ATO

C512 Portable High Precision Signal Generator User Manual

C5123.0C11

ATO

The Attentions in User Manual：

- If there is any change in this user's manual, without notice, please correct it at any time. Please refer to the latest version.
  Please refer to the user's manual version number.
- If you find errors and omissions in the user's manual, please contact our company.
- The company is not responsible for the accident and harm caused by user error operation.
- The function described in this user manual is not used as a reason for the special purpose of the product.

ATO

Warning Before using C512, please read it.

Safety Instruction

Introduction：

C512 Portable high precision signal generator is a hand-held high precision signal source which power supply is from battery or external AC/DC power adapter. It can be used for the output of various specifications of the industrial signal. Please refer to the following table：“Summary of output function”。

In addition to the functions of【Table 1】, C512 also has the following characteristics and functions：

- Automatic Power Switch：Can be connected to the external AC/DC power adapter to work, no external power supply, the use of battery powered (4 AA 1.5V battery).
- Battery Power Monitoring：Real-time monitoring of battery power supply and prompts the user current power.
- Save Common Output：Can be stored and read as many as 64 sets of commonly used output.
- Multi Information Liquid Crystal Display：Contains variety of tips, such as output value, signal type, power information and memory information.
- Combination of Buttons：Not only can you enter the output value through the digital key, but also can adjust the output value by the direction key.

Function	Output
DC Voltage（DCV）	3 gears：100mV，1V，10V
Direct Current（DCA）	2 kinds of current modes：Output（Source），Analog Transmitter（Sink）
Resistance	2 gears：400Ω，4000Ω
Thermal Resistance（RTD）	Pt100，Pt1000，Cu50（Support 2, 3, 4 wire resistance output）
Thermocouple（TC）	K，E，J，T，R，B，S，N
Pulse	Continuous pulse output and pulse counting mode output Frequency Range：2Hz~10kHz
Switch Quantity	Switching output and switching output Frequency Range：2Hz~10kHz
Other Functions	24V External supply mode, memory, record

Table 1： Summary of Output Function

ATO

Security Considerations

Please be sure to observe the following articles and notes in this product specification. If you do not comply with the precautions to use, there is a risk of major injuries or accidents.

- λ Please do not use in the atomic energy equipment, medical equipment and other life related equipment.
- λ The instrument does not have a power supply fuse; please set the fuse and other safety circuit devices in the instrument power supply circuit.
- λ Please do not use this product outside the scope of the specification provided.
- λ Please do not use in flammable and explosive places.
- λ Please avoid being installed on the top of the instrument (heater,

transformer and high power resistance).

- λ The ambient temperature is above 50℃, please use the mandatory cooling fan or cooling machine, but don't let the cooling air blow directly into the instrument.
- λ The disc mounted instrument, in order to avoid the user close to the power supply terminal high voltage part, please take the necessary measures in the final equipment.
- λ The installation, commissioning and maintenance of the products shall be carried out by qualified technicians.
- λ If this product failure or abnormal may lead to a major accident in system, please protect the appropriate settings in the external circuit, to avoid accidents.
- λ The company does not undertake any direct or indirect loss other than the product itself.
- λ The company reserves the right to change the product specification without notice.

ATO

Catalog

1.Matters Needing Attention

safety instruction

In order to avoid electric shock, damage, damage to C512 or other equipment, please strictly comply with all equipment safety procedures!

- λ Must be in accordance with the provisions of this user manual to use C512.
- λ Check the C512 before use, if the C512 is damaged, please do not use it.
- λ Before using C512, please make sure the battery compartment is closed.
- λ Check wire connectivity, the insulation is damaged or metal wire is exposed. Replace the damaged wire test; use pens with metal contact accessory, do not touch the metal part.
- λ In addition to the Sink mA file (analog transmitter output), do not apply any voltage to the output terminal, otherwise it will cause damage to the instrument.
- λ Do not apply a 30V voltage between the terminals or any of the terminals and the ground wire (the ground).
- λ Applying a voltage between the 30V and the input terminals will result in the failure of the factory certification of C512 and may cause permanent damage to the device and cannot be used.
- λ The different output signal must use the correct socket, modes and position.
- λ To avoid damage to the device under test, to ensure that the pen before connecting wire, C512 in the correct mode. When connecting, first connect the L test probe, and then connect the

charged H probe. Disconnect the connection, then disconnect the charged H probe, and then disconnect the L probe.

- λ When calibrating, it is required to use the precision to meet the output requirement of measuring instrument or equipment, and to ensure the temperature and humidity of the calibration environment.
- λ Special attention to the use of environmental requirements, not in the explosive gas, steam or dust in the vicinity of the use of C512.
- λ When the instrument is located in the ambient humidity of less than 30%, please use the C512 to take effective measures to prevent static electricity.
- λ Before switching to another type of output signal, the output must be 2 with external device disconnect between.
- λ When using the mA file (Source & Sink) and the resistance profile (Ohm), switching to this type of signal or switching from the class gear to another signal, the power of the circuit must be turned off before switching. Re connect the correct circuit, the C512 will switch to the corresponding file access circuit, and then through the use of power.
- λ Portable high precision signal generator dedicated AC / DC power adapter type is MPC-DK-9.5V-B and may not be used by other vendors, the power adapter, or cause and the use of the instrument damage will result in C512 factory authentication failure.
- λ Each C512 requires the use of a separate 1 AC/DC power adapter, you cannot use the 1 power adapter to power more than C512, and otherwise it will lead to abnormal meter output function or damage.
- λ C512 dedicated AC/DC power adapter, only for the C512 power supply, please do not take other loads, not with any heating

objects placed together.

- λ If you are using the AC/DC power adapter to C512 power supply, C512 long time does not use, please unplug the power plug and disconnect the power supply completely off, avoid long-term electricity damage caused by the internal circuit of C512.
- λ In the mobile device, please press the power button off, disconnect the output probe with the target device. If you are using the AC/DC power adapter for C512, please unplug the power plug off the power. Finally, pull out the output one line.
- λ Do not let any charged object near the output terminal; otherwise it will cause damage to the internal circuit.
- λ Don't let any volatile chemical exposure meter. Don't let the instrument long-term contact with rubber or plastic products. Be careful not to let the iron or any other hot objects come into contact with the instrument.
- λ As soon as the battery is insufficient, replace the battery as soon as possible to avoid possible use of the battery. Before replacing the battery, you must stop using C512.
- λ Open the battery to replace the battery before, must first remove the pen from C512.
- λ C512 only use AA (5) 1.5V of the battery, please confirm the correct installation of the battery.
- λ In the cleaning instrument keys and the operation panel, please unplug the power plug off the power. Use a soft, clean cloth to wipe the outer surface of the instrument. Do not make C512 internal water.
- λ Do not disassemble the instrument; otherwise it will result in C512 factory certification failure.
- λ If the instrument begins to smoke, emit a pungent odor, or any other abnormal problems in the process of use, please press the

power button to shut off and remove the battery. If you use C512 dedicated AC / DC power adapter, please unplug the power plug disconnect the power supply, and disconnect the connection output pen with a target device. Then contact the supplier to detect the instrument.

2.Technical Specifications

2.1 Standard Equipment List

As shown in the following list of the equipment are included in the set of your C512 portable high-precision signal generator and related accessories in the product package：（※ Parts need to be purchased separately）

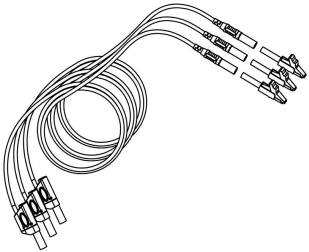
Parts	Model	Number
C512 Host	Portable High Precision Signal Generator	1
Battery	AA（1.5V）	4
User 's Manual		1
Quick Get Start		1
One Line（Length of 1.1 Meters）	Black MPC100BB	2
	Red MPC100BR	1
Pen Clip	Black MPC103BB	2
	Red MPC103BR	1
※Probe	Red MPC110BB	1
	Black MPC110BR	1
※ AC/DC The Power Adapter	MPC-DK-9.5V-B	1
※ Cold End Sensor	MPC101B	1

Table 2.1 List of Accessories

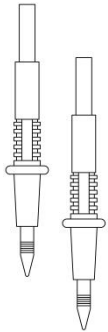
Note： Portable high precision signal generator without communication function, if you need to communicate, please use standard type high-precision signal generator.

The Following Parts of the Sketch Map

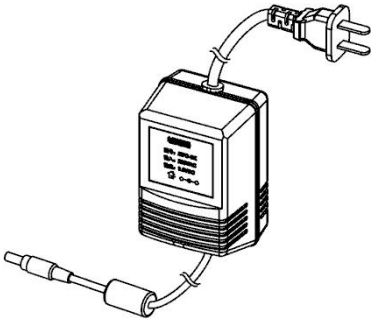
Host



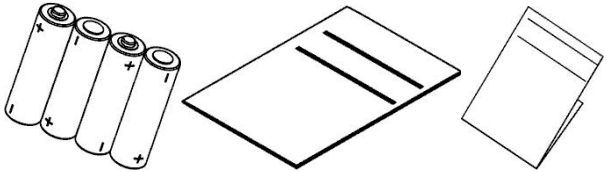
Pen Line + Pen Clip（3）



Probe（2）※



AC/DC The Power Adapter ※ Cold End Sensor ※



Battery（4） User 's Manual Quick Get Start

2.2 Technical Index

λ Power Supply： 4 AA（No.5，1.5V）battery
And power supply through the power adapter,
Power adapter input voltage range ：
110~220V AC

λ Work Environment： Temperature 0℃~50℃，Humidity≤80%R•H，
None Condensing

λ Storage Environment ： Temperature -25℃~60℃ ，

Humidity≤90%R•H,
None Condensing

λ Working Altitude： ≤2000 meters

λ Vibrations or Shock： Random Nature 2g,
5~500Hz（1 meters below the test）

λ Calibration Period： In order to ensure the accuracy, the recommended calibration period is 1 years.

λ Preheating Time： Recommended boot warm-up time is 15 minutes.

λ Instrument Power Consumption： The power consumption is related to the output signal type and load size.

Using 4 standard 1.5V AA alkaline battery power supplies：

4 V DC/1k load, 4 1.5V AA alkaline battery use time is about 4 hours

5V DC/10k load, 4 1.5V AA alkaline battery use time is about 21 hours

λ Output Accuracy：See the table below (should be at least 20 minutes warm-up after use (should) temperature on C512 calibration using high precision equipment, control in 23 + 5 DEG C, relative humidity of 35%~70% R - H, and preheating for more than 20 minutes)

Function	Range	Setting Range	Resolution power	Accuracy (25±10℃ per year) ±(% of reading + deviation)	Remarks
DC voltage DCV	100mV	-10.00~11 0.00mV	10uV	±(0.01%+10uV)	
	1V	0~1.2000 V	0.1mV	±(0.01%+0.1mV)	Maximum output current 0.25mA
	10V	0~12.000 V	1mV	±(0.01%+2mV)	Maximum output current 2.5mA
	Output resistance of each output voltage ≤0.5Ω, 1V, 10V file capacitive load drive capability is not				

	less than 470 mu F, 100mV file capacitive load drive capability is not less than 1 mu F.				
mA Source	20mA	Output 0 ~ 24.000mA	1μA	±(0.02%+2μA)	Load Capacity 19V
mA Sink	-20mA	Analog Transmitters 0 ~ -24.000mA	1μA	±(0.02%+2μA)	External Power Supply 5～28V
Resistance	400Ω	0~400.00Ω	0.01Ω	±(0.015%+0.1Ω)	0.1~0.5mA Excitation Current Precision does not contain lead resistance (Added maximum error of 0.25Ω with 0.1mA excitation）
				±(0.015%+0.05Ω)	0.5~3mA Excitation Current Precision without lead resistance
	4kΩ	0~4000.0Ω	0.1Ω	±(0.015%+0.3Ω)	0.05~0.3mA Excitation Current Precision without lead resistance (Added maximum error of 0.5Ω with 0.05mA excitation）
Thermal Resistance RTD	Pt100	-200℃~850℃	0.1℃	-200~0℃：0.3℃	Pt100-385 Temperature Scale Pt100、Cu50 is ±1mA Excitation
				0~400℃：0.4℃	
				400~850℃：0.5℃	
	Pt1000	-200℃~850℃	0.1℃	-200~100℃：0.2℃	
				100~300℃：0.3℃	

				300~850℃：0.4℃	Current, Pt1000 is ±0.1mA Excitation Current (Pt100 0.1mA incentives to add a maximum of 0.6℃ error); Pt1000 0.05mA incentives to add a maximum of 0.2℃ error 0.05mA incentives to add a maximum of 0.2℃ error） Precision does not contain lead resistance
	Cu50	-50℃~150℃	0.1℃	-50~150℃：0.5℃	
Thermocouple TC	R	-40℃~1760℃	1℃	-40~100℃：1.5℃	Using ITS-90 scale Cold end compensation error is not included in the accuracy
				100~1760℃：1.1℃	
	S	-20℃~1760℃	1℃	-20~100℃：1.5℃	
				100~1760℃：1.1℃	
	K	-200℃~1370℃	0.1℃	-200~-100℃：0.6℃	
				-100~400℃：0.5℃	
				400~1200℃：0.6℃	
				1200~1370℃：0.7℃	
	E	-200℃~1000℃	0.1℃	-200~-100℃：0.5℃	
				-100~600℃：0.5℃	
				600~1000℃：0.4℃	
	J	-200℃~1200℃	0.1℃	-200~-100℃：0.5℃	
				-100~800℃：0.4℃	
				800~1200℃：0.6℃	
	T	-200℃~400℃	0.1℃	-200~400℃：0.4℃	
	N	-200℃~1	0.1℃	-200~-100℃：0.6℃	

		300℃		-100~900℃：0.5℃	
				900~1300℃：0.6℃	
	B	400℃~1800℃	1℃	400~600℃：1.5℃	
				600~800℃：1.1℃	
				800~1800℃：0.7℃	
Continuous Pulse	100Hz	2.00Hz ~99.99Hz	0.01Hz	±0.01Hz	1~10Vp-p square wave，Low level is 0V，Level accuracy ±10% 50% duty cycle, Load >100kΩ
	1kHz	100.0Hz~ 999.9Hz	0.5Hz	±0.5Hz	
	10kHz	1000Hz~10000Hz	100Hz	±10Hz	
Pulse Counting Mode	100Hz 1kHz 10kHz	10~99,999cycles	1cyc	±2 Character	1~10Vp-p square wave，Low level is 0V，Level accuracy ±10% 50% duty cycle, Load >100kΩ
Switch Quantity	100Hz 1kHz 10kHz	Switch output can be divided into the switch quantity continuous output, the switch quantity output count, respectively with continuous pulse output, pulse counting mode output.			Maximum Switching Current Voltage：+28V/50mA
External Power Supply	24V			±10%	Maximum Output Current 25mA，Short circuit protection

Table 2.2 Output accuracy index of various signals

Note 1： Ambient temperature in the case of 23±5℃, the temperature drift coefficient of the above precision x (1/10)℃.

Note 2： Output resistance function due to the adoption of the principle of electronic synthesized resistor, therefore, in to non-constant current (line 4), non SHUANGHENG flow (three wire system) for measuring instrument with resistance signals may cause fluctuations in volatility is

greater than that of using physical resistance measuring the display of measuring instrument. This phenomenon is similar to similar foreign products.

Note 3： Output resistance function to a non-constant current (wire) for measuring instrument with resistance signals, it has been proved that the precision and related wiring method and the matters needing attention please refer to [3.4 wiring of the depiction] and [5.3.8 output resistance].

Note 4： The relationship between the output accuracy and the excitation current in the output of the resistance and the heat resistance is shown in [3.5 Explanation of precision on accuracy].

3.Shape and Connection

3.1 Outline Dimension

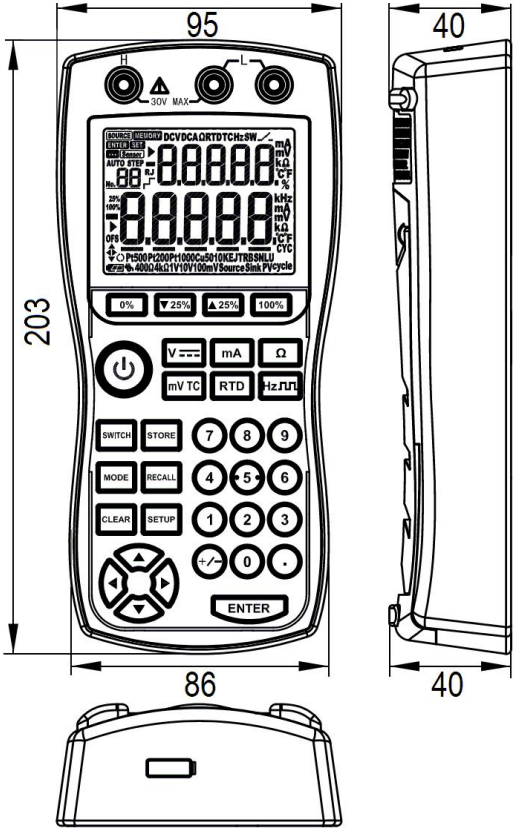


Figure 3.1 Outline Dimension Chart（Unit：mm）

3.2 Liquid-Crystal Display

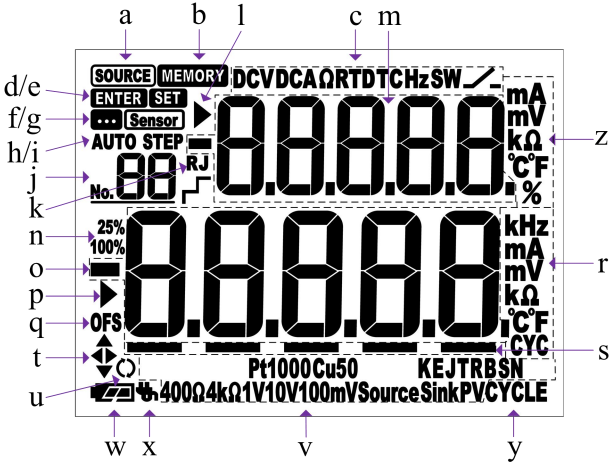


Figure 3.2 Schematic Diagram of the Display Screen Display Element：

a) Output flag
b) Storage / read common output symbol
c) Signal type for the current output (class)
d) Set value output status flag
e) Set status, stored location flag
f) The set value is in the input indicator
g) Cold end sensor insert status flag
h) Cold end compensation start flag
i) Step output indicator span
j) Storage location storage / read common output value
k) Cold end compensation real time refresh flag
l) Modify row indicator parameters

m) On the modified value parameter indicating / menu
n) Step span to adjust the output status indicator
o) Current output setting
p) Modify the parameters indicating.
q) The output set value reaches the upper and lower limits of the indicator
r) Current output setting unit
s) Direction key to directly adjust the output setting value of the modified position indicator
t) Key direction indicator
u) Pulse and switch output key
v) Current output signal type (subclass)
w) Battery status indicator
x) Power supply mode indicator
y) Pulse and switch output counting mode flag

Note： the above description is only as a general introduction to the use of the state, in the use of the display state of the specific instructions, please refer to the following instructions for the operation of the instrument

3.3 Key note

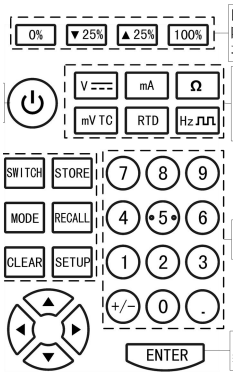


Figure 3.3 Schematic diagram of the key area

Regio	Key Identification	Key Name	Caption
1		Power Key	On / Off
2	**V**	Output V Key	Select DC voltage output function, as well as switching range
	mA	Output mA Key	Select the current output function, as well as the switching range
	Ω	Output Resistor	Select the resistance output function, as well as the switching range
	mV TC	Output mV/TC Key	Select DC mV output and thermocouple output function
	RTD	Output RTD Key	Select the heat resistance output
	Hz	Output Hz Key	Select pulse, switch output
3	**0 ~ 9**	Numeric Keys	Modify output settings
	•	Decimal Tab	The decimal point of the input and output settings
	+/-	Positive and negative number	Change the positive and negative output settings
4	**ENTER**	Output Acknowledgement Key	Signal output
5	**SWITCH**	Parameter Switch Key	In some additional functions to achieve the change of the value of the switch (such as： pulse and switch output, parameter setting, etc.)
	STORE	Save Key	Store commonly used output value; storage parameter value
	RECALL	Read Key	Read common output values
	MODE	State Switch Key	Exit setup status is not saved when parameter settings are set. Pause output in pulse and switch
	CLEAR	Clear Key	Reset modification
	SETUP	Set Key	Enter parameter setting state
6	**▲ ▼**	Up and Down Key	When the analog signal output directly to adjust the output value. Adjust the storage / reading position when the common value is stored / read. Adjust the size of the parameter in the

	◄ ►	Left and Right Key	Mobile modification bit in analog signal output. When the parameter is set, the movement parameter is modified.
7	**0%**	0% Output key	The minimum output value of the analog signal output.
	▼25%	25% Reduce key	Based on the current signal output value, the output of the range is reduced by 25%.
	▲25%	25% add key	Based on the current signal output value, the output is increased by 25% of the range.
	100%	100% Output key	The maximum output value of the analog signal output.

Table 3.1 Key Function

3.4 Connection Description

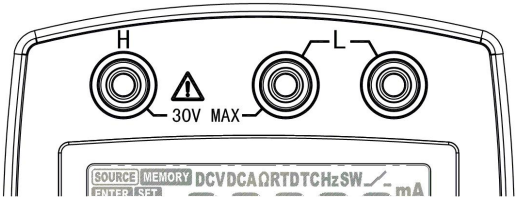


Figure 3.4 Schematic diagram of output terminal

H： Output Signal：Positive Output（+）

L： Output Signal：Common terminal（2 ports）

Please refer to [figure 3.5] shows, the red pen line is inserted into the H jack; black pen line is inserted into the L jack.

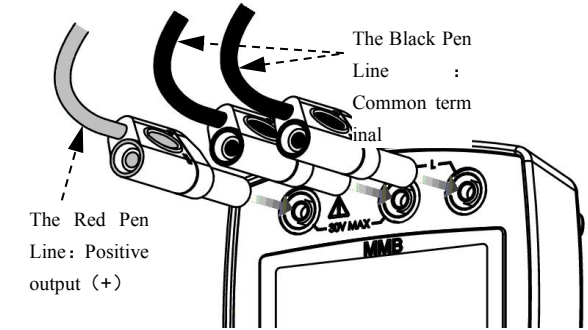


Figure 3.5 Schematic diagram of test interface

Output signal corresponding to the (+) (-) of the wiring method：

H：（+）

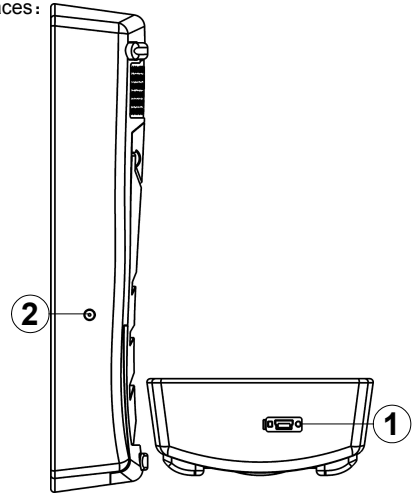
L：（-）

Note that the polarity of the output terminal to the target device is correct.

Output Signal Type	Terminal for use	
	(+)	(-)
DC Voltage	H	Either of the 2 L ports
Direct Current	H	Either of the 2 L ports
Direct Current mV & Thermocouple	H	Either of the 2 L ports
Resistance & Thermal resistance 2 wire system	H	Either of the 2 L ports
Resistance & Thermal resistance 3 wire system	H	2 L ports both connected
Resistance & Thermal resistance 4 wire system	H port two lines superimposed on the inserted	2 L ports both connected
Pulse Signal	H	Either of the 2 L ports
Switching Signal	H	Either of the 2 L ports

Table 3.2 Connection modes of output terminals under different signal types

Other Interfaces：



①. The USB Mini interface for the top of the portable high precision signal generator is the cold end sensor.※ Interface, with the model of the cold end of the MPC101B sensor, used to simulate the cold end of the thermocouple output compensation.

②. Portable high precision signal generator instrument small round hole on the right side of the AC/DC power adapter※ The AC/DC power adapter of the MPC-DK-9.5V-B power adapter provides continuous power supply to the meter.

（※ Accessories need to be purchased separately, using the instructions on the other）

❗ In order to ensure safety, the connection must be carried out after the power failure.

⚠ Portable high precision signal generator instrument at the top of the cold end interface MINIUSB, can only access model for MPC101B cold end sensor, in addition not connected any other device, otherwise it will cause damage to the instrument.

⚠ In addition to the Sink mA file (analog transmitter output), do not apply any voltage to the output terminal, otherwise it will cause damage to the instrument.

On the safety of the connection, please read the “safety instructions” in front of.

3.5 Instructions on Accuracy

Output connection method of four wire resistance：

C512 support to the non-constant current method (4 wire system) to measure the instrument and meter to provide resistance signal. At wiring method, in addition to according to the wiring method [Figure 3.4] to connect three pens, also need to show in figure "H： positive output end (+)" again in a red pen line (model MPC100BR can buy a separate), in order to achieve the four wire resistance output.

λ Factors affecting the accuracy of resistance output：

Resistance signal output is more sensitive, the main factors affecting the output accuracy is the lead resistance, contact resistance, etc.. Pen, pen holder, and the use of line equipment in the loop resistance will have an impact on the output precision.

Therefore, please be sure to use the model for MPC100BB (black), and MPC100BR (red) pen line, model MPC103BB (black), and MPC103BR (red) is the pen clip.

Because the line pen and pen holder will often plug and repeatedly

used holding, the frequent use will have an impact on the contact resistance, it is suggested that regular calibration of C512.

When using C512, you should also pay attention to the range of the excitation current and the impact on the accuracy of the resistance profile (see the next item on this page).

λ The relationship between the output accuracy and the excitation current in the output of the resistance and the heat resistance：

C512 resistance output in the factory calibration, the use of 400 1mA drive current, 4K files using 0.1mA drive current. If the C512 is used to carry out the resistance output or the heat resistance output, it is possible to cause an inherent deviation if the excitation current of the measuring instrument is different from the above mentioned current value. This deviation is almost constant in the whole output range. If you need to use a higher precision, you can set the correction term, in the resistance output and the thermal resistance of the output to remove this inherent deviation (set method see [5.4.2] section of the parameter setting method). Note： when the excitation current changes, the correction term may need to be adjusted. In the use of C512, also need to pay attention to the resistance profile of the excitation current range and the impact on the accuracy of.

This section on the resistance of the output accuracy of the description, see [5.3.8] section on the output of the detailed description of the resistance.

Please pay attention to the following problems as the calibration and inspection tools used in the production line：

λ Power Supply：

Each portable high-precision signal generator need to use separate

a dedicated AC / DC power adapter MPC-DK-9.5V-B, cannot use 1 AC / DC power adapter to power multiple C512, otherwise will lead to instrument output function abnormal or damaged.

λ Calibration：

Due to the factors mentioned above, it is recommended to do the local calibration on the job. In particular, when the resistance signal output is involved, the signal of the final output of the resistance signal should be based on the work and the local calibration.

λ Dynamic Response Time：

Signal switching and change the output value of the dynamic process, the signal jitters.

Therefore, if the target device needs to be continuously measured, it is required to do a certain delay after switching the C512 signal and changing the output value.

λ Communication Networking：

Portable high precision signal generator, no communication function and communication operations (such as： under the RS485 communication network of the unified control of the production line of the calibration and verification of industry and trade) of C512 if needed, please choose model for standard high precision signal generator C512.

Standard type high precision signal generator with infrared communication function, to a computer by using an infrared isolation converter to achieve two-way communication, support the use of RS485 network can be, easily instrument calibration, settings and output functions.

(Need to buy a separate infrared -RS485 communications converter (model： MPC485IR104A)

Please refer to product selection, standard type high precision signal generator user manual, and infrared -RS485 communication converter user manual and other products.

4.Prior to Use

4.1 Note Before Use

Safety Notice

Before using the instrument, please read carefully the safety notes in [section 1].

Environmental requirements

- λ The use of the location of the environment to meet the technical specifications on the working environment of the description：
- λ （ Temperature 0℃~50℃ , Humidity≤80%R•H , Non-Condensing）
- λ When the use of the location of the humidity is less than 30%, please take effective measures to prevent static electricity.
- λ Do not use the instrument in the following environment：
  Exposed directly to the sun or near the heat source.
  There are frequent mechanical vibrations around.
  Close to any source of interference, such as high voltage equipment or power source.
  There is a strong electric field or electromagnetic field around.
  Exposed to a large amount of smoke, heat vapor, dust or corrosive gas environment.
  Exposure to flammable gases in the presence of an explosion hazard.
- λ Avoid sudden changes in the environment temperature or humidity of the instrument. If you need to move the instrument to the environment humidity difference is very big, or the temperature difference is very big place, before starting, please put the instrument in the new environment to warm up more than half an hour, in order to ensure the normal operation of the instrument.
- λ The effect of ambient temperature and humidity on the output

accuracy of the meter, please refer to the description of the accuracy in the previous chapter [2.2].

4.2 Battery Usage Notes

⚠ Open the battery to replace the battery before must first be removed from the C512 test.

❗ Mind：

λ Before using C512, please make sure the battery cover is closed.

λ As soon as the battery is insufficient, replace the battery as soon as possible to avoid possible use of the battery. Before replacing the battery, the instrument must be stopped.

λ C512 AA (5) 1.5V alkaline battery, NiH battery, lithium batteries, high capacity battery, please make sure the battery positive and negative polarity is installed correctly.

λ Do not short-circuit the battery.

λ Do not disassemble or heat the battery.

λ Do not put the battery into the fire.

λ When replacing the battery, please replace all 4 batteries at the same time, and choose the same brand of the same type of battery.

λ If you do not use C512 for a long time, please take out the battery.

4.3 Install and Replace Batteries

λ Step 1： press the power button to shut down; unplug the AC / DC power adapter plug broken off the power. At the same time break off connection output pen with a target device. The pen is removed from the C512. And then start installing the battery.

λ Step 2： support C512 on the back of the instrument support, will be hidden under the support of the battery compartment lid open, as shown in figure 4.1.

λ Step 3： the installation of the 4 section 1.5V (5) AA battery, the positive and negative polarity of the battery at the bottom of the battery has instructions.

λ Step 4： install the battery, replace the battery cover locking.

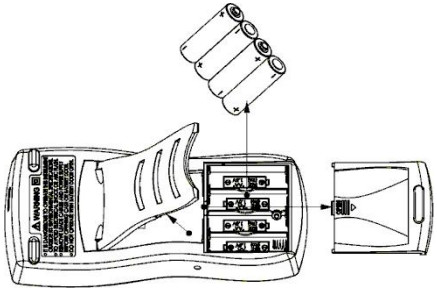


Figure 4.1 Schematic diagram of battery installation

4.4 Battery and power supply status indicator

The battery symbol and the power plug symbol of the lower left corner of the display window is used as an indication of the current battery power and the power supply state.：

λ The lower left corner of the instrument is shown on the right side of the power plug： Indicates that the C512 is powered by the AC/DC power adapter.

λ The lower left corner of the meter displays the battery symbol as shown on the left side of the image above：

λ Indicates that C512 is currently powered by batteries. Battery symbols show different effects according to the battery power：

（Always Light）：Battery power is normal

（Always Light）：Battery power is lower than 60%

（Always Light）：Battery power is less than 30%, but still can be

normal operation.

 （Twinkle）： Battery power has been very low, please replace the battery

λ Specific battery power may be slightly different from the display, please use the actual.

λ Once plugged in the AC/DC power adapter, and the power adapter is connected to the AC 220V power supply, C512 will automatically switch to power supply adapter.

λ AC/DC power adapter only play a continuous supply of the role, cannot charge the battery.

λ The lower left corner of the battery and power status indicator will be displayed in any case, no longer does that at this point alone behind.

Serious shortage of electricity of the battery will cause the meter to use exception, instrument if the battery power is low, boot may be the instrument reset and output value fall or jump change the abnormal issues. Therefore, in order to ensure the normal use of the instrument, please keep an eye on battery power and replace the battery in time.

Instrument normal operation button will activate backlight, backlight in no button out of the delay time is according to the parameter "LCD", set to not light, according to the 1~998 seconds delay extinguish or long bright; the factory default settings for 10 seconds; see [5.4.2 parameters] in the introduction.

5.Instrument Operation and Operation

⚠ Do not apply a voltage above 30V between the input terminal or any terminal and ground wire (the ground).

⚠ Applying a voltage between the 30V and the input terminals will result in the failure of the factory certification of C512 and may cause permanent damage to the device and cannot be used.

⚠ In addition to the Sink mA file (analog 4~20mA transmitter output), do not apply any voltage to the output terminal, otherwise it will cause damage to the instrument.

5.1 ON/OFF

Hold down the power button ⏻ until the display light; loosen the power button, C512 boot.

Hold down the power button ⏻ until the display is off, loosen the power button, C512 off。

5.2 Operation Composition

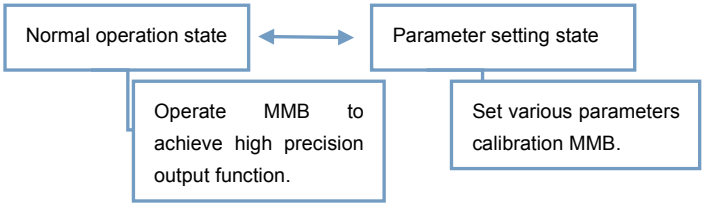


Table 5.1 Instrument Operation Division

5.3 General operation instructions

The routine use of the instrument, to achieve high precision of the signal source, mainly displays the current state of the output signal, the set

value, at any time with the keys to achieve signal type switching and modify the output value. And the realization of ladder span output, storage / read common output advanced features.

The following is the conventional use of the order, step by step to explain the C512 button operation method.

5.3.1 Boot

Hold down the power button ⏻ until the display light, loosen the power button, C512 boot is completed.

⚠ After starting, the output value is neutral. (For open circuit condition, no signal output. Back end circuit)

1. C512 after the boot, the default display the last time before the output signal of the signal type, unit and signal value.
2. If you want to use the boot does not display any set information, you can set the "Load" parameter is 0, after the boot display only shows a row of "- - - - -"。

5.3.2 Switching Output Signal Type

According to the output need, according to Switching output signal type function key in the corresponding signal type button to achieve the output signal switching. When the signal type key is pressed, the current output is switched to the corresponding signal type, and the default output value of the first signal sub type of the signal type is output.

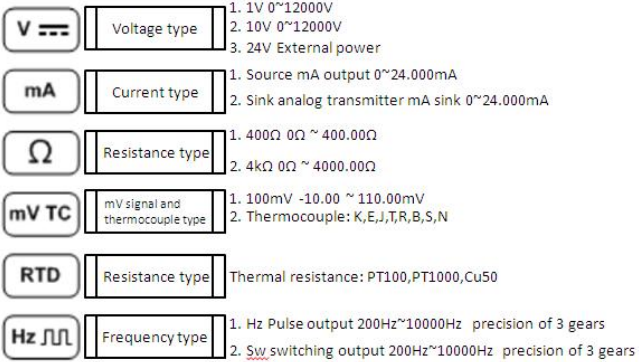


Table 5.2 Switch signal type button function

Signal Type	Initial Output Value	Signal Type	Initial Output Value
400 Ω gear	100 Ω	4K Ω gear	1K Ω
Thermal resistance gear：PT100，Cu50	100 Ω corresponding temperature value	External power supply： PT1000	1K Ω External power supply
mA Source gear （DC current output）	0mA	mA Sink gear （simulation transducer）	0mA
mV gear	0mV External power supply	Thermocouple gear	0mV External power supply
1V gear	0V	10V gear	0V
24V External power supply	0V		

Table 5.3 Default output values for each signal type

（After switching the signal, the output of the above default value is to switch the signal type, in order to ensure the safety of the external equipment and the safety of the equipment.）

5.3.3 Modify and output the set value (analog signal)

1. Normal operation status display：

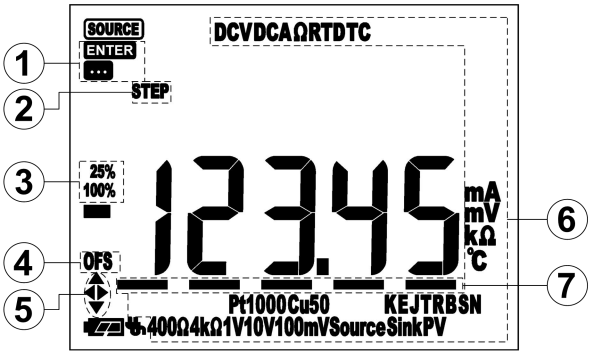


Figure 5.1 Normal operation state display screen

The main display： the size of the signal being set and modified.

① Indicating the output signal：

••• Indicate that the current setting value is modified.

ENTER When the output confirmation key ENTER is pressed, the signal output of the corresponding set value is realized, and the symbol is displayed.

② The ladder span output state indicator：

In stage of ENTER, put the button The ladder span function key 0% ▼25% ▲25% 100% realize the output value or ladder span，“**STEP**” twinkle。

③ The ladder span key indicating: With the instructions ②, indicating the current button.

④ Reach the lower limit display "0"; reach the upper limit display "FS".

⑤ Key instructions: with part of the function, the key to the operation of the button.

⑥ Indicates the current set of output signal types and units.

⑦ In the stage of ENTER , "_" symbol in row five below the figure to indicate the keys directly to adjust the output of the modified bit: Press the arrow keys (or) is the current output value based on modified directly.

2. Standard button operation：

After switching to the desired signal type in accordance with the [5.3.2] section, modify and output the set value by pressing the following buttons:

Modify the current modified values (if the modified values exceed the current signal type to allow the value of the upper and lower limits of the value, then show the modified value directly to the corresponding upper and lower limit).

CLEAR Reset current modified values。

ENTER Confirm current input values and output。

When modifying the set value, the display state：

After the instrument button confirms the output ENTER , the display status is：ENTER

Instrument button to confirm the output ENTER , after the decimal point in the range of accuracy of the number of deficiencies will be automatically up to 0: (role: indicating the accuracy is convenient and intuitive)

Example_1 : Type: 1.03 in the 0~1V file, and then press ENTER button to confirm the output; as the 0~1V file input accuracy is 0.0001; so the display will be changed from 1.03 to 1.0300.

5.3.4 Step span and the direction key to adjust the output (analog signal)

The instrument in the signal output state ENTER has set value by the output signal, but also through the ladder span function key And the ladder span function by direct adjustment within the key button and press the arrow keys ▲▼□□ to achieve signal value. Display the value in row with values of output or refresh.

This adjustment is simple and fast operation, just press a button to be able to output the new signal value, suitable for the quick adjustment of the signal size or quantity increase or decrease.

1. Step output span：

The ladder span function key include：

0% According to the minimum value of the current signal output (about the minimum value of each signal can be referred to in [table 2.2] in the "set range" column.

▼25% On the basis of the value of the signal, according to the

full-scale 25% span reduced output value (if the decline after 25% less than the minimum value, the minimum value is directly based on the output).

▲25% Based on the current signal value, the output value of the 25% span of the total range is increased by 25% (if the maximum value is higher than the maximum value, then the maximum

100% value is output).

According to the current signal output of the maximum output (about the maximum value of each signal can be referred to in [table 2.2] in the "set range" column.

2. Direction key to adjust the output value:

By moving the key modification ◄ ► , indicating the current changes "_" symbol is in the main display numbers below (such as [Figure 3.2] in "s" below).

Increase or decrease the value of the modified bit by the key. ▲ ▼

Example 2: Assuming the current Source mA file has been exported 10.000mA, at this time, through the button will be modified to move to the 10 position;

Every time by the ◄ ► key, the current output value increases 0.100mA, such as: 10.100mA, 10.200mA, 10.300mA.....

Every time the button ▲ , the current output value is reduced by 0.1mA.

Every time the button ▼ , the current output value decreases 0.1mA.

Every time the button ▼25% , the current output value in the existing value based on the reduction of 4mA (current value is less than 4mA, press this button, the current output value becomes 0.000mA).

Every time the button ▲25% , the current output value in the existing

value based on the increase of 4mA (current value is greater than 20mA by this key, the current output value becomes 24.000mA.

Button **0%** , the current output value is changed to 0.000mA.

Button **100%** , the current output value is changed to 24.000mA.

The following section [5.3.5~5.3.10] detailed description of the gear level analog signal output operation

5.3.5 Output DC Voltage

Wiring description reference [3.4 wiring description] in the introduction:

Positive Output（+）：Connected to H port

Common End（—）：Either of L ports.

Step 1：Use the V ⎓ key to switch to the DC voltage DCV output function, and by continuing to press this button in the 1V file, 10V file, and 24V for the power file transfer between the stalls; and use the mV TC key to switch to the DC mV output function. Display the contents of the corresponding prompt character. The default output value of the switch signal is 0V. (Note: the key mV TC can also switch to the thermocouple output, see [5.3.10] section).

Step 2：Use the 0~9 +/- • CLEAR key to match the input need to output the voltage value. If the value exceed / lower limit, display will automatically transform into / lower limit value. When the set value is modified, the display state is ••• . (Skip this step when you use the 24V for the function of the power file.)

Step 3：Press the ENTER key to confirm the output, the display state becomes ENTER according to the current set value output voltage signal.

Step 4：Repeat [step 2~3] can output new voltage value. In the process of typing a new voltage set value, the output signal will maintain the size of the last set value.

Step 5：Instrument under state ENTER signal output, through the 0% ▼25 ▲25 100

button ▲▼◀▶ realize signal value ladder span increase or decrease output; through by direction key to achieve the signal value of direct adjustment. Display real time refresh.

Signal Type	0	▼▲25% Step Span Value	100%
10V gear	0V	±3V	12V
1V gear	0V	±0.3V	1.2V
mV gear	-10mV	±30mV	110mV
24V External power supply	External power supply function, no need to adjust the amplitude.		

Table 5.4 DC voltage signal of each gear limit & step span function

5.3.6 Output direct current

Wiring instruction referred to the introduction of [3.4 Wiring instruction] :

Positive output（+）: connected to H port

Common port（**1** ）: connected to any one of L ports

Step1: The key of **mA** was used to switch to the DCA output function of direct current, and it was still pressed to switch between the current output (mA Source) and analog transmitter (mA Sink). The content was displayed with relevant prompting character. Here the current output had to be used, and it should be switched to display status of "**Source**" .

Step2: The key of **0~9** **+/-** **.** **CLEAR** was used to coordinate the input current value that needed to be output. If the set value exceeded the upper / lower limit, the display would automatically convert to the value of upper / lower limit. When the set value was modified, the status was displayed as **...**.

Step3: The key of **ENTER** was pressed to confirm the output, then

the display status changed to ENTER and C512 output current signal according to the present setting value.

Step4: New current value could be output by repeating [step 2 and step 3]. In the process of setting the new current value, the output signal would remain the setting value of the last current.

Setp5: At the signal output state of ENTER , the instrument could achieve the increase or decrease output of the signal value by pressing the key of 0% ▼25% ▲25% 100% ; the signal could also be directly modified by pressing arrow keys of ▲ ▼ ◄ ► . The display value was refreshed in real-time.

Signal type	0	▼▲25%Step span value	100%
mA Source & mA Sink	0mA	±4mA	24mA

Table5.5 Upper and lower limit of DC signal & instruction of step span function

5.3.7 Analog transmitter output（mA Sink）

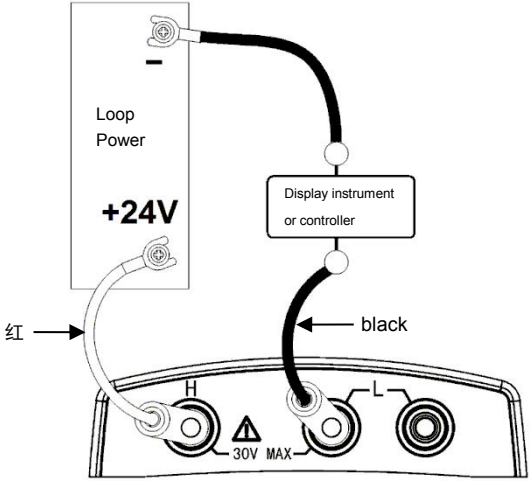


Figure 5.2 Wiring pattern of analog transmitter mode

⚠ Allowable voltage range of loop power: 5~28V DC

Step1: The key of **mA** was used to switch to the function of analog transmitter output（mA Sink）, and it was still pressed to switch between the current output (mA Source) and analog transmitter (mA Sink). The content was displayed with relevant prompting character. Here the analog transmitter had to be used, and it should be switched to display status of "**Sink**" . The default current value after the signal switch was 0mA.

Step 2~6： operating method was the same as that of [5.3.6] section. The setting value of upper and lower limit for mA Sink and the step span value were all consistent with the mA Source.

5.3.8 Output resistance

Notice：

- The Resistance output of C512 was applicable to the target device (measuring instrument, such as a resistance table) in resistance measurement by the method of excitation current "I":
  When C512 was connected with such an equipment, a corresponding voltage "V=R×I" would be produced between the output terminals of C512 according to the excitation current signal "I" appearing from the target device, so as to simulate the production of a corresponding equivalent resistance "R=V / I".
- C512 could accept the excitation current signal "I" coming from the target device in a allowable range of 0.1 ~ 3mA. Different resistance stalls and different resistance ranges had different requirements for the excitation current, which could be seen in [Table 2.2] for the detailed description of the relationship between the accuracy of the resistance and the excitation current.
- All resistance signals output by C512 did not contain lead wire resistance. In order to output accurate resistance signals, the 3-wire or 4-wire connection method was recommended to be used.
- The factory calibration of C512 was calibrated by the 4-wire connection method.
- The capacitance between the terminals of the target device should be reduced as far as possible, otherwise, it might lead to an unstable resistance signal produced by C512.
- Factors affecting the accuracy of resistance output：
- Resistance signal output was relatively sensitive, and main factors that affected the output accuracy were lead wire resistance, contact resistance, etc.. Meter pen wire, Meter pen folder and the whole loop resistance of the equipment would affect the output accuracy.

Therefore, made sure to use the model of MPC100BB (black) MPC100BR (red) meter pen wire with the model of MPC103BB (black) and MPC103BR (red) meter pen folder.

- λ Since the meter pen wire and meter pen fouler were often plugged, pulled and repeatedly grasped, which would affect the contact resistance, so it was suggested to calibrate C512 regularly .
- λ In the factory calibration of C512 resistor output, 400Ω was corresponding to the excitation current of 1mA, 4KΩ was corresponding to the excitation current of 0.1mA. When C512 was used for resistance output or thermal resistance output, if the excitation current of measuring instrument was different from the above current value, it was likely to cause an inherent deviation. This deviation was substantially constant in the whole output range. If it needed higher precision you could set the correction term to remove this inherent deviation in the resistance output (see parameter setting method in [5.4.2] section). Note: when the excitation current changed, the correction term might need to be adjusted. When C512 was used, the attention should be paid to the excitation current range of resistance and its influence on the accuracy.

Wiring instruction referred to the introduction in [3.4 wiring instruction] :

Resistance connection mode	**connecting terminals**	
	Positive output port (+)	**common port (-)**
2-wire system	H	Either of the 2 L
3-wire system	H	Both of the 2 L ports were connected
4-wire system	two meters were inserted in superimposition pattern on H port	Both of the 2 L ports were connected

Table 5.6 Connection instruction of resistance

Step1: The key of [Ω] was used to switch to the resistance output function, and this key was again pressed to switch between 400Ω and 4kΩ; the content would be displayed with appropriate prompting characters. The default output values after switching signal: 400Ω was corresponding to 100Ω, 4kΩ was corresponding to 1kΩ.

Step2：The key of [0~9] [+/-] [.] [CLEAR] was used to coordinate the input current value that needed to be output. If the set value exceeded the upper / lower limit, the display would automatically convert to the value of upper / lower limit. When the set value was modified, the status was displayed as [...].

Step3：The key of [ENTER] was pressed to confirm the output, then the display status changed to [ENTER] and C512 output resistance signal according to the present setting value.

Step4：New resistance value could be output by repeating [step 2 and step 3]. In the process of setting the new resistance value, the output signal would remain the setting value of the last resistance.

Step5: At the signal output state of [ENTER], the instrument could achieve the increase or decrease output of the signal value by pressing the key of [0%] [▼25%] [▲25%] [100%]; the signal could also be directly modified by pressing arrow keys of [▲] [▼] [◄] [►]. The display value was refreshed in real-time.

Signal type	0	▼▲25%Step span value	100%
400Ω	0Ω	±100Ω	400Ω
4kΩ	0Ω	±1kΩ	4kΩ

Table5.7 Upper and lower limit of resistance signal & instruction of step span

function

5.3.9 thermal: analog thermal resistance output

Notice：

- The principle of analog thermal resistance was as same as that of resistance output.
- The accuracy of different output temperature segments was different.
- The information of accuracy, excitation current, lead resistance and temperature scale, etc., could be seen from the description of thermal resistance in [table 2.2].
- All resistance signals output by C512 did not include lead resistance. In order to output the precise resistance signals, 3-wire or 4-wire connection was suggested to be used.
- The output accuracy of the thermal resistance output for C512 was depended on calibration accuracy of the resistance. In the factory calibration, PT100 and Cu50 used the excitation current of 1mA, and PT1000 used the excitation current of 0.1mA. When C512 was used for analog thermal resistance output, if the excitation current of measuring instrument was different from the above current value, it was likely to cause an inherent deviation. This deviation was substantially constant in the whole output range. If it needed higher precision you could set the correction term to remove this inherent deviation in the resistance output (see parameter setting method in [5.4.2] section（parameter R1inA and R2inA）, and notice that the unit of the correction parameter was Ω). Note: when the excitation current changed, the correction term might need to be adjusted. When C512 was used, the attention should be paid to the excitation current range of resistance and its influence on the accuracy.

Step1: The key of **RTD** was used to switch to the thermal resistance

output function, and it was still pressed to switch among PT100, PT1000, Cu50; The content was displayed correspondingly with prompting character. The default output value after switching signal:

PT100： 100Ω（according to 0℃）

PT1000：1kΩ （according to 0℃）

Cu50： 100Ω（Exceeding the upper limit）。

Step2: The key of **0~9** **+/-** **.** **CLEAR** was used to coordinate the input temperature value (unit:℃)that needed to be output. If the set value exceeded the upper / lower limit, the display would automatically convert to the temperature value of upper / lower limit. When the set value was modified, the status was displayed as **...** .

Step3：The key of **ENTER** was pressed to confirm the output, then the display status changed to **ENTER** and C512 output thermal resistance signal according to the present setting value.

Step4： New temperature setting value could be output by repeating [step 2 and step 3]. In the process of setting the new thermal resistance temperature value, the output signal would remain the setting value of the last resistance.

Step5: At the signal output state of **ENTER** , the instrument could achieve the increase or decrease output of the signal value by pressing the key of **0%** **▼25%** **▲25%** **100%** ; the signal could also be directly modified by pressing arrow keys of **▲** **▼** **◄** **►** . The display value was refreshed in real-time.

Signal type	0	▼▲25%Step span value	100%
PT100	-200℃	±250℃	850℃
PT1000	-200℃	±250℃	850℃

Cu50	-50℃	±50℃	150℃

Table 5.8 Upper and lower limit of thermal resistance signal & instruction of step span function

5.3.10 thermal: Analog thermocouple output

⚠ Inserting and pulling for cold junction sensor should be operated after power off, and it should be sure not to be pulled and inserted at boot status.

❗ Notice:（instructions for Cold junction sensor（type：MPC101B））

- λ If the portable precision signal generator did not connect to cold junction sensor when it simulated the output of thermocouple, the output thermocouple signal was managed according to the method that 0℃ was used as a reference node compensation (ie: without cold junction compensation). If it was output by a reference node compensation not at 0 ℃, it should connect with the cold junction sensor.
- λ Temperature measuring range of cold junction sensor: -55~+125℃
- λ Accuracy was ± 0.5 ℃ in the range of -10 ~ + 85 ℃
- λ Accuracy was ± 2 ℃ in the entire range
- λ The output accuracy of analog thermocouple could be seen in [table 2.2] for the description of thermocouple, which did not contain cold junction compensation.
- λ Thermocouple signal was added to the cold junction compensation, the range of the voltage output was still -10mV~110mV.
- λ When C512 was plugged with the cold junction sensor, the sensor status symbol " **Sensor** " would be lit in left and lower corner of the screen, as shown in [figure 3.2] as the "g".
- λ After re-boot and switching signal and gear, the default output state was not corresponding to cold junction compensation. You could

press the key of **MODE** to turn to the output mode of automatic cold junction compensation.

λ The automatic cold junction compensation was divided into two compensation types: fixed compensation mode and compensation mode of real-time refreshing .

①. Fixed compensation mode：

The temperature value of initial cold junction compensation was output by simulating thermocouple signal, in accordance with the cold junction compensation for temperature value by pressing the output button. When output was confirmed, even if the cold junction temperature value changed, the output value was unchanged.

②. Compensation mode with real time refreshing:

The temperature value of initial cold junction compensation was output by simulating thermocouple signal, in accordance with the cold junction compensation for temperature value by pressing the output button. When output was confirmed, if the cold junction temperature value changed, the output value would change with cold junction temperature.

In this mode, it should be noticed:

Real time refreshing Time parameter of cold junction temperature value could be set, and the parameter setting method could be seen in [5.4.2] section (parameter tCoLd).

Cold junction temperature with real time refreshing took effect in the simulation of thermal resistance output,and when the output value changed in the dynamic process, the signal also shook accordingly. Therefore, with the demand for measuring equipment, refresh rate (parameter tCold) should not be set too fast.

Step1: The key of **mV TC** was used to switch to the thermocouple

output function, and it was still pressed to switch among the thermocouple types: K，E，J，T，R，B，S，N； The content was displayed correspondingly with prompting character. The default output value after switching signal was the temperature value corresponding to 0mV.

（ Note: the key of [mV TC] could also be used for switching signal to DC voltage mV output, which could be seen in [5.3.5] section）。

Step2：After the signal and the gear position were switched, the default output state was not the cold junction compensation. Please press the key of [MODE] to switch to the mode of automatic cold junction compensation for the analog thermocouple output. the cold junction compensation status in the upper left corner of the screen was showed by lightening a symbol "AUTO" (such as "h" shown in [figure 3.2]), indicating that the current output contained a cold junction compensation; if not, it indicated that no cold junction compensation was contained.

Step3: The key of [0~9] [+/-] [•] [CLEAR] was used to coordinate the input temperature value (unit:℃)that needed to be output. If the set value exceeded the upper / lower limit, the display would automatically convert to the temprature value of upper / lower limit. When the set value was modified, the status was displayed as [•••] .

Step4：The key of [ENTER] was pressed to confirm the output, then the display status changed to [ENTER] and C512 output thermocouple signal according to the present setting value. (Whether the current output had the cold junction compensation could be judged by whether the screen displayed "AUTO" character).

Step 5: if the compensation mode was set as a real-time refresh

compensation mode (determined by the tCoLd parameter), the screen would display the "RJ" characters, which would flash when the data refreshed.

Step6： New temperature setting value could be output by repeating [step 3 and step 4]. In the process of setting the new thermal resistance temperature value, the output signal would remain the setting value of last time.

Step7: At the signal output state of **ENTER** , the instrument could achieve the increase or decrease output of the signal value by pressing the key of **0%** **▼25%** **▲25%** **100%** ; the signal could be directly modified by pressing arrow keys of **▲** **▼** **◄** **►** . The display value was refreshed in real-time.

Step 8: in the thermocouple output state, the key of **SWITCH** could be pressed to display the temperature measurement value of present cold junction sensor. At this time, the secondary display area of upper row displayed the word of "cold", and the character " **Sensor** " in the upper left corner flashed.

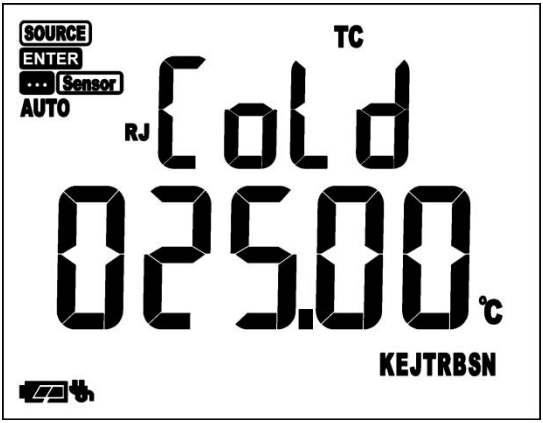


Figure 5.3 display status of cold junction temperature

Signal type	0	▼▲25% Step span value	100%
K	-200.0℃	±400.0℃	1370.0℃
E	-200.0℃	±300.0℃	1000.0℃
J	-200.0℃	±350.0℃	1200.0℃
T	-200.0℃	±150.0℃	400.0℃
R	-40℃	±450℃	1760℃
B	400℃	±350℃	1800℃
S	-20℃	±450℃	1760℃
N	-200.0℃	±375.0℃	1300.0℃

Table 5.9 Upper and lower limit value of thermocouple signal for every gear & instruction of step span function

example 3: Output temperature of simulated K thermocouple was 1000 ℃, requiring a cold junction compensation, and the cold junction compensation refreshed in real-time with refreshing interval of 60 seconds. (cold junction temperature was 25 ℃)

Step1： The tCoLd parameter was first set as 60 (the tCoLd parameter was set to the value of non 9999. When it return to the normal output state, the display was prompted with a word of RJ, such as the "k"shown in figure [3.2]).

Step2：the key of **mV TC** was used to switch to the thermocouple gear of type K.

Step3：Under the premise that the cold junction sensor was confirmed to be well inserted, the key of **MODE** was pressed to switch to the output mode of automatic cold junction compensation. (character of **AUTO** was shown for prompt, such as “h” shown in figure [3.2]).

Step 4: The key of **0~9** **•** **CLEAR** was used to coordinate with the output temperature value modified to 1000℃.

Step 5: The key of ENTER was pressed to confirm the output. The internal processing method for the corresponding mV value of analog thermocouple output was as follows:

Actual output mV = corresponding mV at the set temperature - corresponding mV at the cold junction temperature

Actual output mV = corresponding mV at 1000℃- corresponding mV at 25℃

Actual output mV = 41.276 mV – 1.000 mV

Actual output mV = 40.276 mV

Step 6: After the output, for every 60 seconds, the output value was recalculated according to the current cold junction temperature and refreshed the output. When the output was refreshed, the RJ character flashed for prompt.

The following sections [5.3.11~5.3.13] described the output operation for the signal with frequency type

---

5.3.11 Output of frequency signal

The display and operation mode of frequency signals were relatively more special. Please refer to the following contents for the correct operation of C512, so as to output the correct pulse or switch signal.

Frequency signals were divided into the following types:

Signal type	prompt	Subtype
Pulse	Hz	Continuous pulse
		Pulse counting mode
switching value	SW	continuous output for switching value

		Counter output for switching value

Table 5.10 Sub types of frequency signals

Step1: The key of Hz was used to switch to the output function of frequency signal, and by continuing to press this key to switch between the pulse output and the switch output.

The resolution ability of the output frequency for the pulse and the switching signal was matched adaptive, and the specific output range, resolution and precision were in [table 2.2]:

The set value of the current key input exceeded the upper and lower limits of the allowable range, then the modified value displayed changing directly to the corresponding upper and lower limit value;

If the setting value of the current key input value exceeded the allowable resolution limit (i.e., the allowable number after the decimal point), the key input was locked, and the value exceeding the maximum resolution was not allowed to input.

Step 2: in the operation state of frequency signals, the key of SWITCH could be pressed to switch between the modified contents:

Signal type	Subtype	Parameters for switch settings		
		Frequency value -F-	pulse amplitude -Pv-	pulse number CYCLE *
Pulse	Continuous pulse	√	√	cont *
	Pulse counting mode	√	√	√
switching value	switching value continuous output	√		cont *
	switching value counter	√		√

Table 5.11 Sub-types of frequency signals

*：default setting of pulse number was continuous mode: showing "cont", if you hoped to output pulse or switching value according to counting mode, please set this parameter to the value of the requiring pulse number / switch times.

Frequency value： “**-F-**”： 2.00 Hz ~99.99 Hz
100.0 Hz ~999.9 Hz
1.0kHz ~10.0 kHz
Accuracy of the three gears adaptive matched with the key input

Pulse amplitude “**-Pv-**”： 1.00V ~ 10.00V

Pulse number / switch time “CYCLE”： Continuous mode cont (default) or 10~99999 cycle

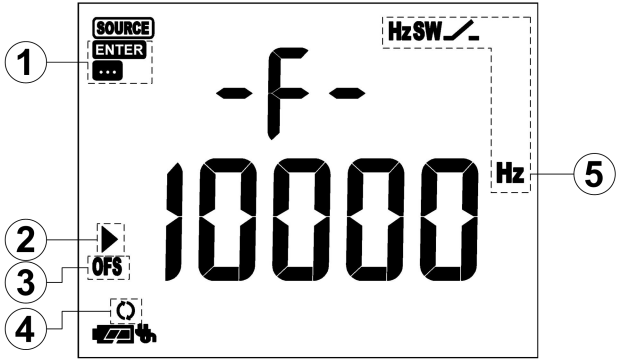


Figure 5.4 The display screen 1 during the frequency signal operation: frequency value modification

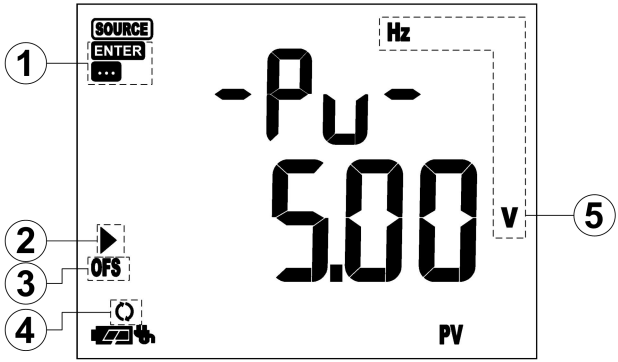


图 5.5 Display screen 1 during the operation of frequency signal: frequency value modification

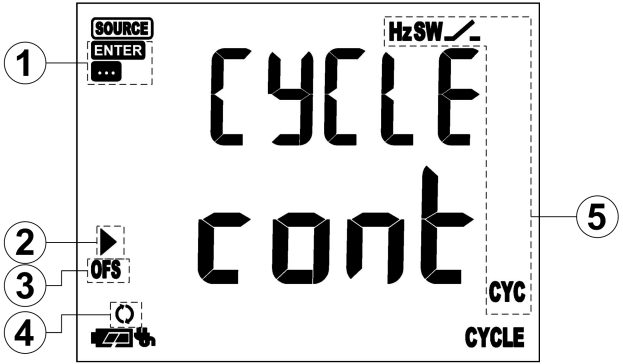


Figure 5.6 Display screen 3 during the operation of frequency signal: pulse number (switch times) modification

① Indicator for output signal：

••• Indicated the present setting value was being modified.

ENTER When the output confirmation key ENTER was pressed, the corresponding set value of the signal realized the output and the symbol was displayed.

② The prompt for the data modification: ► arrow on the left of the lower row flashed for the prompt.

③ When ti reached the lower limit, "0" was displayed; when it reached the upper limit, “FS” was displayed.

④ In the output process, the key of MODE could be pressed to stop the output, the symbol “ ” flashed several times.

⑤ Indicating the current set frequency output signal types and the unit of the modification parameters:

Hz： Pulse signal

SW： Switching signal

When the pulse number (switching times) was modified:

The lower row displayed "CONT" which indicated the continuous mode;

When the lower row displayed the digital, the “CYC” in the right lower corner was light, representing the count mode.

Step3: The key of [0~9] [+/-] [•] [CLEAR] was used to coordinate the input voltage value (unit:℃) that needed to be output. If the set value exceeded the upper / lower limit, the display would automatically convert to the upper / lower limit. When the set value was modified, the status was displayed as [•••] .

（When the "CYCLE" parameter of the pulse number / switching time was modified, the effect of the key [CLEAR] was to return to the "cont" continuous mode）

Step4：The key of [ENTER] was pressed to confirm the output, then the display status changed to [ENTER] and C512 output according to the present setting value.

（ Pulse output should be paid attention to set the pulse amplitude "-Pv-" parameters）

Step 5：During the output process, the key of [MODE] could be pressed to stop output.

Example 4: pulse square wave signal with output frequency 168.5Hz, pulse amplitude 5.86V ,containing 1000 pulses:

Step 1: At the normal operation state of other signals, the key of [Hz JUL] was pressed to shift to pulse signal types with frequency signal operating state, such as [figure 5.4], (upper row showed: "**-F-**").

Step 2: in the state of frequency modification, the key of [0~9] [•] [CLEAR] was used to coordinate modifying th e frequency value into 168.5Hz.

Step 3: The key of [SWITCH] was pressed to switch to the stat e of pulse amplitude modification, such as [figure 5.5]. [0~9] [•] [CLEAR]

(upper row showed: "**-Pv-**"), and the key of was used to coordinate the modification of pulse amplitude as 5.86V.

Step 4: The key of **SWITCH** was pressed again to switch to the state of pulse number modification, such as [figure 5.6] (upper row showed: "CYCLE"), then the number key **0~9** was directly pressed to change the pulse number from cont continuous mode to 1000 pulses.

Step 5: The key of **ENTER** was pressed for confirmation and automatically in accordance with a series of settings to achieve the output.

Chapter [5.3.11] made an overall introduction of the frequency signal output, and the following chapters [5.3.12] and [5.3.13] made a detailed description for the pulse output and switching value.

5.3.12 Frequency signal: pulse output

Characteristics of C512 output pulse signal:
square wave; duty ratio 50%; pulse amplitude 1~10Vp-p; Low power level was 0V; the precision of electrical level was 10%. Load > 100kΩ.

Step 1: the key of [Hz] was used to switch to the pulse output function, the top row showed "**Hz**", (shown in "C" part in [Figure 3.2])

frequency range (Hz)	Resolution ability
2.00 ~ 99.99	0.01Hz
100.0 ~ 999.9	0.5Hz
1000 ~ 10000	100Hz

Table 5.12 Resolution of frequency signals in different frequency bands

Step 2: First, When "-F-" was displayed on the upper row, the key of [0~9] [•] [CLEA] was used to coordinate with the input of frequency value that needed to be output. If the setting value exceeded the upper / lower limit, the display would automatically change to upper / lower limit frequency value.
Frequency resolution adaptive matched according to the input frequency of keys. If the set value of current input keys exceeded the allowable resolution limit, the key input would be locked (input frequency value was less than 1000); or automatically matched the current gear during the output process (input frequency value was equal to or greater than 1000).

Step 3: The key of [SWITCH] was used to switch the current modification content to pulse amplitude: "-Pv-" (displaying on upper row). Then the key of [0~9] [•] [CLEAR] was used to coordinate with the input pulse amplitude (V) that needed to be

output . Set the range of 1.00V ~ 10.00V; if the value exceeded upper / lower limit, display would automatically transform into upper / lower limit.

（If the pulse amplitude parameters were not modified, the default amplitude value of pulse output was 1V）.

Step 4: If you wanted to output the default number of pulse signals, please continue to use the key of SWITCH to switch the current modification content to the number of pulses: "CYCLE" (Upper Display). Then the key of 0~9 CLEAR was used to coordinate with the output pulse number that needed to be output, and the allowable setting range was from 10 to 99999.

If you wanted to output continuous pulses, be sure to ensure that the "CYCLE" parameter was set to "CONT", which could be achieved by pressing the key of CLEAR.

Step 5: The key of ENTER was pressed to confirm the output, and the display state changed from ... to ENTER , C512 output pulse signals according to the current set of pulse frequency value and the pulse amplitude (continuous pulse or according to a preset pulse number by the output method seen in [step 4]).

Step 6: Dueing the process of pulse output for C512, the button of MODE could be pressed to stop the pulse output, " " "symbol flashed several times for prompt.

5.3.13 Frequency signal: switching output

Characteristics of switching value output by C512：

Maximum switching current and voltage：+28V⁄50mA

Step 1: the key of Hz was used to switch to the switching output function, and the top row showed "SW", (displayed in the "C" part of [Figure 3.2]):

frequency range (Hz)	Resolution
2.00 ~ 99.99	0.01Hz
100.0 ~ 999.9	0.5Hz
1000 ~ 10000	100Hz

Table 5.13 Resolution of frequency signals in different frequency bands

Step 2: first of all, “-F-” was displayed on the upper row by using the key of [0~9] [.] [CLEAR] to coordinate with the input of switching frequency that needed to be output. If the set value exceeded upper / lower limit, the display would automatically transform into upper / lower limit of the frequency value.

Frequency resolution adaptive matched with the input frequency of the keys. If the set value input by the current keys exceeded the allowable resolution limit, the input keys were locked (input frequency value was less than 1000); or output automatically matched with current gear resolution (input frequency value was greater than or equal to 1000)

Step 3: if you hoped to output a preset number of switch signals, please continue to use the key of [SWITCH] to switch the current revision content to switching times: "CYCLE" (displayed on upper row). And then the key of [0~9] [CLEAR] was used to coordinate the input switch number that needed to be output. The allowable set range was 10~99999. (

If you wanted to output switching value continuously, be sure to ensure that the "CYCLE" parameter was set as "cont", and it could be achieved by the key of [CLEAR].)

Step4：The key of [ENTER] was pressed to confirm the output, and the display state changed from [...] to [ENTER], C512 output switch value according to current set frequency value (methods for switch continuous output or in accordance with the presupposition of the switching times could refer to [step 3]).

Step 5: In the process of switch output for C512, pulse output could be stopped by pressing the key of MODE , and the symbol of " " flashed several times for prompt.

5.3.14 Common output value for storager

C512 could store up to 64 sets of common output. You could store the common sets(signal types and settings) in the storage of C512 for convenient call at any time.

The situation of low battery power or the replacement of the battery did not have an impact on the storage settings.

Only the analog signal could be stored the common output value, and the frequency signal could not be stored.C512

1. Display content in the storage operation status：

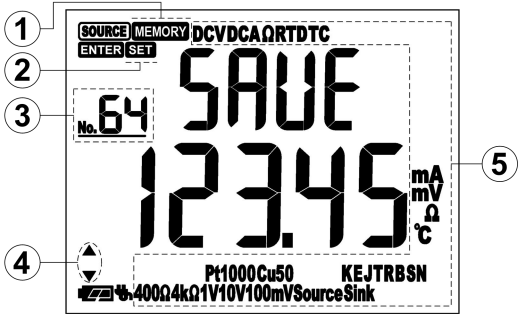


Figure 5.7 Display picture of common output value in the storage

Symbol in the upper row: "SAVE" prompt

The number in the lower row: Signal setting value that would be stored

① Current status indication：

MEMORY flashed, indicating that the current status was the

"storage" status.

② The prompt was stored in the current storage location :

If the storage locations of current numbers had already stored data, then the symbol **SET** flashed.

③ Storage location：

Position numbers were 1~64, and the storage location could be switched by pressing the button of ▲▼◄►

④ Direction key indicated as follows:

Current storage location was prompted by flashed

No.01 position：▲flashed

No.02~No.63 position：▲▼flashed

No.64 position：▼flashed

⑤ The signal types and units that were to be stored currently。

2. Operation of storage key：

A complete storage procedure was as follows：

(1) In the state of **ENTER** when the key of **STORE** was pressed, the instrument switched to the display of storage status, and the content was displayed in [figure 5.7].

(2) By pressing the key of ▲▼◄► to switch the current storage location of 1~64, and the digital was displayed in the upper left corner. The up and down keys were according to the position number of ±1, and the left and right keys were according to the position number of ±10.

(3) When the storage location was selected, the key of **STORE** should be pressed until it returned to the normal operating state such as [Figure 5.1] (when the word of "**SAVE**" disappeared from the upper row, flashing content stopped). The set value of lower row was cleared as zero, and the signal type was still the

same as the signal type when it was stored.

(4) If you did not want to store in the midway, it could return directly to the normal operating state, and it only needed to press the key of **MODE** .

Example 5: the current 400Ω gear had already exported 123.45Ω. In the same time the key of **STORE** should be pressed, and the display changed to the to the storage state of "**SAVE**", then the key of ▲ ▼ ◀ ▶ was pressed to change the storage location displayed in the upper left corner as 50, then the key of **STORE** was pressed and the display returned to normal operating state. Finally, the set value of the lower row was back to zero. Above operations achieved the aim of storing set value in the No.50 location.

5.3.15 Read common output values

According to the previously mentioned storage value of "store commonly used output value" function, it could be read at any time.

1. Read the display content of operation status:

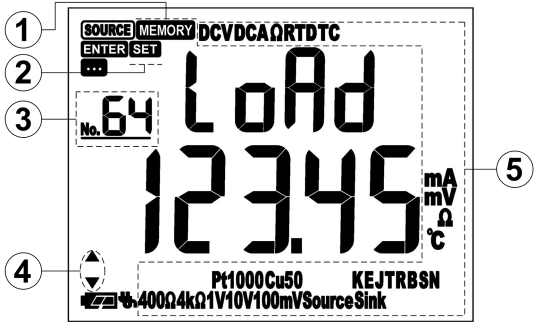


Figure 5.8 Display screen for reading the common output value

The symbol in the upper row: “LoAd”prompt

Digital in the lower row: Signal setting value that had been stored in the current storage location.

① Current status indication：

② When MEMORY shed, it indicated that the current status was in the "reading" status.

③ Current storage location had stored the prompt:

④ If the storage location of current number had stored data, the symbol of SET flashed as the prompt. (the lower row of the storage location without storing data displayed as "- - - - -").

⑤ Storage location：

⑥ Position numbers were 1~64, and the storage location could be switched by pressing the key of ▲▼◀▶.

⑦ Direction key indicator：

⑧ Flashing prompted current storage location

No.01 location：▲flashed

No.02~No.63 locations：▲▼flashed

No.64location：▼flashed

⑨ Signal types and units that had been stored in the current storage location.

2. Read key operation：

A complete reading process was as follows:

(1) During the normal operation of C512, the key RECALL was pressed and C512 switched to display of reading state: the displaying content was shown in [figure 5.8].

(2) By pressing the key of ▲▼◀▶ to switch and select the reading locations of 1~64, and the location number was displayed on the left up corner. With the switch of the reading position, the stored value, signal type and unit information that

were stored in the selected number location would display and refresh in the lower row in real time. If there was no data in the current memory location, it would display "- - - - -".

(3) When the reading position was chosen, the key of ENTER was pressed and the display would automatically return to normal operation state shown in [figure 5.1] (the word " LoAd" in the upper row vanished, and the flashing content stopped flashing), then the stored data output directly.

(4) If you did not want to read in the midway and you wanted to return directly to the normal operating state, you only needed to press the key of MODE . (the display would be cleared to zero, and because the read operation was not carried out at this time, the type of output signal after returning to normal operation state was still the signal type before entering the reading function.

Example 6: according to [example 5], after the completion of the No.50 location storage. Under normal operating state, the key of RECALL was pressed and the display became the state of "LoAd", then the key of ▲ ▼ ◄ ► was pressed to change the storage location in the upper left corner to 50. Finally, the key of ENTER was pressed, and the display returned to the normal operating state, and the resistance value was output in accordance with the stored 123.45Ω.

5.4 Parameter setting instructions

Note: in the setting picture for about 1 minute, there was no key operation, and C512 automatically returned to normal operation state.

5.4.1 Password checking

in the normal using state, pressing the key of SETUP for 2 seconds to enter the password checking status：

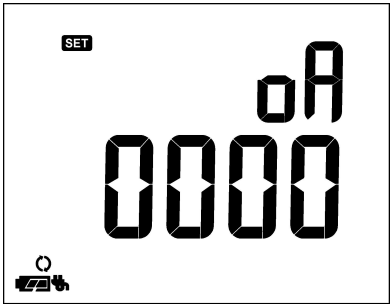


Figure 5.9 display of password checking status

upper row: parameter indicator: "oA" represented the password

Lower row: the password to be checked

Pressing the key of CLEAR to enter the password modification state, and the corresponding modification location flashed. the location was shifted by pressing the key of ◄ ► , and the set value was modified by pressing the key of ▲ ▼, and the key of STORE was pressed to confirm the result. If the password was correct it entered the corresponding parameter group, otherwise returned to password checking status and the display returned to the state as shown in [figure 5.9].

Password value：

8205：	Entering instrument parameter setting status
1111：	Entering signal calibration status

9999： Querying machine serial ID

Every time when C512 was operated from password checking state back to common using state, C512 was in the neutral position (i.e., in a state of open circuit, without signal output, so the back-end circuit was protected). At this time, the main display only showed a row of "- - - - -".

5.4.2 Parameter setting

The password was 8205, then the key of STORE was pressed to make confirmation, and the meter was in the state of parameter setting.

1. Display content in the parameter setting status：

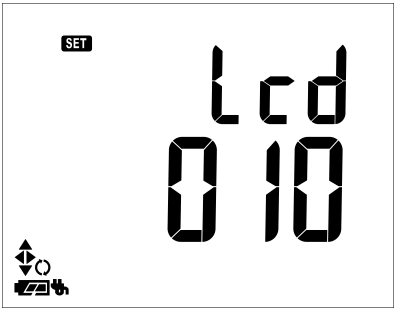


Figure 5.10 instrument parameter setting status & modification status

Upper row：Parameter indicator

Lower row：Parameter setting value

parameters of C512 that could be set were as follows：

Parameter symbol	Parameter name	Range	Default value	Remark
Lcd*	lighting time for LCD backlight (sec)	0~999	10	

LoAd*	Whether the boot process recover output	0: no / 1:yes	1:yes	
bEEP	switch of keypad sound	0:no / 1: yes	1:yes	
rESt*	auto off time (min)	1~999	999	
Co-iA*	Zero correction value of cold junction temperature	-99.9~99.9	0	
Co-Fi*	Full degree correction value of cold junction temperature	0.000~2.000	1.000	
R1inA	Resistance correction value of 400 Ω（Ω）	-9.99~9.99	0.00	*
R2inA	Resistance correction value of 4kΩ（Ω）	-9.9~9.9	0.0	*
tCoLd	Cold junction refresh time (sec)	0~9999	0	

Table 5.14 Instrument parameters

*Lcd： Unit of backlight time was sec. When the value was set as 0, backlight was closed all the time. When it was set as 999, the light was bright.

*LoAd： 0（no）：lower row on the instrument display “- - - - -” after boot.

1（yes）：After boot, the lower row recovered displaying the type and value of last output signal before shutdown (only for analog signal, except frequency signal).

*rESt： Automatic shutdown with the unit of minute was set as 999 (factory default), indicating the shield of automatic shutdown function.

*Co-iA，Co-Fi：

These two parameters were used to coordinate the automatic compensation output of the thermocouple cold junction temperature, which should be used in accordance

with the external cold junction sensor. If the sensor was not connected, the parameters did not take effect. In the process of cold junction compensation, the cold junction compensation accuracy could be adjusted by this parameter. In the adjustment, the zero point should be modified first, then the full degree was revised.

The efficient cold junction temperature value = cold junction temperature value before the correction of zero point + Co-iA

The efficient cold junction temperature value = the cold junction temperature value before the correction of full degree × Co-Fi

* R1inA，R2inA：

When the constant current excitation of the instrument was not equal to 1mA at the gear of 400Ω, the zero migration deviation might appear, and it could be amended by the R1inA parameter.

When the constant current excitation of the instrument was not equal to 1mA at the gear of 4kΩ, the zero migration deviation might appear, and it could be amended by the R1inA parameter.

When the constant current excitation of the instrument output at the resistance gear of C512 and it was not equal to the above current value. The deviation of several actually measured points were recorded, and the average value of

this deviation value was set as the resistance correction value.

*tCoLd： Cold junction refresh time was set as 9999 (factory default), indicating the refresh compensation was not carried out in real-time. Numbers were set among 10~9999, then the cold junction temperature was compensated in real time according to the interval time (sec) of the set value.

2. Key operation of the parameter setting：

In the setting state of instrument parameter, the key of SWITCH could be pressed to switch parameters menu

In the setting state of instrument parameter, the key of CLEAR was pressed to enter the modification state of the instrument parameter value according to the parameter, and the corresponding modification location flashed: then the key of ◄ ► was pressed for the shift, the key of ▲ ▼ was pressed to modify settings, the key of STORE was pressed to save.

In the set state of the instrument parameter, the key of SETUP was pressed for 2 seconds to return to normal operation state.

5.4.3 Output calibration

❗ Calibrated environmental conditions：

Ambient temperature：23±5℃

Relative humidity：35%~70% R·H

Preheat：C512 needed to boot and preheat for more than 20 minutes in the calibration environment.

❗ To Calibrate C512, the high precision digital meter that had high accuracy than C512 should be used, such as high precision digital meter with six and a half locations etc.. So the output accuracy indicator of C512 could be satisfied for in the transfer process.

Evyery signal output gear of C512 relied on the two high and low calibration points to of calibrate the output accuracy.

Signal type and gear position	Calibration point				Remark
	Low point0 (L)		High point FS (H)		
	Parameter symbol	Default value	Parameter symbol	Default value	
DC voltage10V	**10v-L**	0.2V	**10v-H**	12V	
DC voltage 1V	**1v-L**	0.1V	**1v-H**	1.2V	
DC voltage mV	**Ev-L**	1mV	**Ev-H**	110mV	
DC voltage output mA Source	**Sou-L**	1mA	**Sou-H**	9.5mA	High point adopted 9.5mA rather than 20mA, was the consideration of the consistency problem of the current monitoring equipment range
analog transmitter mA Sink	**Sin-L**	1mA	**Sin-H**	9.5mA	
resistance 400Ω	**400L**	0.5Ω	**400H**	400Ω	Calibration method of four wire system was adopted at the factory time
resistance 4kΩ	**4000L**	5Ω	**4000H**	4kΩ	

Table 5.15 Recommended setting value selected by the gear and calibration point

In the calibration of resistance gear for C512, resistance correction value parameters of R1inA and R2inA would automatically shielded.

1. Status of the display content for the output calibration parameter menu：

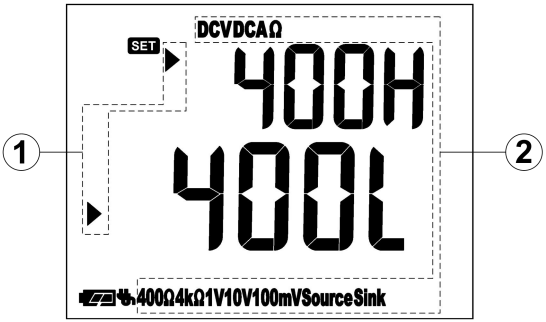


Figure 5.11 status of the calibration parameter menu

Upper row: High point parameter for the signal type that needed to be calibrated

Lower row: Low point parameter of the signal type that needed to be calibrated

① prompt for the data modification：

② ► arrow indicated the current modification position (high point of calibration entered the upper row parameters, low point of the calibration entered the lower row parameters).

③ Current signal type to be calibrated。

2. Display content of the calibration value in the modification status：

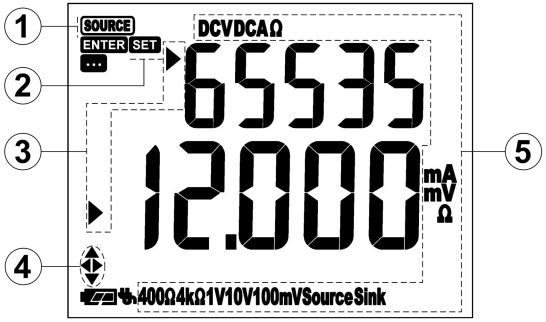


Figure 5.12 Modification state of the the calibration value according to the calibration point

Upper row: DA code value (0~65535) of the signal type that required calibration at high/low point

lower row: physical value of the signal type that required calibration at high/low point. See [table 2.2].

① Confirmation code value output the prompt：

② Each time when the output confirmation key of ENTER was pressed, the set value was output, and the the symbol SOURCE could be lit and flashed several times, so the current C512 was prompted to output according to the set code value.

③ Prompt modification：

④ The sparkling symbol of SET indicated that it was in a modification state of calibration.

⑤ prompt for the Modified data ：

⑥ ►The arrow indicated the current position of the modification (DA code value was modified into the upper row parameter, and the corresponding physical value was modified into the lower row parameter).

⑦ Prompting the direction keys that needed to be used for the current modified value.

⑧ Signal type and unit of the current calibration point.

Before the calibration, please refer to the connection mode in [table 3.2], and to well connect C512 and high precision digital meter for calibration. The calibration of resistance signal could be according to the actual demand to choose connection mode of 2 wire, 3 wire, 4 wire system.

Step 1：With reference to the section of [5.4.1], the password was set as 1111. After confirmation, the instrument was in the output calibration state, as shown in [figure 5.11].

Step 2:The key of **V** **mV TC** **mA** **Ω** in the region of “function keys for switching output signal types” was pressed to switch to the desired calibration signal type and gear, and the corresponding parameter menu referred to [table 5.15].

Step 3：The key of **SWITCH** was pressed at the signal type and gear that needed the calibration to switch the high and low calibration points for the corresponding signal types (H/L). The flashing prompt of " " were used to indicate the current modification parameters, as shown in [figure 5.11].

Step4：The Key of **CLEAR** was pressed to enter the modification status of calibration value at the high or low calibration point for corresponding signal types as shown in [figure 5.12].

Step 5：In the modification state of calibration value, the key of **SWITCH** was pressed to switch calibration modification of DA code value for current calibration point(upper row parameters) or to modify the corresponding physical value (lower row parameters).

Step6：The physical value in the lower row should be modified first：The

Key of [0~9] [+/-] [.] [CLEAR] was pressed to coordinate with modifying the physical value of current calibration point. If the set value exceeded upper / lower limit, the display would automatically transform into upper / lower limit value. When the set value was modified, the status was displayed as .

Step7：Then the DA code value in the upper row was modified: to shift by pressing the key of [◄] [►] to modify the set value by pressing the key of [▲] [▼] , and the modifying location flashed; to clear by pressing the key of [CLEAR]. It could be freely modified in the range of 0 ~ 65535.

Step 8：When the output confirmation key of [ENTER] was pressed, the instrument output signals according to the modified DA code value. When the output was stable, the measured value on the high accuracy digital meter of C512 output signal was checked for the judgment whether it was the same as the physical value of the current calibration point set in "step 6". Repeating "step 7" and finely tuning the value of DA code to make the output value be most close to the measured value.

Step 9：The key of [STORE] was pressed until the display returned to calibration parameter menu status shown in [figure 5.11] (different signal types returned to their respective calibrated parameter menu status), and the calibration parameter of current calibration point were saved and took effect.

Step 10：If you did not want to save data in the midway, you could directly quit from the calibration status by only pressing the key of [MODE]. Display would directly return to the status of calibration parameter menu as shown in [figure 5.11].

Step 11：In the status of calibration parameter menu, the key of [SETUP] was pressed for 2 seconds and then it returned to the normal operation state.

Example 7: An attempt to accurately calibrate the high point calibration value of 100mV for the mV gear:

Step1 : With reference to the method in the [5.4.1] section, it first entered the status of calibration menu with the password of 1111, then the key of [mV TC] was pressed to switch to the mV signal type.

Srep2 : According to the instructions of the flashing ► arrow, the current calibration point was selected: :

The key of [SWITCH] was pressed to select the mV signal peak calibration value in the upper row.

Step3 : The key of [CLEAR] was pressed to enter the modification state of the mV signal high point calibration value.

Step4 : According to the instructions of the flashing ► arrow, the current modification content was selected:

The key of [SWITCH] was pressed to choose the modification of the physical value in the lower row, and by pressing the key of [0~9] [+/-] [.] [CLEAR] to modify the high point physical value as 100mV.

Step5: The key of [SWITCH] was pressed to choose the modification of the DA code value in the upper row. The key of [◄] [►] was pressed to shift the position. the key of [▲] [▼] was pressed to modify the DA code value, and the output confirmation key of [ENTER] was pressed to output the corresponding mV value.

Step6: by observing the high precision digital meter which measured the mV output of C512, the measured mV value was checked and judged whether it was equal to 100mV, and the DA code value most close to 100mV was chosen as the standard value. Then the key of [STORE] was pressed until

the display returned to the status of calibration parameter menu for mV signal. High point of mV gear finished the calibration.

※ The above signal calibration did not include the frequency signal calibration. The frequency value of the frequency signal did not need to be calibrated. When it related to the pulse amplitude of the pulse signal, it was based on the calibration result of the 10V voltage gear.

Points for attention：

(1) The selection of calibration lows and highs should be determined by the actual range of the signal that had to be output. Generally, it could set the actual range of the desired output signal at low point of 10% and high point of 90% .

(2) When the output signal was mV signal, the low point should be set above 0mV during the calibration process, and the recommended value was 1mV; the negative mV value should not be selected as the calibration point, because C512 and external calibration equipment all could be affected by the thermocouple effect.

(3) The thermal resistance and thermocouple signals need not be calibrated separately, and the accuracy was dependent on the calibration accuracy of the the resistance gear and the mV gear of the DC voltage：

Signal type	Signal type	Dependent calibration signal
Thermal resistance	PT100	resistance 400Ω
	PT1000	resistance 4kΩ
	Cu50	resistance 400Ω
Thermocouple	K/E/J/T/R/B/S /N	DC voltage mV

Table 5.16 the signal type that was needed in the actual calibration for the

thermal signal.

(4) In the output of the thermal signal (thermal resistance, thermocouple), the selection of the calibration low point and high point for the correspondingly dependent calibration signal should referred to the allowable setting temperature range according to [table 2.2].

Example 8: if you needed to output the entire range of K type thermocouple from -200.0 ℃ ~1300.0℃ , the indexing table of the K type thermocouple thermocouple should be checked, and the mV range of the the temperature range was -5.89mV~52.41mV. Then the low point and high point of the mV signal that was needed for the calibration could be based on the range of the mV value. For example, the high point of 53mV and low point of 1mV were calibrated.

(5) In order to increase the output accuracy, the low point and high point for the calibration should be as close as possible to the desired output range.

(6) In the calibration of the resistance gear, due to the use of the principle of electronic synthesized resistor for resistance output function, the output resistance value was negative for the part of Da code value close to zero, and the high precision digital table could be used to measure this negative value of the resistance. Please check after the 0Ω point after the calibration, and the negative resistance value should not appear on the 0Ω point, otherwise it might cause problems in the actual use.

❗ When the battery power was too low, the calibration should not be done, otherwise it might lead to a larger deviation of the accuracy.

⚠ In order to ensure safety in the calibration, the wiring connection must be carried out after the power off.

5.4.3 Query instrument serial number and restore factory setting

1. Query table serial number：

Referring to [5.4.1] section, the password was set as 9999. After the confirmation, the unique Serial ID of each C512 could be seen, as shown in [figure 5.13].

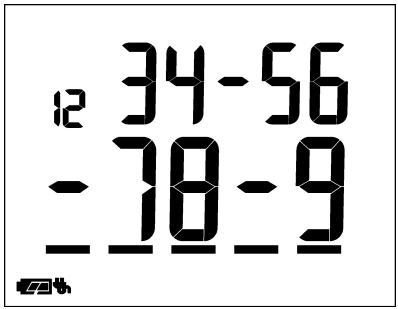


Figure 5.13 Query state of machine serial ID

The machine serial ID shown in above figure was 12-34-56-78-9, and each C512 had its unique serial ID

Usage of the instrument serial ID：

When C512 had failure or you had some relative questions to consult the manufacturer, you could reply to the manufacturer for the serial ID, so as to provide factory information to the manufacturer for tracing the instrument.

2. Factory reset：

According to the [5.4.1] section, the password was set as 7310. After the confirmation, the instrument entered the query screen of the factory reset status:

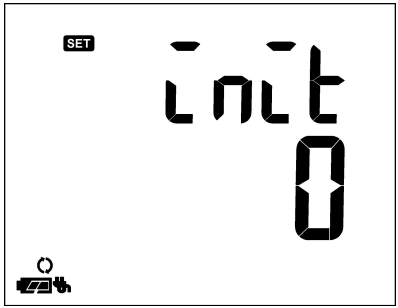


Figure 5.14 Query screen of the factory reset status

Upper row: initialization of the indicator "**init**"

lower row: whether to restore the factory status: 0： not， 1：yes

The key of ▲ ▼ was pressed to enter the parameter modification status for the recovery of the factory status, and the number "0" flashed; then by pressing the key of CLEAR to modify the flashing number into "1"; after pressing the key of STORE the flashing location no longer flashed.

Then the the power button was pressed to shut down and the power button was pressed again to boot, and parameters in the backup parameter area were restored to the main parameter area by C512. Instrument parameters are returned to the default state in [table 5.14] and the common output storage was cleared.

Afterwards, C512 could be normally operated and used, and the 7310 parameter was no longer needed to be intervened.

❗ Factory setting recovery should be used carefully!

6.Information of version number

Version number and function upgrade project of C512 host computer：

◆ C512-V3.0： initial version of host software for the portable high precision signal generator

※ Other functions of C512 and its accessory instruction：

- λ Portable high precision signal generator supported the thermocouple signal output by compensation method with the datum node at temperature not at 0℃. Cold junction sensor should be bought separately (model: MPC101B).
- λ Load capacity of DC current output gear mA source of C512 was 19V. If the user required that the load capacity was more than 1K @20mA for the current C512 instrument, it was recommended for the user to switch to the function of mA Sink. It was used with external power. The outer power supplied for this function should best use linear power and internal loss (= power supply voltage × set current - load resistance × set current) must be less than 0.5W. It could also achieve the requirement that users needed the passive isolator to supply power in back-end and the application of adjusting current.
- λ Portable high precision signal generator did not have communication function. If the communication operation was needed for C512 (such as: the calibration and verification on the production line controlled

by the unified RS485 communication network), the C512 should be chosen as the type of standard high precision signal generator.

- λ High precision signal generator with standard type had the infrared communication function, and it could achieve the two-way communication with computers by using an infrared isolation converter. It also supported the use of RS485 network and easily realized instrument calibration, settings, output and other functions.
- λ (It needed to buy a separate infrared -RS485 communication converter (model: MPC485IR104A))
- λ *Detailed instruction could refer to product selection, user manual of the standard high precision signal generator, user manual of infrared -RS485 communication converter and other product information.*

（Corrections were made at any time, so please use the latest version for consulting.）