operation standards.
- Select correct function and range gear according to measurement requirements.
- Confirm the closing of battery door before calibrator application.
- Remove the test line of calibrator before opening the battery door.
- Check whether damaged or exposed metal exists in the test line and whether the test line has been conducted. Replace the damaged test line before using.
- Fingers should not touch the metal contact when the detector is used. Fingers should be behind the finger-protecting device.
- Connect the common line and then electric test line. As for wire removal, electric test line should be first removed.
- Don't use the calibrator in case of abnormal operation. Calibrator should be repaired because it may have been damaged.
- Don’t use the calibrator near explosive gases.
- Remove the test line before changing measurement or output function.
- 6 LR03 (7 size) alkaline batteries or R03 nickel-metal hydride batteries (or nickel-cadmium batteries) should be used in the calibrator and the battery should be placed inside the meter housing.
- Replace or charge the battery when the screen displays low pressure of battery, to avoid reading error and possible electric shock or personal injury.

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