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1.Safety Information

To ensure the safety operation, the following signs are used only as specified in this operation instruction.

⚠Warning

A warning shows that if the operation does not comply with the following correct instruction it is possible to bring hazards to the user or cause damage to the source in use. The warning also points out how to avoid the accidents.

! Caution

A caution shows that if the operation does not comply with the following correct instruction, it is possible to cause damage to the source in use. The caution also points out how to avoid maloperation.

Note

A note serves as a sign to remind the user that he must understand the correct operation of the source and its characteristics.

To prevent the user and the source from any electric shock and other hazards, it is necessary to observe the following regulation:

⚠Warning

- Do not operate the source at the working field where there exists flammable gas or explosive gas or vapor.It is very dangerous to operate the source in such surrounding.
- Never apply more than 30V between any two terminals,or between any terminal and earth ground.

! Caution

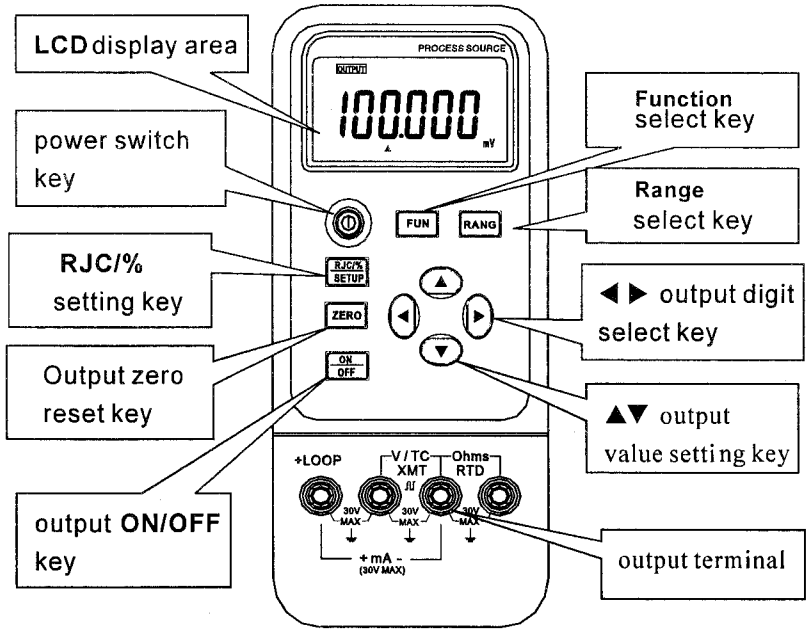
Disassembly: No one is allowed to remove the split case (top & bottom) of the source except professionals.

- **Cleaning**:Periodically wipe the case with a damp cloth and detergent;do not use any corrosive solvents

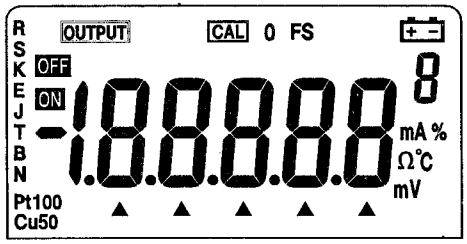
Note

- To keep the source in a designed accuracy, it needs warming up 5 minutes before it is put into operation.
- If any user requires a higher accuracy of the source, the user should make contact with the manufacturer.
- If the source is not in use, it is recommended to shut down the power supply or keep it in an off-state .In such a way ,the battery can prolong its life greatly. During the operation of the output current, do your possible to adopt external 24V·DC power supply and use the mode of connecting a transmitter, which can prolong the battery life greatly.

2.Instrument Panel Layout and Function



Explanation of LCD Display Area



a)OUTPUT:When this symbol appears in the display, it denotes the source in an output state.

b)CAL: When this symbol appears in the display, it denotes the source in a calibration state.

c)0 FS: This symbol appears when the source is in a state of calibration,denoting that the zero point or the full scale point is now in calibration.

d) : When this symbol appears, it denotes that the battery is nearly used up and needs replacing now. (See subsection 3.1)

e)▲: When this symbol appears, it denotes that the output digits need setting.

f)ON, OFF: These symbols denote the turn on or turn off of any output signals.

g) V,mV, mA,℃, Ω ,%:These symbols denote the individual units of current output values.

h)R, S, K, E, J, T, B, N:Each of these individual symbols show the type of a thermocouple.

j)Pt100, Cu50: The display of this symbol denotes the respective type of a RTD.

3.Replacing the batteries and fuses

⚠Warning

- The test leads must be removed and the power supply of the source must be shut down prior to replacing the battery.

3.1 If the symbol appears in the display,it denotes that the battery is nearly used up and needs replacing according to the following steps:

1)Remove the test leads and shut down power supply of the source.

2)Remove the holster from the source. Open the battery cover at the back of the source by releasing the lock in the indicated direction.

3)Replace the used-up battery with a new one. Put the battery cover back and lock it in the indicated direction.

4) Put the holster back onto the source.

3.2 If the output value of the source doesn't change with the value of the set digits of panel, it denotes that the fuse has been blown and needs replacing according to the following steps:

1)Remove the test leads and shut down power supply of the source.

2)Remove the holster from the source. Open the battery cover at the back of the source by releasing the lock in the indicated direction.

3)Disassemble the three fixed screws in the bottom case, then open the top case.

4)Replace the 0.05A/60V faster fuse on the mainboard.

5)Install the source over again.

4.Power-On/Off of source

4.1 Power-key Operation

Press the power key to turn on the power supply of the source. Then press it again to hold it in one second and the power will be off. When the power is turned on, the source starts to make self-diagnosis internally and the **'VC11'** is in display. After this, appropriate operation should be carried out.

Note

- **Power-on**: To ensure the correct operation of the source with power on. It is good practice to turn off the power supply pausing 5 seconds, and then restart the calibration.

4.2 Automatic power-off

By the shipping time, the source is set in the factory like this: In case there is no operation of the source within a period of 10 minutes after power-on, it will cut off the

power supply automatically. However, users can decide whether they want to use the function of the automatic power-off or not. The setting can also be done by themselves. (See section 6.)

5. Output from Source

The output terminal of the source produces the DC voltage, current resistance and temperature set by the user.

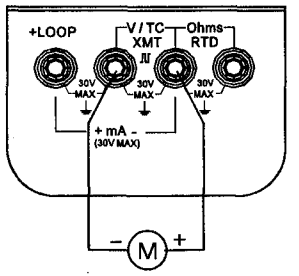
! Caution

During the operation, do not apply voltage to the output terminal. If any improper voltage is applied to the output terminal, it will cause damage to the internal circuit.

Output Operation Procedure

Function Operation	Range Operation	Display	Setting Range
DCV ←	10V ←	0.0000V	-1.0000 to 10.0000V
↓	↓ 1V	0.00000V	-0.10000 to 1.10000V
↓	↓ 100mV —	000.000mV	-10.000 to 110.000mV
DCA	20mA	0.000 mA	0.000 to 22 .000mA
↓ Ω	400Ω	000.00Ω	000.00 to 400.00Ω
↓	↕ 2KΩ	0000.0Ω	0000.0Ω to 2000.0Ω
TC	R ←	0000℃	-40 to 1760 ℃
↓	↓ S	0000℃	-20 to 1760 ℃
	↓ K	0000.0℃	-200.0 to 1370.0 ℃
	↓ E	0000.0 ℃	-200.0 to 1000.0 ℃
	↓ J	0000.0 ℃	-200.0 to 1200.0 ℃
	↓ T	0000.0 ℃	-200.0 to 400.0 ℃
	↓ B	400 ℃	400 to 1800 ℃
	↓ N —	0000.0 ℃	-200.0 to 1300.0 ℃
RTD —	Pt100	000.0 ℃	-200.0 to 850.0 ℃
	↕ Cu50	000.0 ℃	-50.0 to 150.0 ℃

5.1 DC voltage output



1)Insert one end of the test lead into the V output jack of the source and connect the other end to the input of the user's instrument as shown in the left diagram.

2)Press the key 〔**FUN**〕to select the voltage function when the unit 'V' appears in the display.

3)Press the key 〔**RANG**〕to select the apporpriate range and unit.

4)Press the key 〔◄〕 / 〔►〕 to select the set digits for output.

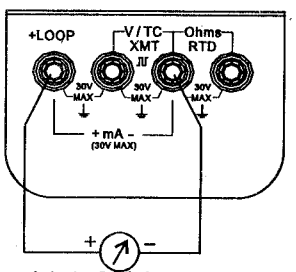
5)Press the key 〔▲〕 / 〔▼〕 to change the value of the set digits The value can do carry or number decrement automatically. Hold the pressed key in one second and the value will be kept varying.

6)Press the key 〔**ON/OFF**〕 to turn on or turn off the output,and the display indicates the symbol 'ON' or 'OFF'.

7)Press the key 〔**ZERO**〕and the output will be directly set to 0V.

5.2 DC current output

1)Insert one end of the test lead into the +mA- output jack of the source and connect the other end to the input of the user's instrument as shown in the following diagram(LOOP terminal is positive pole).



2)Press the key 〔**FUN**〕 to select the mA function and display the unit 'mA'.

3)Press the key 〔**%**〕 to select the output to be set in mA or % and display the unit 'mA' or 'mA%', in which 0% is 4mA and 100% is 20mA.

4)Press the key 〔◄〕 / 〔►〕 to select the set digits for output.

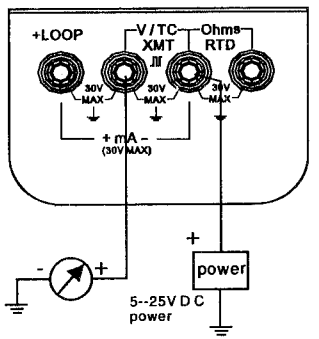
5)Press the key 〔▲〕 / 〔▼〕 to change the numerical value of the set digits , which can do carry or number decrement automatically. Hold the pressed key in one second and the numerical value will keep varying.

6)Press the key 〔**ON/OFF**〕 to turn on/off the output followed by displaying the symbol 'ON' or 'OFF'.

7)Press the key 〔**ZERO**〕 and the output will be directly set to 00.000mA.

5.3 Simulating Transmitter output (absorption current)

1)Insert one end of the test lead into the XMT output jack of the source and connect the other end to the input of the user's instrument and the power supply as shown in the following diagram.



2)The key operation is the same as that of DC current output in subsection 5.2.

Note

- Range of power supply: 5 to 25V DC
- During the operation at the current output, try your best to use an external 24V DC power source in a mode of connection with a transmitter, thus being able to prolong the battery life.

5.4 Simulating output from thermocouple (TC)

1)Insert one end of the test lead into the output (TC) jack of the source and connect the other end to the input of the user's instrument as shown in the above-illustrated diagram.(the red terminal is positive pole)

2)Press the key 〔**FUN**〕to select the function of a thermocouple and the display will indicate the unit '℃' or the type of 'R' .

3)Press the key 〔**RANG**〕 to select an appropriate type.

4)Press the key 〔◄〕 / 〔►〕 to select the set digits for output.

5)Press the key 〔▲〕 / 〔▼〕 to change the numerical value of the set digits. The value can do carry or number decrement automatically. Hold the pressed key in one second and the numerical value will keep varying.

6)Automatic compensation for reference-junction temperature. During the direct calibration of an instrument with reference - junction temperature compensation, it is common practice to press the key 〔**RJC**〕 so that the source can start the function of automatic reference-junction compensation, thus providing the required thermo-electromotive force for output followed by displaying the symbol 'RJ-ON'. (Refer to section 7 concerning the reference-junction compensation accuracy of the source.)

Where: output emf = emf corresponding to the set temperature-emf corresponding to the room temperature

✧ It takes two seconds for the source to start its internal reference-junction temperature. After this, each automatic compensation takes place at interval of 10 seconds.

✧ If there is a change in the operating ambient temperature, do not start the operation until the built-in compensating sensor has become stable (ca.10 minutes).

✧ If there is no need for the source to perform the function of automatic reference-junction compensation, press the key 〔**RJC**〕and the symbol 'RJ-ON 'will no longer appear in the display.

7)Press the key 〔**ZERO**〕 and the output will be directly set to 0000℃(R or S type), 400℃(B type) or 0000.0℃(other type).

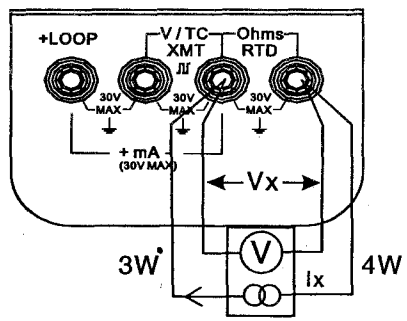
5.5 Simulating output from resistance or RTD

Note

● **Resistance-simulation:** The source produces the simulation resistance up to 2000.0Ω at its output terminal(Ohms/RTD). The method of simulating resistance output is to send out an appropriate voltage 'Vx according to the exciting current 'Ix' produced by the calibrated instrument. Because R (set resistance) = Vx(output voltage)/Ix (exciting current), the calibrated device must provide an exciting current to the source. The exciting current should range from 0.5mA to 2mA.

A 4-wire system is designed for the resistance output during the calibration. If the user adopts a two-wire system,he or she should take into consideration the error (ca.0.1Ω) arising from the lead resistance of the test leads. If the capacitance between the resistance output terminal of the source and the tested instrument is more than 0.1μf, the source will produce improper resistance.

1)Insert one end of the test lead into the output (Ohms/RTD) jack of the source (the red lead is exciting current input) and connect the other end to the input of the user's instrument as shown in the following diagram. (The dedicated test leads supplied with the source can be made into a 3-wire or 4-wire system for testing output according to user's requirement.)



2)Press the key 〔**FUN**〕 to select the function of resistance or RTD when the unit 'Ω' or '℃' and the type of the RTD 'Pt100' appear in the display. (If the 'ErCur' is in display, it denotes the exiting current direction is reverse and change the direction)

3)During the use of the resistance function, press the key 〔**RANG**〕 to select the range 400Ω or 2000Ω; during the use of the RTD function, press the key 〔**RANG**〕 to select a corresponding type.

4)Press the key 〔◄〕 / 〔►〕 to select the set digits for output.

5)Press the key 〔▲〕 / 〔▼〕 to change the numerical value of the set digits.The value can do carry or number decrement automatically. Hold the pressed key in one second and the value will keep varying.

6)Press the key 〔**ZERO**〕 and the output will be directly set to 0000℃(R or S type)400℃(B type)or 0000.0℃(other type)

6. Other Features

The following operation makes it possible for the source to change its automatic power-off function.

1)Cut off the power supply of the source.

2)Press the key 〔**POWER**〕to make a full screen display, and then release the power key immediately followed by pressing the key 〔**RANG**〕 when the source gets into a maintenance state. The display indicates the symbol 'AP-XX'.

3)Press the key 〔▼〕 when the symbol 'AP-OF' appears in the display, denoting that there is no automatic power-off function available to the source, and when the symbol 'AP-ON'appears,denoting that the source has recovered the automatic power-off function.

4)Cut off the power supply again to exit the maintenance state.

7. Performance Capabilities

Output Function & Specification(applicable to temperature range from 18℃ to 28℃, within one year after calibration)

Output	Range	Output Range	Resolution	Accuracy	Remark
DCV	100mV 1V 10V	-10.0 to 100.0mV -0.1 to 1.10000V -1.0 to 11.0000V	0.001mV 0.01mV 0.1mV	0.02% of reading +0.01% range	Max. output current ±2mA
DCA	20mA	0.000 to 22.000mA	0.001mA	0.02% of reading +0.01% range	Max. load: 1kΩ at 20mA Note 1
OHM	400Ω 2KΩ	0.00 to 400.00Ω 0.0 to 2000.0Ω	0.01Ω 0.1Ω	0.02% of reading +0.02% range 0.03% of reading +0.02% range	±1mA excit. current Note 2&3
Analog transmitter (absorb. current)	-20mA	0.000 to -22.000mA	0.001mA	0.02% of reading +0.02% range	Max. Load: 1kΩ at 20mA Note 4
TC	R	-40 to 1760℃	1℃	-40 to 100℃:1.5℃ 100 to 1760℃:1.2℃	By using ITS-90 temperature scale Note 5
	S	-200.0 to 1760℃	1℃	-20 to 100℃:1.5℃ 100 to 1760℃:1.2℃	

	B	-200.0 to 1800℃	1℃	400 to 600℃:2.0℃ 600 to 800℃:1.5℃ 800 to 1800℃:1.1℃	
	E	400 to 1000℃	0.1℃	-200 to -100℃:0.6℃ -100 to 600℃:0.5℃ 600 to 1000℃:0.4℃	
	K	-200 to 1370℃	0.1℃	-200 to -100℃:0.6℃ -100 to 400℃:0.5℃ 100 to 1200℃:0.7℃ 1200 to 1370℃:0.9℃	
	J	-200 to 1200℃	0.1℃	-200 to -100℃:0.6℃ -100 to 800℃:0.5℃ 800 to 1200℃:0.7℃	
	T	-200 to 400℃	0.1℃	-200 to 400℃:0.6℃	
	N	-200 to 1300℃	0.1℃	-200 to -100℃:1.0℃ -100 to 900℃:0.7℃ 900 to 1300℃:0.8℃	
RTD	Pt100	-200 to 850℃	0.1℃	-200 to 0℃:0.3℃ 0 to 400℃:0.5℃ 400 to 850℃:0.8℃	By using Pt100-385 Note 2&3.
	Cu50	-50 to 150℃	0.1℃	-50 to 150℃:0.6℃	

Notes: 1.When the battery voltage exceeds 6.8V, the maximum load is 1KΩ at 20mA. When its voltage lies between 5.8V and 6.8V, the maximum load is 700Ω at 20mA.

2.Without accessory lead resistance.

3.Range of exciting current:0.5mV to 2mA;
Max.output voltage:≤2V

4.Power supply range: 5 to 25VDC.

5.The accuracy does not include the error of internal temperature compensation caused by a sensor.
The range of the internal temperature compensation sensor is from -10 to 50 ℃ with its compensating error up to 0.5℃.

6.Temperature coefficient:±0.005% of range per ℃ for the temperature ranges 5℃ to 18℃ and 28℃ to 40℃.

General Specifications

- Power supply: 9V battery (ANSI/NFDA or IEC6LR619V alkaline)
- Battery life: about 12 hours under the condition of 10mA
- Max. permitted voltage:30V(between any two terminals

or between any terminal and earth ground)

- Operating temperature: 0℃ to 50℃
- Operating relative humidity: ≤80%RH
- Storage temperature: ≤-10℃ to 55℃
- Storage humidity: ≤90%RH
- Size: 200×100×40 mm(with holster)
- Weight: 550g (with holster)
- Accessory: operation instruction, a set of CF-36 industrial test lead (with alligator clips)
- Option: AC power-supply adapter (VCPS) and a set of CF-31-A industrial test lead (with probe clips)
- Safety: Certified as compliant to IEC1010 provisions (Safety Standard issued by International Electro-technical Commission)

8.Calibration

Note

- In order to keep the designed accuracy of the source, it is recommendable to calibrate your source once a year. The following example shows the use of recommended standard equipment to perform the calibration.

! Caution

During the operation, avoid short circuit and never apply more than the max. permitted voltage to the output of the source or to a co-working standard device, otherwise any maloperation will cause possible damage to their internal circuits.

8.1 Selecting Standard Equipment

Calib. Item	Standard Equipment	Input Range	Accuracy	Recommend
DCV 100mV	Digital meter	MAX.110mV	±(10ppm+1uV)	1281 (FLUKE)
10V		MAX. 11V	±(10ppm+5uV)	5520 (FLUKE)
DCA 20mA	Digital meter	MAX. 20mA	±(50ppm+0.4uA)	or equivalent
OHM 400Ω	Standard source	MAX. 2V	±(10ppm+5uV)	
2000Ω		±1mA exciting current	±(80ppm+0.03uA)	

8.2 Ambient Condition for Calibration

Ambient temperature: 23℃±1℃

Relative humidity: 45 to 75% RH

Warming-up:

- The standard equipment must be warmed up to the given time.
- Do not connect the source to the power supply until it has been exposed to the ambient condition for 24 hours. Then set the source to a state of non-automatic shut down followed by warming up to 0.5 hour.

Note

Power supply for source: During the calibration, it is good practice to replace the old battery with a new alkaline one.

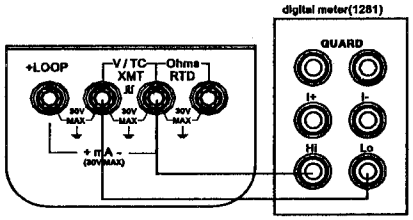
8.3 Operating Output Calibration

Operating calibration in order of items and calibration points listed in the following table:

Item Number	Output Range	Calib.Point
1	1.00000 V	0
		FS
		0 FS
2	100.000 mV	0
		FS
3	10.0000V	0
		FS
4	400.00 Ω	0
		FS
5	2000.0Ω	0
		FS
6	20mA	0
		FS

8.3.1 DC voltage output calibration

1)The calibration wiring diagram is shown in the following diagram:



2)Press the keys (**POWER**), (**FUN**)and (**RANG**) simultaneously to enter the source in a state of 1V output calibration, and then the symbols 'OUTPUT', 'CAL 0 ', 'ON' and 'V' appear in the display.

3)Set the digital meter to an appropriate range.

4)With the output stabilized, operate the keys (◄)/ (►) and (▲) / (▼) to adjust the source to a value in identity with the reading of the digital meter.

5)Press the key (**SETUP**) to start flashing in the display, denoting the calibrated point has been stored.

6)Press the key (**RANG**) and the display will indicate the symbol 'CAL FS'. With the output stabilized, repeat the steps 4 and 5.

7)Now press the key (**RANG**) again and the display will indicate the symbol 'CAL 0 FS'. With the output stabilized, repeat the steps 4 and 5.

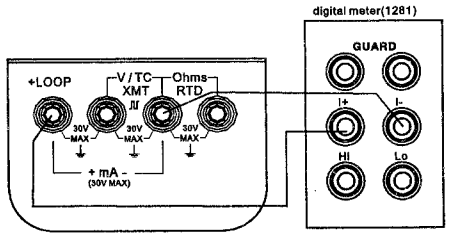
8)Press the key (**FUN**) to select range 100mV or 10V, repeat the steps 3 and 6.

Note

Calibration storage : Press the key (**SETUP**) to store the calibrated point when the display appears 'NoCAL' symbol, denoting that the calibration storage is invalid.

8.3.2 Calibrating 20mA range

1)The calibration wiring is shown in the following diagram:

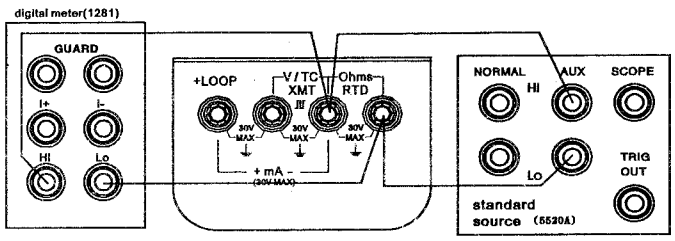


2)Press the key (**V/mA**)to enter the source in a state of 20mA output calibration, and then the symbols 'OUTPUT', 'CAL 0' , 'ON' and the unit 'mA' appear in the display.

3)Repeat the steps from 3 to 6 in subsection 8.3.1.

8.3.3 Resistance output calibration

1)The calibration wiring is shown in the following diagram:



2)Press the key (**FUN**) to enter the source in a state of calibrating the resistance output when the display indicates the symbols 'OUTPUT', 'CAL 0', 'ON' and the unit 'Ω'.

3)Set the digital meter and the standard source to a corresponding range, and then set the standard source to +1mA output.

4) With the output stabilized, repeat the steps from 3 to 5 in subsection 8.3.1.

5)Press the key (**RANG**) to display the symbols 'CAL FS' .With the output stabilized, repeat the steps from 3 to 5 in subsection 8.3.1.

6)Press the key (**RANG**) to select 2000Ω output range, repeat the operation of steps 3 to 5.

Note

Exciting current: Direction of exciting current must accorded with the above diagram, else the display will indicate the symbol of 'ErCur' that denotes the calibration is ineffective(the red terminal is the input terminal of exciting current).

9 Points for Attention to Use of Operation Instruction

- The present operation instruction is subject to change without notice.
- The content of the operation instruction is regarded as correct. Whenever any user finds its mistakes,omission, etc., he or she is requested to contact the manufacturer.
- The present manufacturer is not liable for any accidents and hazards arising from any maloperation.
- The functions described in this operation instruction should not be used as grounds to apply this product to a particular purpose.