Operating Manual

4530F Atomic Absorption Spectrometer

P/N: ASA1.670.802SM Version No.: 2008/10

Operation Safety Notice

 No open fire in the lab housing a 4530F atomic absorption spectrophotometer. Acetylene cylinders and 4530F atomic absorption spectrophotometers shall not be kept in the same room.

- The room housing acetylene cylinders shall be well ventilated, and no open fire is allowed.
- The acetylene flow shall not exceed 3L/min upon ignition, and water seal shall be in place in the drain tubing before ignition.
- The output pressure of an acetylene cylinder shall not exceed 0.12 MPa.
- ♦ The operator shall always attend the instrument after ignition.
- To extinguish the flame, turn off the acetylene cylinder first. After the flame is extinguished, press the "Test" key in "Flame atomizer settings" until the residual acetylene in the tubing is empted.
- ♦ Please read this manual carefully before operating the 4530F atomic absorption spectrophotometer.

Safety Signs

PRECAUTIONS Precautions indicate possible damage to the operator.

ATTENTION Attentions indicate possible damage to work of the operator.

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Overview

General Information

The 4530F atomic absorption spectrophotometer is a single-beam instrument, equipped with a PC and dedicated programs for function controlling and data processing, for testing macro, micro and trace metal elements and semimetal elements.

The instrument provides continuous, peak height and peak area readings for determination of absorbance, concentration and emission intensity, and offers atomic absorption, background absorption and background correction modes, with integration time of 0.1 seconds through 60 seconds. PC menus are used to set the lamp currents, negative high voltages, working wavelengths and combustion conditions for the instrument. Functions available include automatic gain, background correction, automatic energy balance, wavelength scanning, automatic peak finding with peak values, etc. All readings, measurement results, correction curves and operating conditions can be printed.

The instrument provides concentration correction of 1-9 points, allows slope factor adjustment with a single standard sample, offers linear regression, curve fitting, linear and nonlinear standard addition method determination as well as baseline compensation, averages and relative standard deviation, etc.

The instrument complies with the enterprise standard Q31/0104000010C017.

Construction and Working Principles

Atomic absorption spectroscopy is a measurement method based on the absorption by ground-state atoms of characteristic wavelengths.

Normally, atoms are in the ground state. For each element, the energy for their atoms to transit from the ground state to the exited state is known and called characteristic spectral lines. For atomic absorption spectroscopy, a hollow cathode lamp (HCL) is used as the light source to emit the light of the wavelength characteristic of an element. Then the light passes through the atom vapor which absorbs the light of the characteristic wavelength. The concentration of atom concentration of the element is calculated based on the absorption of the light.

After a beam with intensity of I_0 passes through the media with atomic concentration of C, the intensity is decreased to I, by following the Lambert–Beer law.

$$A = \lg(I_0 / I) = KCL$$

- A: Absorbance
- I₀: Incident ray intensity of characteristic spectral lines
- I: Emergent ray intensity of characteristic spectral lines
- k: Absorbance factor
- L: Flame distance passed by ray of characteristic spectral lines
- C: Atomic concentration

The equation indicates that the absorbance and atomic concentration is in a linear relationship in certain circumstances.





Figure 1-1 Atomic Absorption Diagram

Figure 1-2 Standard Curve Diagram

As shown in Figure 1-2, the relationship between the concentration of a standard sample (e.g. $1\mu g/ml$, $2\mu g/ml$ and $3\mu g/ml$) and its absorbance can be plotted into a line, which is called the standard curve of the characteristic element. The concentration of the element contained in an unknown sample can be determined with the standard curve method as shown in Figure 1-2.

The 4530F atomic absorption spectrophotometer mainly comprises one optical system, one signal system and one gas control system.

See Figures 1-3, 1-4 and 1-5 for illustration of the signal system, optical system and gas control system.



1. Hollow cathode lamp power 2. supply *6*8

- 3. Lamp holder step motor
- 5. Slit step motor
- 7. Step motor drive
- 9. Beam splitter
- 11. Monochromator
- 13. photomultiplier tube
- 15. Microcomputer
- 17. Computer system

- D2 lamp power supply
- 4. Lifting platform step motor
- 6. Wavelength step motor
- 8. Hollow cathode lamp
- 10. Atomization system
- 12. Negative high voltage
- 14. Front mounting
- 16. Gas flow adjustment
- 18. DC constant voltage power supply

Figure 1-3 Signal System of 4530F



Figure 1-4 Optical System of 4530F



Figure 1-5(a) Gas System of 4530F

Overview General Information

Technical Specifications

1. Monochromator

Туре:	Czerny-Turner
Wavelength range:	190.0 nm - 900.0 nm
Wavelength accuracy:	Full range $\leq \pm 0.15$ nm
Wavelength repeatability:	≤ 0.04 nm
Grating blaze wavelength:	250 nm

- 2. Spectrum bandwidth: 0.1 nm, 0.2 nm, 0.4 nm, 1 nm and 2 nm
- 3. Resolution

Two spectral lines of Mn at 279.5nm and 279.8nm can be separated with the spectral bandwidth being 0.2nm.

- 4. Photometer
- * Single beam "AC" system (pulsed light source)
- * Deuterium lamp as continuous spectrum for background correction
- 5. Readings

4-digit display; 5 and 6 digits possible under extended conditions; display of values of absorbance, concentration, emission intensity as well as lamp currents and negative high voltages; printing, plotting and tabulation of readings

Reading types: continuous, peak height and peak area

Signal types: Atomic absorption, background absorption, background correction, emission intensity

Integration time: 0.1 – 60 seconds (0.1 increment)

Scale expansion: 0.1 - 100 times

Absorbance range: -0.1 - 2.000 (Abs)

Wavelength display: 4 digits

Energy display: 2 digits

6. PC menus and functions

* Menus for setting lamp currents, negative high voltages, working wavelengths and other conditions

* Variable wavelength scanning rates, automatic peak finding, background correction, automatic energy balance, automatic gain, and zero

* Standard concentration calibration of 1-9 points, and slope factor adjustment with a single-point standard sample

* Linear regression, curve fitting, and linear and nonlinear standard addition measurement of 1-9 points

- * Calculation of average accuracy
- * Operation error indication
- 7. Gas control
- * Interlock safety mechanism

 \ast $\;$ Ignition only possible when the gas pressure is normal and the burner is properly installed

- * Selection air-acetylene; and detection and adjustment of gas flow
- * Automatic ignition only possible in the air-acetylene mode

* Automatic shutoff of gas and flame extinguishing in the case of failure or gas supply

- * Ignored operation errors
- 8. Combustion system
- * Premix expansion chamber with explosion protection devices
- * High efficiency glass nebulizer
- 9. Stability

Drift \leq 0.002 Abs/30 min, testing of baseline stability of copper spectral lines at 324.7 nm after half hour of warm-up of the instrument and copper lamp under normal conditions

10. Determination of typical element

Element	Wavelength	Sensitivity/Characteristic	Detection limit
	(nm)	concentration (µg/ml)	(µg/ml)
Cu	324.7	0.02	0.004

11. Accuracy: $\leq 0.5\%$ (AA flame Cu)

12. Power supply 220 V±22 V 50 Hz, 200W

Dimensions and Weight

Dimensions: 4530F Main Device: 700 mm (W) \times 550 mm (D) \times 530 mm (H) (combustion chamber)

Net weight: 80 kg



Figure 1-6 Dimensions of 4530F Atomic Absorption Spectrometer

2

Installation and Testing

Lab

The 4530F atomic absorption spectrometer should be kept in a clean lab room without corrosive substances, with indoor temperatures within 10-30 °C, and relative humanity of air less than 85%.

Workbench and Exhaust Pipes

The workbench should be strong enough and shockproof. The workbench should be flat and have a hole of a diameter of 8-10 cm for drain pipes. See Figure 2-1(A) for the workbench dimensions, and arrangement of the principal instrument and the accessories, and see Figure 2-1(b) for arrangement of the ventilation equipment.

For servicing purpose, a passageway accessible to one operator should be left behind the workbench.

Moreover, ventilation equipment should be installed 30cm above the combustion chamber to discharge hazardous smoke and corrosive vapors from the flame, for protecting health of operators and elongating the life of the instrument. It is recommended to fabricate the ventilation equipment with stainless steel with dimensions shown in Figure 2-1(B).



1. Workbench2. Power supply for graphite furnace (optional)3. 4530F4. PC5. PrinterFigure 2-1(A) Workbench Dimensions



Figure 2-1(B) Schematic diagram of Ventilation Equipment

Supply of Power, Gases and Water

The lab shall be supplied with single-phase AC power of 220 V \pm 22 V at 50 Hz, and the instrument's earthing terminal should be properly earthed. Considering the use of the instrument, air compressor, accessories and service tools, at least eight sockets (250V/10A 3-core) should be provided, and the outlets should be mounted near the workbench.

If a graphite furnace is used, 220V 30A single-phase AC power at 50 Hz should be provided. To avoid interference with the instrument, the power supply should be separately connected to the junction box and can withstand the maximum load with 250V/30A 3-core sockets. There should be the source of cooling water and drain openings inside the lab. The source of cooling water may be tap water or a circulation and cooling system, with a flow rate no less than 2 L/min. The air compressor should be kept several meters away from the instrument at a well-ventilated and clean place. Keep connection plastic pipes always from heat sources. The user should provide acetylene cylinders with back fire arrangement and N₂O. Such cylinders should be kept at a well-ventilated place without open fire within 3 meters, to avoid accidental inflammation or explosion.

Front Panel and Rear Panel



Figure 2-1(D) Rear View of Instrument

Installation

Installation of the Instrument

Place the instrument on a flat and stable workbench. Align the combustion chamber (Figure 2-2) with the ventilation equipment above. The hole on the workbench should be properly located under the combustion chamber. (See Figure 2-1(a))



1. Safety interlock bolt and detection head	2. Drain pipe	3. Mixed gas pipe
4. Burner (50 mm or 100 mm)	5. Automatic lifting platform	6. Expanded gas pipe
7. Nebulizer	8. Igniter	9. Pressing disc

Figure 2-2 Combustion Chamber

- 1. Attach one end of a drain pipe in an appropriate length onto the drain outlet of the premix chamber. The other end should run through the holes on the bottom plate of the burner, the bottom plate of the entire instrument and the hole of the workbench.
- 2. Place the base of the premix chamber onto the automatic lifting platform of the burner, and fix it with the screws on the base.
- 3. Attach a single-slit burner of 100 mm (or 50 mm) on the neck of the premix chamber, and completely insert the safety interlock bolt into the bolt hole if the gas is needed.

- 4. Arrange the drain pipe under the workbench into a ring with a diameter of 100 mm and fix it with wires, the discharge end of the pipe should be inserted into a plastic container.(Attention: Do not fold or twist the drain pipe.)
- 5. Connect the mixed gas pipe on the left of the combustion chamber to the premix chamber, and attach it by hand. Then use a 10-mm open mind wrench to fasten it.

Installation of Nebulizer

A: Glass Nebulizer

- 1. Unfasten the screws on the end cover, and lift up the pressing disc.
- 2. Place the nebulizer in the end cover, and press tight the pressing disc.
- 3. Connect the expanded gas pipe on the right of the combustion chamber to the inlet of the nebulizer, and attach it by hand. Then use a 10-mm open mind wrench to fasten it.
- 4. Place a polyethylene capillary tube onto the metal capillary tube at the inlet of the nebulizer.

B: Stainless Steel Nebulizer

- 1. Remove the front end cover of the premix chamber.
- 2. Insert the dispersion ball onto the adjustment lever on the end cover; align the center of the dispersion ball with the center hole of the end cover; and fix it with nylon screws.
- 3. Place a polyethylene plastic capillary tube (φ 1.2×0.3, and 150-200 mm long) onto the metal capillary tube at the inlet of the nebulizer.
- 4. Lift up the pressing disc and place the metal nebulizer; drop the pressing disc and turn tight the screws.
- 5. Connect the expanded gas pipe on the right of the combustion chamber to the expanded gas inlet of the nebulizer, and attach it by hand. Then use a 10-mm open mind wrench to fasten it.

Water Seal

After the premix chamber, combustion chamber, nebulizer and drain system have been installed properly, remove the burner, and inject about 400 ml water from the neck of the premix chamber (See position 2 in the figure below) to make the drain pipe sealed with water, as shown in Figure 2-3. Attach the burner again.



13. Waste liquid

Figure 2-3 Drain System of Premix Chamber

PRECAUTIONS CHECK WHETHER THERE IS WATER SEAL IN THE DRAIN PIPE BEFORE IGNITION EVERY TIME!

Gas Pipes

Connectors to gas pipes are located on the rear of the instrument, as shown in Figure 2-4.



Figures 2-4 Gas Connection

- 1. Connect one end of the air pipe ($\phi 6 \times 1$ nylon pipe) to the air inlet of the instrument, and the other end to the outlet of oilless air compressor via the water separation air filter.
- 2. Connect one end of the acetylene pipe ($\phi 6 \times 1$ nylon pipe) to the acetylene inlet of the instrument, and the other end to a source of clean acetylene.

I.CORRECTLY IDENTIFY GAS SOURCES. NEVER CONNECT TO A
WRONG GAS SOURCE.

- 2. TURN TIGHT SCREWS OF CONNECTORS TO AVOID GAS LEAKAGE.
- 3. DO NOT USE A COPPER PIPE WITH COPPER CONTENT HIGHER THAN 65% TO CONNECT THE SUPPLY OF ACETYLENE. DO NOT USE PIPES WITH OILS TO CONNECT THE SUPPLY OF GASES TO AVOID SELF SPONTANEOUS IGNITION OR EXPLOSION.

Installation and Removal of Chimney

The top part of the combustion chamber of 4530F can be removed from the instrument. To remove the chimney, just lift it up. Attach the chimney by placing it back.

Hollow Cathode Lamp

The lamp chamber is located on the right upper part of the instrument. The lamp holder can house 6 and 8 hollow cathode lamps at the same time. While one lamp is used in testing, it is possible to warm up other lamps. Rotate the lamp holder with the AA workstation software to the testing position, and press the fine tuning bottom to place it into the optimal position.

Installation Procedures:

- 1. Properly insert a hollow cathode lamp into the socket.
- 2. Place the hollow cathode lamp onto the lamp holder.
- 3. See page 4-2 for correction of the light source.

Connection of Cables on the Rear of Instrument

1. RS232 port

The port should be connected with the workstation for control and data processing.

2. Graphite furnace communication port

The port should be connected with the control of the graphite furnace for controlling temperatures of the oven.

3. Power cords

After above connection of cables has been completed, connect the power cords of the instrument and the computer while their power switches are at the off position. See Figure 2-1(D).

Introduction to Workstation

Software Installation

Hardware and Software Specification

- Windows 98/NT/ME/2000, with Windows NT recommended
- Hard disk of 10G or above
- RAM 128 M or above
- 17" or larger color display, with resolution of 1024×768 or above

Software Installation

The software installation is simple for the 4530F atomic absorption spectrophotometer. Just follow the steps under Windows OS. Steps are as below:

Insert the installation CD supplied for the AA workstation. Open the Windows Explorer, and select D:\AAsetup\disk1\setup as shown in the figure below:



5 4530 Setup	
	Welcome to the installer for 4530 1.0. It is strongly recommended that you exit all Windows programs before continuing with this installation. If you have any other programs running, please click Cancel, close the programs, and run this setup again. Otherwise, click Next to continue.
_	KBack Next> Cancel
Click	Next
4530 Setup License Agreement Please read the following license a	agreement carefully.
Insert your license agreement text	here
 I agree to the terms of this lice I do not agree to the terms of term	nse agreement his license agreement
	< <u>₿</u> ack <u>N</u> ext> <u>Cancel</u>
	ext



User Information	
Enter your user information and click Next to continue.	
Name:	
spsic	
Company:	
spsic	
< Back Nex	(t > <u>C</u> ancel
Click Next	
-	

		20	GENHIE-MINAL
nstallation Folder	to be installed?		
Where Would you like 4000	to be installed :	1	
The software will be installed new path, or click Change to	d in the folder listed below. To se o browse for an existing folder.	lect a different location	ı, either type in a
nstall 4530 to:			
c:\4530			C <u>h</u> ange
Space required: 3.60 MB			
Space available on selected	drive: 7.28 GB		
		(I
	< Back		Lancel
4530 Setup	Click Next		1
4530 Setup Nortcut Folder Where would you like the sh	Click Next		
4530 Setup hortcut Folder Where would you like the sh The shortcut icons will be cr folder, you can either type a	Click Next nortcuts to be installed? reated in the folder indicated bel new name, or select an existing	ow. If you don't want to folder from the list.	use the default
4530 Setup Abortcut Folder Where would you like the sh The shortcut icons will be cr folder, you can either type a Shortcut Folder:	Click Next nortcuts to be installed? reated in the folder indicated bel new name, or select an existing	ow. If you don't want to folder from the list.	use the default
A 4530 Setup A hortcut Folder Where would you like the sh The shortcut icons will be cr folder, you can either type a Shortcut Folder: 4530	Click Next nortcuts to be installed? reated in the folder indicated bel new name, or select an existing	ow. If you don't want to folder from the list.	use the default
4530 Setup Abortcut Folder Where would you like the sh The shortcut icons will be or folder, you can either type a Shortcut Folder: 4530 Install shortcuts for curre Make shortcuts available	Click Next nortcuts to be installed? reated in the folder indicated bel new name, or select an existing ent user only le to all users	ow. If you don't want to folder from the list.	use the default
A 530 Setup A 530 Setup A 54530 Setup A 54530 Setup A 54530 A 5453 A 545	Click Next nortcuts to be installed? reated in the folder indicated bel new name, or select an existing ent user only le to all users	ow. If you don't want to folder from the list.	use the default

Introduction to Workstation **Software Installation**

5 4530 Setup	\mathbf{X}
Ready to Install You are now ready to install 4530 1.0	XX
The installer now has enough information to install 4530 on your computer.	
The following settings will be used:	
Install folder: c:\4530	
shortcut rolder: 4530	
Please click Next to proceed with the installation.	
< <u>B</u> ack <u>N</u> ext >	<u>C</u> ancel
4530 Setup Installing 4530 Please wait	
Installing Files c:\4530\Elements.mdb]
	<u>Cancel</u>
Click Next	



Now, the software of AA workstation has already been installed!

Now, install the database program DAO for the workstation to work.

Install the DAO program. Select daosdk \disk1 \setup, as shown in the figure below:

Jdaosdk File Edit View Eavorites	Tools Help			
A Back + A -	Search C Folders			
		1.0.0		
Addiress U D:(4530(daosok	~ ~	~		a 0
File and Folder Tasks	DISK1		DISK2	
Make a new folder	Size: 1.12 Files: DAG	MB DCORE 1. DAOMIN.ISS. DISK1.ID	NOSDK ISS. SETUP EXE.	
Web				
Other Places	(*)			
6 4530				
My Documents Shared Documents				
My Computer				
S My Network Places				
Details	*			
becomp				
				-
-↓	-			
DISK1	Tarla Urla			
File Edit view Pavorites				
G Back • O • D	Search 16 Folde	rs ·		
Address D:\4530\daosdk\D	JSK1			Go 🔁
File and Folder Tasks		32I	LIB File	
Rename this file	291 K			
Copy this file	5ETU 2.20.0 Setup	P.DLL 200.0 Launcher Resources	1 File	
Publish this file to the V	Veb			
E-mail this file	ISS FI	e 1	ID File	
^		(155	SETUR	
Other Places	ISS Fill ISS Fill 1 KB	•	Setup Launcher (SETUP.EXE) Stirling Technologies, Inc.	
aosdk 🔁	SETUR			-
My Documents	Intern 11 KB	et Communication Settings	ISS F Description: Setup Launcher (SETUP.EXE) 1 KB Company: Stirling Technologies, Inc.	
My Computer	SETUR	.PKG	File Version: 2.20.903.0	
My Network Places	PKG F 1 KB	le 🛄	Insta Size: 46.5 KB Stirling Technologies, Inc.	
Details	(¥)			
D'LLUD				
	Click Nex	t		
÷.				

Introduction to Workstation **Software Installation**



Introduction to Workstation **Software Installation**



DAO has been installed!

Now, the installation of the 4530F workstation is complete.

Hardware Installation



Rear View of Connection between the Instrument, Printer and PC

Connection of Power Supply

Connection between the Instrument and PC

Connect one end of the cable to a serial port of the PC, and the other end to the RS-232 port of the instrument.

PRECAUTIONS ALL HARDWARE CONNECTION AND INSTALLATION ACTIVITIES DESCRIBED ABOVE SHOULD BE DONE WHILE THE 4530F INSTRUMENT AND PC ARE TURNED OFF; OTHERWISE, CERTAIN COMPONENTS OF MAY BE DAMAGED.
4

Work with Workstation

Start Equipment

- 1. Turn on the power of the computer.
- 2. Select the icon as shown in Figure 4-1. Double click to open the workstation, and a dialog box will appear as shown in Figure 4-1(a).



Figure 4-1



Figure 4-1(a)

3. Turn on the power of the instrument, which will start self-test, as shown in Figure 4-2.





ATTENTIONIf you want to view measurement results which have been stored in
the offline state, press the Offline button when opening the
workstation. Close the self-test dialog, and data files can be accessed.If you want work online in connection with the instrument, restart
the workstation.

4. After the self-test, the screen is as shown in Figure 4-3.

Communication Port	Pass
Wavelength	Pass
Slit	Pass
Lamp Holder Position	Pass
OK	Off Line
Figure 4-3	

ATTENTION

If any self-test item fails (as shown in Figure 4-4), restart the workstation. If the self-test item fails again, please immediately contact our After-Sale Service.

	5
Communication Port	Pass
Wavelength	Pass
Slit	Fail
Lamp Holder Position	Pass
OK	Off Line

Figure 4-4

5. Press "OK", and the screen is as shown in Figure 4-5.



Figure 4-5

You can select desired test conditions and methods here.



Figure 4-6

Set Password of Workstation

1. Select "System settings > System information" from the menu bar, as shown in Figure 4-7, and a dialog will appear as shown in Figure 4-8.

R AA WorkStation					- E 🛛
File(E) Condition setting(S) Help(E)	ystem setting				
🌾 🛷 블 🛚 Zer	Favelength correction	Си			
Keck Occasillatory	1.750 b 1.500 1.220 0.550 0.550 0.050 0.050 0.050	10	20	20	e
Ges: 1.00 Oxfd ges: 0.00	Ho Name Abca	Canc B5 (SI(t))		Hlask Standard Dample Herrard Call standard	



Company	Password
Operator	Password Again
Password required or not?	
OK	Cancel



2. Check the box next to "Password required or not", and enter the password and re-enter the password for confirmation. See Figure 4-9.

Company	Password

Operator	Password Again

☑ Need Password?	
OK	Cancel

Figure 4-9

- 3. Press "OK" to save the password.
- 4. Thereafter, a dialog will appear as shown in Figure 4-10 every time the workstation is started. Enter the correct password and press "OK", before the instrument can start self-test.

Password		
	OK	Cancel
	Figure	e 4-10

ANTTE	NTION

You may set a desired password for the 4530F workstation based on your needs, or just designate no password.

If you forget your password, reinstall the workstation's software.

Functions of Method Establishment Dialog

The "Method establishment" dialog has tags for "Instrument parameters", "Correction curve and slope factor readjustment parameters", and "Flame atomizer parameter setup" or "Graphite furnace atomizer parameter setup", as shown in Figure 4-11.

	In	istrument paramet.	ers	
Periodic table Element Cu V HCL (mA): 2.00	Emission D2 0.00 (mA)	Signal method aa-absorp bg-absorp bg-correc	atomic method Flame C Graphite C H2	Lamp holder © 1 Cu C 2 Mn C 3 As C 4 Mn C 5 Cs C 6 Cd C 7 Hg C 8 Cu
NRV (V): 220 Wave (xm): 324.80 💌	C Self-absor	de C D2 mode	Read method C peak hei C peak are	Lift setting Lamp warm-up
nteggrate-T 2.0 📑	Slit C 0.1 @ C 1.0 C	0.2 C 0.4 2.0	(continuo	Martin

Figure 4-11

Instrument Parameters

1. Element selection: Two methods can be used for element selection. One is clicking the "Periodic table of elements" as shown in Figure 4-11, and a periodic table of elements will appear as shown in Figure 4-12.



Figure 4-12



Figure 4-13

- 2. Select and click on an element with the mouse. The selected element will be shown on a highlighted position, as shown in Figure 4-13.
- 3. Press "OK" to close the "Periodic table of elements" box, with Cu being selected. If you press "Cancel" to close the "Periodic table of elements" box, no element has been selected.

4. The other method is moving the cursor to the "Element selection" pulldown list to select a element by clicking on it, as shown in Figure 4-14.





ATTENTION

Atomic absorption methods are not suitable for analysis of nonmetal elements. If no analysis conditions are available for a selected element, no analysis will be conducted.

5. Wavelength selection: The default wavelength is the main sensitive line of the selected element. If another sensitive line is necessary, move the cursor to the "Wavelength" pull-down list and select a wavelength by clicking on it, as shown in Figure 4-15.



Figure 4-15

 Negative high voltage selection: Enter the desired value into the "Negative high voltage" field. The range of negative high voltages is 0 – 700 V, as shown in Figure 4-16.



Figure 4-16

 Lamp current selection: Enter the desired value into the "Lamp current" field. The range of lamp currents is **0 – 12mA.**See Figure 4-17.

	Ins	trument paramete	er 5	
Periodic table Element Cu V HCL (mA): 00	D2	-Signal method	atomic method Flame C Graphite C H2	Lamp holder © 1 Cu C 2 Mn C 3 As C 4 Mn C 5 Cs C 6 Cd C 7 Hg C 8 Cu
NHV (V): 220	Background mod	e C D2 mode	Read method	Lift setting
integgrate-T 2.0	Slit C 0.1 © 0 C 1.0 C 1	0.2 C 0.4 2.0	C peak are	Lanp warm-up

Figure 4-17

8. Signal types: Signals have three types, atomic absorption, background absorption, and background correction. Select any type of the radio boxes (The dot in the box indicates being selected), as shown in Figure 4-18.

	Instrument para	neters	
Periodic table Element Cu ▼ HCL (mA): 2.00	Emission 12 0.00 (mA)	nod - tomic method P Flame Graphite C H2	Lamp holder (* 1 Cu C 2 Mn (* 3 As C 4 Mn (* 5 Cs C 6 Cd (* 7 Hg C 8 Cu
NHV (V): 220 Wave (nm): 324.80 💌	Background mode C Self-absorj C D2 mode	Read method C peak hei	Lift setting
nteggrate-T 2.0 🔆	Slit C 0.1 © 0.2 C 0.4 C 1.0 C 2.0	C peak are	

Figure 4-18

- 9. Display after selection of a signal type:
 - a. After "Atomic absorption" is selected as shown in Figure 4-19, the field for deuterium lamp current is gray. The fields for background mode are also grey, and the radio boxes for emission are selectable (Selection of these boxes are optional).

			٦	
Periodic table Element Cu v HCL (mA): 2.00 NHV (V): 220	Emission D2 0.00 (mA) Background mod	Signal method	atomic method Flame Graphite H2 Read method C peak hei	Lamp holder
Wave (nm): 324.80 💌	Slit C 0.1 C 0 C 1.0 C 2	0.2 0 0.4	C peak are © continuo	Lamp warm-up

Figure 4-19

b. After "Background correction" is selected as shown in Figure 4-20, the fields for the background mode and deuterium lamp current are enabled, while the radio boxes for emission are disabled.

	Instrument paramet	ers	
Periodic table Element Cu 💌 HCL (mA): 2.00	D2 lamp: 40 (mA) Signal method C as absorp G bg absorp C bg correc	atomic method Flame C Graphite C H2	Lamp holder • 1 Cu • 2 Mn • 3 As • 4 Mn • 5 Cs • 6 Cd • 7 Hg • 8 Cu
NHV (V): 220 Wave (nm): 324.80	Background mode C Self-absorj 🙃 D2 mode	C peak hei	Lift setting Lamp warm-up
nteggrate-T 2.0	Slit C 0.1 © 0.2 C 0.4 C 1.0 C 2.0		

Figure 4-20

c. After "Background absorption" is selected as shown in Figure 4-20, the radio boxes for emission and the field for deuterium lamp current are enabled, while the self-absorption mode is disabled, as shown in Figure 4-21.

	In	strument paramet	ers	
Periodic table Element Cu HCL (mA): 2.00	Emission D2 lamp: 40 (mA)	Signal method C aa-absorp C bg-absorp C bg-corred	atomic method Flame C Graphite C H2	Lamp holder • 1 Cu
NHV (V): 220 Wave (nm): 324.80 •	C Self-absorp	e • D2 mode	Read method	Lift setting
nteggrate-T 2.0	Slit C 0.1 C C 1.0 C	0.2 C 0.4 2.0	C peak are	

Figure 4-21

10. Deuterium lamp current: The deuterium lamp current varies in the following conditions:

a. After "Atomic absorption" is selected, the field for deuterium lamp current is grey.

b. After "Background correction" is selected, there are two possibilities:

1) If "Deuterium lamp" is selected for the background mode, just enter the current value in the field. The range of current is 12 – 110mA, as shown in Figure 4-22.

		_	
Periodic table Element Cu HCL (mA): 2.00 NHV(V): 220	Emission D2 lamp: 40. Background mode	atomic method Flame Graphite H2 -Read method	Lamp holder © 1 Cu
Wave(nm): 324.80 💌	⊂ Self-absorj 💽 D2 mode	C peak are.	Lamp warm-up
integgrate-T 2.0 🔅	Slit C 0.1 © 0.2 C 0.4 C 1.0 C 2.0	(continuo	- Int

Figure 4-22

 If "Self-absorption" is selected for the background mode, the "Deuterium lamp current" automatically changes into the "Selfabsorption current" field. Just enter the desired current value into the field, as shown in Figure 4-23. The range of current is 0-14mA.



Figure 4-23

c. After "Background absorption" is selected for the signal type, the field for deuterium lamp current is enabled; and then enter the current value into the field.



Figure 4-24

11. Slit: There are five radio boxes (0.1, 0.2, 0.4, 1.0 and 2.0) for the slit, and only one option can be selected.

	In	strument paramet	ers	
Periodic table Element Cu - HCL (mA): 2.00	Emission D2 0.00 (mA)	Signal method aa-absorp bg-absorp bg-correc	atomic method Flame C Graphite C H2	Lamp holder • 1 Cu C 2 Mn C 3 As C 4 Mn C 5 Cs C 6 Cd C 7 Hg C 8 Cu
NHV (V): 220 Wave (nm): 324.80 🗸	-Background mo C Self-absorp	de C D2 mode	Read method	Lift setting
integgrate-T 2.0 🛨	Slit C 0.1 @ C 1.0 C	0.2 C 0.4 2.0	C peak are	Sang hain up

Figure 4-25

12. Lamp holder position: There are eight radio boxes (1, 2, 3, 4, 5, 6, 7 and 8) for the lamp holder position, and select one option for the position, as shown in Figure 4-26.

	In	strument paramet(ers	
Periodic table Element Cu v HCL (mA): 2.00	Emission D2 0.00 (mA)	Signal method aa-absorp bg-absorp bg-correc	atomic method Flame Graphite H2	Lamp holder • 1 Cu · C 2 Mn C 3 As · C 4 Mn C 5 Cs · C 6 Cd C 7 Hg · C 8 Cu
NHV (V): 220 Wave (rum): 324.80 💌	Background mo	de C D2 mode	Read method C peak hei	Lift setting Lamp warm-up
nteggrate-T 2.0 🔆	Slit C 0.1 © C 1.0 C	0.2 C 0.4 2.0	© continuo	- And

Figure 4-26

13. Press the "Lifting platform settings" button to display the "Lifting platform" dialog as shown in Figure 4-27. Press "◄", "▶", "▲" and "▼" buttons or directly enter the coordinates to adjust the position of the lifting platform. The range of forward and backward movement is 0~250, and the range of upward and downward movement is 0~250.



Figure 4-27

14. After startup, the instrument automatically makes the lifting platform stay at the previous position. Press the initialization button if necessary, and make further adjustment with the "◄", "▶", "▲" and "▼" buttons as section 13.

15. If the instrument has a flame device, as shown in Figure 2-2, the "Flame" method is enabled. If the instrument has a graphite furnace, the "Graphite furnace" method is enabled. See Figure 4-28.

	Iı	istrument paramet	ers	
Periodic table Element Cu • HCL (mA): 2.00	D2	-Signal method aa-absorb bg-absorb C bg-correc	atomic methol Flame Graphite H2	Lamp holder C 1 Cu C 2 Mn C 3 As C 4 Mn C 5 Cs C 6 Cd C 7 Hz C 8 Cu
NHV (V): 220 Wave (nm): 324.80 -	Background mo	de C D2 mode	Read method	Lift setting
nteggrate-T 2.0 📑	Slit C 0.1 @ C 1.0 C	0.2 C 0.4 2.0	C peak are	

Figure 4-28

16. Reading types: Three types of readings are available, peak height, peak area and continuous type, as shown in Figure 4-29, which can be selected depending on different tests.

method setting Correction curve and s	:lope factor readj In	ustment paramete strument paramet	rs Flame at ers	.omizer parameters setup
Periodic table Element Cu HCL (mA): 2.00	Emission D2 0:00 (mA)	Signal method aa-absorp bg-absorp bg-correc	atomic method Flame C Graphite C H2	Lamp holder C 1 Cu C 2 Mn C 3 As C 4 Mn C 5 Cs C 6 Cd C 7 Hg C 8 Cu
NHV (V): 220 Wave (nm): 324.80 💌	Background mod	le C D2 mode	Read method C peak hei C peak are	Lift setting Lamp warm-up
Integgrate-T 2.0 🔅	Slit C 0.1 © C 1.0 C	0.2 C 0.4 2.0	© continuo	
				OK

Figure 4-29

ATTENTION

Generally, if the flame method is applied, the "Continuous" reading type can be chosen.

17. Press "Lamp warm-up", and the screen is as shown in Figure 4-30.Select one or multiple lamps for warming up.



Figure 4-30

- 18. Save method: After above parameters have been set:
 - a. Select "Save method" in the "File" menu, as shown in Figure 4-31.

MAA WorkStatic										
File(E) Condition get	ting(S) Help(H) S	ysten settin	a							
New (N)	Ctrl+N	1								
Call actived		1								
Save method										
Save data(S)	Ctrl+S									
Direct print (D)		1.750 b								
Print (P)	Ctrl+P	8 600								
Preview(W)										
Frint setting(g)	inted(F)	1.250								
Save template (M)	ancoargenti									
Set up gerial port										
Exit (g)		0.750								
🖉 🖉 🖤	1	0.000								
<u>/</u>		0.290								
		0.000								
Inject method	Atomizer	0.000		10		20		30	40	
Manual 🗾	Flame 💌							C		
	Atomizer set							Conc		
Gas, 0.0										
Oxid gas: 0.0		No	Nane At	s Conc	BG SD	(%) RSD(%)	renark +	Blank	1	
								- Didilk	_	
								Standard		
								Sample		
(
								Reread	1	
물								11616.80	_	
							•	Call standa	ird	



b. The "Display information" dialog will appear as shown in Figure 4-32. The dialog displays the instrument conditions you have set.

Figure 4-32

🔯 AA WorkStation				đΧ
File(F) Condition setting(S) Help(H) System setting				
🌾 🐟 블 <table-cell> Zero</table-cell>				
Mod∢ Quantitativy.▼ Setting Adjust Zero	1 000 0 875 0 825 0 825 Save As			
acter and a comparison	Save in: 4530GF-E AA4530-3.0 hip Adjust int Communication ib Dota prink Dota Release Drawlew ines		16.000 20.000	
Inject method Atomizer Manual Atomizer Atomizer	File name: Semple Save as type: Sample Files(*.dat)	Save Cancel	RSD(%) remari	<u> </u>
Gas: 0.0 Oxid gas: 0.0			Standard Sample Reread	
			Call standar	d



c. Press "Save" and the "Save as" dialog will appear as shown in Figure 4-33. Enter the file name and press "Save". 19. Call criteria:

a. Press the "Call criteria" button, as shown in Figure 4-35.The "Open" dialog will appear as shown in Figure 4-35-1.



Figure 4-35



Figure 4-35-1

b. Select the file to be opened, and press "Open" to go to the "Display information" dialog. The dialog displays the saved standard sample. Press "OK" to enter the standard sample. See Figure 4-35-2.



Figure 4-35-2

c. After the standard sample has been entered, you can start test samples.

Correction Curve and Slope Factor Readjustment Parameters

 Equation selection: The pull-down list contains seven methods (linear method, curve correction, linear standard addition, curve standard addition, direct reading of absorbance, single-point method and standard deviation). Select the desired method from the list, as shown in Figure 4-36.



Figure 4-36

2. Average times: Enter a proper value within the range of 1-21. There are two methods for entering the average times. You may directly enter the value of average times. Alternatively, you can select the value by pressing the up and down arrow buttons.



Figure 4-37

3. Significant digits: Enter a proper value within the range of 1-4, as shown in Figure 4-37. The methods for entering the value are similar to those for entering the average times.

- 4. Concentration unit: The default concentration unit is mg/L. Alternatively, press "▼" to select the desired unit, as shown in Figure 4-37.
- 5. Expansion: Enter the desired scale expansion times (0.1-30) in the field, as shown in Figure 4-37.

- 6. Whether slope factor readjustment is required: The setting is deselected by default. If slope factor readjustment is required, check the box, as shown in Figure 4-37.
- Standard blank correction: The setting is deselected by default. If standard blank correction is required, check the box, as shown in Figure 4-37.
- 8. The concentration of standard samples must be entered in the table on the right for other test methods except direct reading of absorbance. The concentration of standard samples must be entered in the table on the right for other test methods except direct reading of absorbance (The concentration of 9 standard samples can be entered in maximum).The table for linear standard addition method and curve standard addition method is as shown in Figure 4-39 (The concentration of 8 standard samples can be entered in maximum).

method setting			
Correction curve and slope fact Equation linear Average 3 == Digits 3 == Conc unit mg/L = Expansion 1.0 Slope readjust required?	Instrument param or readjustment param Name Elski Svil	neters eters Flame atomi andard blank correction onc	zer parameters setup
			OK

Figure 4-38

orrection curve and slope fact	Instrumen or readjustmen	nt parameters t parameters	Flame atomizer parameters setup
Equation Linear		🔽 Standard bl	ank correction
	Name	Conc	
Average 3 🕂	Blank		
2	Std1		
n' in land	Std2		
Digits 3 🗔	Std3		
	Std4		
Conc unit mg/L 💌	St d5		0
	Std6) (a
Expansion 1.0	Std7		1 X -3
	St d8		l l oʻ
Slope readjust required?	Std9		
		1	
1			

Figure 4-39

Flame Atomizer Parameter Setup

1. The screen of "Flame atomizer parameters" is as shown in Figure 4-40.



Figure 4-40

- 2. Enter a proper value within the range of 0-6 for the fuel gas.
- 3. Two modes are available, "Air-acetylene", as shown in Figure 4-41. The mode must be determined before ignition.

Correction curve and slope factor r	Instrument parameters eadjustment parameters	Flame atomizer parameters setup
Gas:L/Min 1.00	d Workmode	Air-acetyle - Air-acetylen Mir-acetylene Mitrovs oxide
Gas connection state: C A N 50 A F O 2 I 2 mm G 1 t H R O h A a h 2 e S m		4 10 2 5 Ges Agas
d e Detect Detec	t leakIgnite	Oxid gas
		OK

Figure 4-41

- 4. For gas connection state, the green indicators mean the normal state, and red indicators mean abnormality, as shown in Figure 4-41.A prompt dialog will appear if abnormality exists.
- 5. The "Detect" button is for detecting the flow rates of gases. Press "Detect" before ignition, and the gas flow rates will be shown (Attention: the flow rates shown for your instrument may be different from those shown in the figure).

6. Press "Detect leakage" to check the gas connection, as shown in Figure 4-42. After detection, press "Stop detection" to return to the screen as shown in Figure 4-41. See details in "Ignition Operation".



Figure 4-42

Light Source Correction

Take a copper lamp for example, and lamp 1 is the one currently being used.

1. Press "Instrument adjustment" to show a dialog as shown in Figure 4-43.

Instrument adjustment	
Manual Find peak Zero Balance Wave(nm) 324.80 $\stackrel{.}{\sim}$ Send NHV(V): 220 $\stackrel{.}{\sim}$ Send	100 80 60 40 0
Lamp holder adjustment More parameters OK	324.3 AA

Figure 4-43

2. Press the "More parameters" button in the dialog to enter the "Instrument parameters" screen. For example, an element Cu is selected; the wavelength is 324.8 nm; the negative high voltage is 200 V; the current is 2.0 mA; and the slit is 0.2 nm. See Figure 4-43a.

		strument paramet		
Periodic table Element Cu • HCL (mA): 2.00	Emission D2	Signal method aa-absorp C bg-absorp C bg-correc	atomic method Flame C Graphite C H2	Lamp holder • 1 Cu 2 Mn • 3 As 4 Mn • 5 Cs 6 Cd • 7 Hz 8 Cu
NHV (V): 220 Wave (nm): 324.80 👻	Background mo	de C D2 mode	Read method	Lift setting
nteggrate-T 2.0 👘	Slit C 0.1 @ C 1.0 C	0.2 C 0.4 2.0	(peak are-	

Figure 4-43a

3. Press "OK", and the screen is as shown in Figure 4-44. Press "Find peak" for automatically finding the center of the wavelength.

Find peak Zero	
	100 -
Balance	80
Wave(nm)	60
324.80 <u>·</u> Send	
NHV[V]:	40
220 - Send	20
	324.3
Lamp holder adjustment	

Figure 4-44

If the energy indication is close to zero, increase the lamp current and the negative high voltage, or press "Lamp holder adjustment" to adjust the position of the lamp holder.



If the energy indication is not within the green zone, press "Zero" or increase the negative high voltage, for the energy indication to fall within the green zone.



If the energy indication outflows, decrease the negative high voltage to refind the peak until the energy indication to fall within the green zone, and the peak is the optimal absorption peak of the element.



As shown in the figure on the left, the energy indication is in an optimal

state.

4. The light source correction is completed.

Ignition Operation

Burner Position Adjustment

The route and position of the light beam from the hollow cathode lamp in the flame can significantly affect the sensitivity of the system. The slit of the burner should be parallel to and slightly lower than the optical axis of the instrument. Detailed steps are given below:

1. Press "Instrument adjustment" to show a dialog as shown in Figure 4-45.

Instrument adjustment	
Manual Find peak Zero Balance Wave[nm] 324.80 \div Send NHV[V]: 220 \div Send	100 80 60 40 20 0 324.3
Lamp holder adjustment	AA
More parameters	BC
ОК	Du

Figure 4-45

2. Press "More parameters" to show a dialog as shown in Figure 4-46.

	In	strument paramete	ers	•
Periodic table Element Cu v HCL (mA): 2.00 NHV (V): 220	Emission D2 0.00 (mA) Background mod	Signal method aa-absorp C bg-absorp C bg-correc e C D2 mode	atomic method Flame C Graphite C H2 Read method C peak hei	Lamp holder (* 1 Cu (* 2 Mn) (* 3 As (* 4 Mn) (* 5 Cs (* 6 Cd) (* 7 Hg (* 8 Cu) Lift setting
Wave (nm): 324.80 💌	Slit C 0.1 (* C 1.0 (*)	0.2 C 0.4 2.0	C peak are	Lanp warm-up

Figure 4-46

3. If you need to adjust the position of the lifting platform, press the "Lifting platform settings" button to display the "Lifting platform" dialog as shown in Figure 4-47.



Figure 4-47

- 4. Make further adjustment with the "◄", "▶", "▲" and "▼" buttons (After startup, the instrument automatically makes the lifting platform stay at the previous position).
- 5. Operation: Place the light check board on the slit of the burner; you may press "◄", "▶", "▲" and "▼" buttons to adjust the burner (The range of forward and backward movement is 0~250, and the range of upward and downward movement is 0~250) to align the light spot center with the center line of the light check board; the light spot center should be at about 5 mm on the light check board.(This data varies for different elements)

Ignition

PRECAUTIONS CHECK WHETHER THE WATER SEAL EXIST IN THE DRAIN PIPE BEFORE EACH TIME OF IGNITION!

Connect the gas pipes as shown in Figure 4-48.



Figure 4-48

Check Gas Connection

The entire gas connection must be inspected before ignition during installation and testing, to avoid gas leakage. Periodically inspect the gas connection thereafter. See Figure 4-49.



1. Safety interlock bolt and detection head	2. Drain pipe	3. Mixed gas pipe
4. Burner (50 mm or 100 mm)	5. Automatic lifting platform	6. Expanded gas pipe
7. Nebulizer	8. Igniter	9. Pressing disc
	Figure 4-49	

Inspection Procedures:

- 1. Connect the pipes by referring to Figure 4-19 for the gas connection diagram. Turn on the acetylene pressure reducing valve until the output pressure is adjusted to be 0.1MPa. Turn off the acetylene pressure reducing valve.
- 2. Rotate off the two gas pipe connectors in the combustion chamber from the premix chamber (item 3 and 6 shown in Figure 4-49), and connect them with a connector. Rotate them tight.

3. Turn on the air compressor, and adjust the output pressure to be 0.3MPa. Adjust the internal stabilization pressure of the pressure stabilization valve to be 0.2MPa within the instrument. Turn on the power of the gas connection. Turn on the needle valve of acetylene. Pressure the "Detect leakage" button and turn off the pressure stabilization valve tight. It is required that the internal pressure of the instrument should be decreased to below 0.02 Pa; otherwise, there is leakage in the gas connection.

PRECAUTIONS DO NOT WORK WITH GAS CONNECTION WITH LEAKAGE, OTHERWISE SAFETY ACCIDENTS MAY OCCUR.

Air-Acetylene Ignition

- 1. Turn on the air compressor, and adjust the pressure to be 0.3MPa. Turn on the acetylene cylinder, and the output of the pressure reducing valve should not exceed 0.1MPa.
- 2. As shown in Figure 4-50a, press the "Atomizer settings" to enter the "Flame atomizer parameters" screen. See Figure 4-50b.

File(2) Condition setting(2) Help(3) System setting	-
🌾 🐟 블 🕷 Zoro 🔟	
Mask Country 100 Appen Zerre 100 Appen Zerre 100 200 100 200 100 200 100 200 100 200 100 200 100 200 100 200 100 200 100	
Inject method Atomizer 0000	-
Manual Thane de 10 20 20 40	
Atomizer set	

Figure 4-50a

		Instru	ment parameters	Riona atomiza	
Correction curv	e and slope f	actor readjustm	ent parameters	Flame atomize	er parameters setu
Gas:L/Min	1.00	Send	Workmode	Air-acetyle 💌	
Agas:L/Min	0.0			6	L/M - 15
				1	1
<i>c</i>				4	10 -
- Gas connection	state.				4
				2_	5_
2 I mm (F U				
нк п. н. 2 е 5	ka h Sm			Gas	Agas
a. d	e		<u> </u>	1000	
				-Oxid ga	s
Det	ect	Detect leak	Ignite	• Ai	r C N20



3. Enter a proper value in the "Fuel gas" field, or move the cursor onto the arrows. Press the up arrow to increase the value (larger flow rate), or press the down arrow to decrease the value (lower flow rate). Press the "Ignite" button until the flame appears. When a flame is just ignited, the flame is high. See Figure 4-50c.The flame will reach the normal state after a few minutes. See Figure 4-50d.

Work with Workstation Ignition Operation



Figure 4-50c



Figure 4-50d

- 4. If ignition fails after the "Ignite" button is pressed. You may appropriately increase the flow of acetylene.
- 5. After the flame is ignited and retain stable, you may change the flow of acetylene at any time.
- 6. Press "OK" to close the dialog.
Flame Adjustment

After the flame is ignited, the proportions of the fuel gas and the combustionsupporting gas can changed by adjusting the flow rates of the gases (In the air-acetylene mode, the fuel-lean flame gives off blue light with high temperatures, and the fuel-rich flame gives off yellow light with low temperatures).The nitrous – acetylene flame should have a red lampwick of 1-2 cm. The state of flame should be adjusted based on actual requirements on the test elements.

AA Flame Extinguishing

- 1. After the analysis activities have been completed, spray deionized water for cleaning. If an organic solvent is used, also clean the burner after the flame is extinguished.
- 2. Turn off the master switch of the acetylene cylinder and the pressure reducing valve. Only turn off the air compressor after the flame is extinguished. In the case of a nitrous flame, it is recommended to press the "Atomizer settings" to enter the "Flame atomizer parameters" screen, select the "Air-acetylene" mode, and select "Extinguish".
- 3. If the instrument is to be left unused for a period of time, turn off the sources of air, acetylene, etc, and press the "Inspect" button to allow the residual gases in pipes are empted.

ATTENTION If an error prompt is shown during or after ignition, please immediately extinguish the flame and contact our After-Sale Service.

Cleaning of Burner Slit

When the burner is burning, an even flame should exist along the entire slit. If the flame is uneven or even saw-toothed, it indicates that the burner has accumulated carbon which should be cleared. In such case, extinguish the flame, and fold a piece of filter paper and insert it into the slit. Repeatedly and slightly clean the interior sides of the slit until the accumulated carbon has been removed.

If the abovementioned cleaning method is ineffective, remove the burner for cleaning according to the following steps:

- 1. Pull out the bolt of the burner from the bottom plate of the combustion chamber, and pull the burner off the premix chamber.
- 2. Remove the four screws on the burner base to separate the top side boards of the burner from the base. Then, remove the bolts fixed on the side boards of the burner (Remember the position of the bolts).
- 3. Remove the two screws on the sides of each side board (Remember the position of the gaskets on both sides).
- 4. Immerse the two side boards and the burner base in 5% dilute nitric acid for 30 minutes. Take them out and wash them with tap water. Wash them with deionized water for several times.
- 5. Place a piece of metallographic sand paper on a glass table surface. Place the burning surfaces (i.e. the slit surfaces of the burner) of the side boards on the sand paper, and sand them lightly to make the surfaces smooth and free of accumulated carbon. Then, wash the sanded side boards with deionized water.
- 6. Dip a piece of gauze into ethanol and use it to clean the 6 screws and 2 gaskets.
- 7. Reassemble the parts to their positions (Attention: The side boards and base of the burner must be tightly and evenly fixed without fissure; otherwise the flame may jump from the fissure after ignition).

To avoid/reduce carbon accumulation at the burner when samplesATTENTIONare made, place the sample suction tubes in distilled water and cook
them for 20 minutes before extinguishing the flame.

Cleaning of Burner

Suction and Spraying of Organic Samples

After suction and spraying of organic agents (such as oils and isopropyl acetone), absorbance signals may start to have noise and become unstable. To avoid contaminated water solutions after suction and spraying of organic agents, completely clean the atomization system according to the following steps.

- 1. Suck and spray a blank organic agent for about 5 minutes.
- 2. Suck and spray acetone for 5 minutes.
- 3. Suck and spray 1% HNO3 for 5 minutes.
- 4. Inspect the burner. If there are deposits, remove the burner and clean it with a cleaning solution and a brush.
- 5. Use water to flush the drain pipe. Dispose of the waste liquid according to local regulations.

Suction and Spraying of High-Concentration Copper, Silver or Mercury Salts

AFTER SUCTION AND SPRAYING OF HIGH-CONCENTRATION COPPER, SILVER OR MERCURY SALTS, UNSTABLE ACETYLIDES MAY BE PRECAUTIONS GENERATED AND PRONE TO EXPLOSION WHEN BEING DRY. THEREFORE, EACH TIME AFTER SUCH ANALYSES, SPRAY PURE WATER ON A TIMELY BASIS, COMPLETELY CLEAN THE PREMIX CHAMBER AND DRAIN PIPE, AND VISUALLY CHECK WHETHER RESIDUAL SUBSTANCES HAVE BEEN WASHED OFF FROM THE PREMIX CHAMBER.

Cleaning of Nebulizer and Sample Inlet Capillary Pipe

If absorbance readings remain low after the burner and burner slit have been cleaned, this may be caused by obstruction in the nebulizer or the sample inlet capillary pipe. Suck and spray a pure solution for burning until satisfactory readings are obtained for subsequent standard samples.

If a long sample inlet capillary pipe is used, the suction and spraying flow and sensitivity of samples will be decreased. If the obstruction cannot be cleared through suction and spraying of the solution, it is necessary to clean the sample inlet capillary pipe.

1. Stainless steel nebulizer

Use a ϕ 0.3-mm wire to clear solid particles from the capillary pipe. If this method fails, remove and wash the nebulizer. The construction of the nebulizer is shown in Figure 4-51a.

Generally, adjusting nut 2 has been properly set before shipment. No untrained operator is expected to adjust the nut or remove it, to avoid damaging the capillary pipe.



L. Sample inlet capillary pipe	2. Adjusting nut
3. Connector	4. Nozzle

Figure 4-51a Stainless Steel Nebulizer

Maintenance Cleaning of Nebulizer and Sample Inlet Capillary Pipe

- 2. Glass nebulizer
 - Unfasten the screw of the pressing disc and lift up the disc. Carefully take out the glass nebulizer and hold it on your hand. Turn on the switch of the air compressor. Insert the sample inlet capillary pipe (1) into deionized water, and rotate the dispersion ball (4) (Figure 4-51b), to realize the best spraying state.
 - 2. If there are foreign substances in the capillary pipe, use a similar method. Carefully take off the dispersion ball (4) on the nebulizer. Turn on the switch of the air compressor. Insert the sample inlet capillary pipe (1) into deionized water. Use a figure to cover the outlet of the nebulizer for several minutes and swiftly move away the finger, until all foreign substances have been blew out of the capillary pipe.



1. Sample inlet capillary pipe2. housing3. O ring4. Dispersion ballFigure 4-51b Glass Steel Nebulizer

5

Quantitative Analysis

Direct Reading of Absorbance

Take a Cu lamp for example, and lamp 1 is the one currently being used.

Direct reading is only used for determining absorbance of samples under certain conditions. If it is necessary to know the concentration of an element in the sample, you must use another linear or curve or single-point quantitative analysis correction method.

- 1. For light source correction, see "Light source correction".
- 2. For igniting the flame, see "Ignition operation".
- 3. Enter a proper value in the "Integration time" field and select a proper reading method in the "Instrument parameters" screen, as shown in Figure 5-1a.

	113	strument paramet		
Periodic table Element Cu • HCL (mA): 2.00	D2 0.00 (mA)	Signal method aa-absorp bg-absorp bg-correc	atomic method Flame Graphite H2	Lamp holder • 1 Cu
NHV (V): 220 Wave (nm): 324.80	Background mod	C D2 mode	C peak hei	Lift setting Lamp warm-up
nteggrate-T 2.0 📑	C 0.1 (c) C 1.0 (c)	0.2 C 0.4 2.0	Continuo	

Figure 5-1a

4. As shown in Figure 5-1b, select "Quantitative analysis" in the pull-down list.



Figure 5-1b

- 5. Press "OK" to confirm that you are about to conduct quantitative analysis.
- 6. Press "Setting" to enter the "Correction curve and slope factor readjustment parameters" screen, as shown in Figure 5-2.

orrection curve and slope facto	Instrumen or readjustment	t parameters parameters	Elama atomizar naramatars satur
			These acourter parameters seeup
Equation linear	•	🔽 Standard bi	lank correction
ſ	Name	Conc	-
Average 3 🕂	Blank		-
	St d1		
Digite D	St d2		
bigitts (5 -	St d3		
	St d4		
Conc unit mg/L 💌	St d5		0
	St d6		
Expansion 1.0	Std7		, X
	St d8		
☐ Slope readjust required?	Std9		

Figure 5-2

 Select "Direct reading of absorbance" in the "Equation selection" pulldown list. Determine the conditions based on the actual needs. See Figure 5-3.

method setting		
	Instrument parameters	1
Correction curve and slop	e factor readjustment parameters	Flame atomizer parameters setup
Equation direct res	ding of absorbs 🔻 🦵 Standard b	lank correction
	Name Conc	-
Average 3 🔆		
Digits 3		
Conc unit mg/L -		
Evnanzian 1.0		
any martin (1.0		
Slope readjust requir	red?	
	,	
		OK
🕼 🗚 WorkStation		_ 8 ×
File(F) Condition setting(S) Help(H) System setting		0
	<u> </u>	Cu
Mode Quantitative	ano 6	
Setting	8000 S	
Adjust Start	40.0	
	20.0	
	Warning!	
	Do you want to change mode?	8 0313. 600 700 800
Inject method Atomizer Manual • Flame •		-
Atomizer set	No Name Abs Conc BG	SD(%) Blank
Gas: 1.00 Oxid cos: 0.00		Standard
5.00 gus. 0.00		Sample
		Reread
		← Call standard
T		•
	Figure 5-3	

5 - 4

8. Press "OK" to close the dialog. Then the "Test sample" button is enabled.(See Figure 5-4)



Figure 5-4

9. Press "Zero" to zero the instrument. After zeroing, suck and spray the sample. After the real-time displayed values become stable, press the "Test sample" button and the screen is as shown in Figure 5-5 (Because the "Average times" in the "Correction curve and slope factor readjustment parameters" screen is set to be 3, the values will be read for three times).



Figure 5-5

- 10. At this time, you may start sample insertion for the second time. Press "Test sample" again to start the second round of sample testing.
- 11. You may conduct multiple rounds of sample testing based on your actual needs.
- If you are not satisfied with the test results, you may restart the testing. See "Standard Sample Rereading and Deletion, and Name Modification" for information of the method.
- 13. After sample testing is completed, you can save and print the test data.

Linear Method

The linear method is the most common quantitative analysis standard curve method and is suitable for quantitative analysis of elements whose standard curves have good linearity.

Take a Cu lamp for example, and lamp 1 is the one currently being used.

- 1. For light source correction, see "Light source correction".
- 2. For igniting the flame, see "Ignition operation".
- 3. Enter a proper value in the "Integration time" field and select a proper reading method in the "Instrument parameters" screen, as shown in Figure 5-6.

	In	strument paramete	ers	
Periodic table Element Cu v HCL (mA): 2.00	D2 0.00 (mA)	Signal method	atomic method Flame Graphite H2	Lamp holder (*) 1 Cu (*) 2 Mn (*) 3 As (*) 4 Mn (*) 5 Cs (*) 6 Cd (*) 7 Hg (*) 8 Cu
NHV (V): 220 Wave (nm): 324.80 💌	C Self-absor	C D2 mode	Read method C peak hei C peak are	Lift setting Lamp warm-up
nteggrate-T 2.0 📩	Slit C 0.1 © C 1.0 C	0.2 C 0.4 2.0	(continuo	A A A A A A A A A A A A A A A A A A A

Figure 5-6

4. As shown in Figure 5-7, select "Quantitative analysis" in the pull-down list. Press "OK" to confirm that you are about to conduct quantitative analysis.



Figure 5-7

correction curve and slope facto	Instrumen or readjustmen	nt parameters t parameters	Flame atomizer parameters setup
Equation Linear	•	🔽 Standard bl	ank correction
	Name	Conc	
Average 3 🕂	Blank		
	Std1	1	
Digits 3 🔆	Std2		
	Std3		
	Std4		
Conc unit mg/L 💌	Std5		0
	Std6		0
Expansion 1.0	Std7		
	Std8		
T Slope readjust required?	Std9		
· ·			
			4

Figure 5-8

- 5. Press "OK" to confirm the quantitative analysis mode. Press "Setting" to enter the "Correction curve and slope factor readjustment parameters" screen, as shown in Figure 5-8.
- Select "Linear method" in the "Equation selection" pull-down list. Determine the conditions based on the actual needs. See Figure 5-9. (Attention: At least 2 standard sample points should be entered.)

ethod setting			
Correction curve and slope fact	Instrume or readjustmen	nt parameters t parameters F] ⊽ Standard blank	lame atomizer parameters setup correction
· .	Name	Conc	
Average 3	Blank	1	
	Std1	2	
Digits 3	5ta2 Std3	4	
	St d4		
Conc unit mg/L ▼	St d5		6
	Std6		
Expansion 1.0	Std7		N
	Std8		
Slope readjust required?	St d9		
			OK



7. Press "OK" to close the dialog. Now, the "Standard blank" button should be enabled. See Figure 5-10.

 If the standard blank and the sample blank are substances belonging to different systems, blank correction should be conducted separately for them.

If the concentration of the standard blank sample and that of - deionized water, you should select "Standard blank".

LOAA WorkStation							
File(E) Condition setting(S) Help(E)	System setting						
🌾 🛷 🚔 💘 Zero				Си			
Mode (Descritter) v Getting Adjust Zers	1.790 b 5 1.500 1.290 1.000 0.790 0.500 0.290						
Inject method Atomizer	0.000		10		20		40
Manual Flame 💌			10		20	30	•0
Atomizer set	L					Conc	
Gas: 1.00							
	No	Name Abs	Conc 86	SD (%) RSD (%)	renark (Blank Stantzeri Sample Fieread Call standard	

Figure 5-10

8. Suck deionized water, and press "Zero" to zero the instrument. After zeroing is entered, spray and suck the standard sample blank. Press "Standard blank", and the screen will be shown as that in Figure 5-11.



Figure 5-11

9. Spray and suck the standard sample blank for the second time. Press "Standard blank", and the screen will be shown as that in Figure 5-12. The standard blank testing is complete.

I∉AA ₩orkStation										- F 🗙
$\texttt{File}(\underline{F}) \texttt{Condition setting}(\underline{S}) \texttt{Help}(\underline{H}) \vdots $	Systen setti:	ng								
🌠 🚳 🚔 😽 Zero		AA: BG:	0.002			Cu				
Mode Quantitativ v Setting Adjust Zero	1.750 A b 1.500 S 1.250 1.000 0.750 0.500 0.250 0.000 0		10		20	U 0 1	30 Conc	1	40	
Inject method Atomizer										
Manual 💌 Flame 👻										^
Atomizer set Gas: 1.00 Oxid gas: 0.00	No 1 2 3 4	Name Blank Blank Blank Average	Abs 0.002 0.002 0.002 0.002	Conc 0.000 0.000 0.000 0.000	BG	SD (%) 0. 000	RSD (%) 0. 000	remark ·		Blank tandard Sample Reread
									Call	standard v

Figure 5-12

10. Spray and suck standard sample 1 blank. Press "Standard sample", and the screen will be shown as that in Figure 5-13.



Figure 5-13

11. Spray and suck standard sample 1 blank again. Press "Standard sample", and the screen will be shown as that in Figure 5-14.



Figure 5-14

12. Measure the other two standard samples according to the steps described above. After the standard samples have been tested, and the screen will be shown as that in Figure 5-15. The standard sample testing is complete.



Figure 5-15

- If you are not satisfied with the test results, you may restart the testing. See "Standard Sample Rereading and Deletion, and Name Modification" for information of the method.
- 14. Start to measure the samples to be tested according the method described above.
- 15. After the testing is completed, you can save and print the test data.
- 16. After the standard curve has been completed, right click the mouse and the screen will be shown as that in Figure 5-15a. Now, you may change the curve fitting mode (linear or curve correction) at any time. In the figure, curve correction is selected, i.e. the curve fitting mode.

Linea	r
Curve	correction
Clear	
Displ	ay data
Backg	round color
Setup	coordinate

Figure 5-15a

Curve Method

The curve method is suitable for quantitative analysis of elementary samples whose standard curves are nonlinear.

Take a Cu lamp for example, and lamp 1 is the one currently being used.

- 1. For light source correction, see "Light source correction".
- 2. For igniting the flame, see "**Ignition operation**".
- 3. Enter a proper value in the "Integration time" field and select a proper reading method in the "Instrument parameters" screen.
- 4. As shown in Figure 5-16, select "Quantitative analysis" in the pull-down list.



Figure 5-16

5. Press "Settings" to enter the "Correction curve and slope factor readjustment parameters" screen, as shown in Figure 5-17.

ethod setting			
	Instrumen	t parameters	
Correction curve and slope fact	or readjustment	parameters	Flame atomizer parameters setup
Equation Curve	•	V Standard b	lank correction
	Name	Conc	
Average 3 🕂	Blank		-
	Std1		
Digits 2	Std2		
	Std3		
	Std4		
Conc unit mg/L 💌	Std5		\bigcirc
	Std6		0
Expansion 1.0	Std7		×+
	Std8		
🥅 Slope readjust required?	Std9		
			OK

Figure 5-17

6. Select "Curve correction" in the "Equation selection" pull-down list. Determine the conditions based on the actual needs. See Figure 5-18.

Correction curve and slope facto	Instrume or readjustmer	ent parameters at parameters	Flame atomizer parameters setup
Equation curve	•	🔽 Standard bl	Lank correction
	Name	Conc	1
Average 3	Blank	0	ī.
	Std1	1	
Distant Inc. 1	Std2	2	
Digits 3 🚍	Std3	4]
	Std4		
Conc unit mg/L 💌	Std5		6
	Std6		
Expansion 1.0	Std7		· · · · · · · · · · · · · · · · · · ·
	Std8		l of
Slope readjust required?	Std9		1
· · ·			



ATTENTION At least 3 standard sample points should be entered, when the curve methods is used.

- 7. The testing method is the same as that for the "Linear method".
- 8. If you are not satisfied with the test results, you may restart the testing. See "Standard Sample Rereading and Deletion, and Name Modification" for information of the method.
- 9. After the standard sample testing is complete, the screen will be shown as that in Figure 5-19.





- 10. Start testing the samples with the method the same as that for testing of standard samples.
- 11. After the testing is completed, you can save and print the test results.

Linear Standard Addition Method

Standard addition methods are methods to exclude the matrix interference and accurately determine the content of elements being analyzed without removal of the matrix interference. The methods include the linear standard addition method and the curve standard addition method.

Take a Cu lamp for example, and lamp 1 is the one currently being used.

- 1. For light source correction, see "Light source correction".
- 2. For igniting the flame, see "**Ignition operation**".
- 3. Enter a proper value in the "Integration time" field and select a proper reading method in the "Instrument parameters" screen.
- 4. As shown in Figure 5-20, select "Quantitative analysis" in the pull-down list.



Figure 5-20

5. Press "Settings" to enter the "Correction curve and slope factor readjustment parameters" screen, as shown in Figure 5-21.

	Instrumen	t parameters	
Correction curve and slope fact	or readjustment	parameters	Flame atomizer parameters setu
Equation linear standard	addition 💌	🔽 Standard b	lank correction
	Nane	Conc	-
Average 3 🕂	Blank		
	Unknown		
Disite 2	Std1		
presta la 🖂	Std2		
	Std3		
Conc unit mg/L 💌	Std4		0
	St d5		C
Expansion [1.0	Std6		1 × 1
	Std7		
Slope readjust required?	Std8		

Figure 5-21

6. Select "Linear standard addition method" in the "Equation selection" pull-down list. Determine the conditions based on the actual needs. See Figure 5-22.(Attention: At least 2 standard sample points should be entered.)

Correction curve and slope fact	Instrumen or readjustmen	nt parameters t parameters	Flame atomizer parameters setup
Equation linear standard	addition 💌	🔽 Standard b	lank correction
	Name	Conc	1
Average 3	Blank		
	Unknown		
Distant and	Std1		
bieics 3	Std2	2	7
	Std3		
Conc unit mg/L 💌	Std4		0
	Std5		0
Expansion 1.0	Std6		N
	Std7] [oʻ
☐ Slope readjust required?	Std8		



7. Press "OK" to close the dialog. Now, the "Standard blank" button should be enabled. See Figure 5-23.



Figure 5-23

- 8. Suck deionized water, and press "Zero" to zero the instrument.
- 9. Spray and suck the standard sample blank. Press "Standard blank", and the screen will be shown as that in Figure 5-24.

▶ AA WorkStation										
$\texttt{File}(\underline{F}) \texttt{Condition setting}(\underline{S}) \texttt{Help}(\underline{H}) \texttt{S}$	System settin	ne								
🍻 🛷 블 🛚 Zero		AA: BG:	0.000			Cu	l			
Made Quantitativ V Setting Adjust Zero	1.750 A b 1.500 S 1.250 1.000 0.750 0.500 0.250 0.250									
	U		10		20		30		40	
Inject method Atomizer Manual The Flame							Conc			-
Atomizer set	No	Name	Abs	Conc	BG	SD(%)	RSD (%)	remark +	Blank	
Gas: 1.00 Oxid gas: 0.00		Blank	0.000	0.000					Standard Sample	
									Reread Call standard	
									Data	-

Figure 5-24

10. Spray and suck the standard sample blank again. Press "Standard blank", and the screen will be shown as that in Figure 5-25.



Figure 5-25

11. Start testing an unknown sample. Spray and suck the unknown sample. Press "Unknown sample", and the screen will be shown as that in Figure 5-26.

M# AA WorkStation			
Martin Condition Setting (5) melp (1) 3	AA: 0.002 BG:	Си	
Mode Quantitativ Setting Adjust Zero	1 750 Å 1 500 Å 1 320 Å 1 320 Å 1 320 Å 0 500 Å 0 500 Å 0 500 Å 0 10 Å	20 30 Conc	40
Manual T Flame			-
Atomizer set Gas: 1.00 Oxid gas: 0.00	No Name Abs 1 Blank 0.002 2 Blank 0.002 3 Blank 0.002 4 Average 0.002	Conc BG SD (%) RSD (%) 0,000 0 0 0 0,000 0 0 0 0,000 0 0 0 0,000 0 0 0	Blank Standard Sample
			Call standard

Figure 5-26

12. Spray and suck the unknown sample again. Press "Unknown sample", and the screen will be shown as that in Figure 5-27.

In AA ₩orkStation File(E) Condition setting(S) Help(H) :	System setting								
🌾 🔷 🚔 🤘 Zero		AA: BG:	0.065			Cu			
Madi Quantitativ 💌 Setting Adjust Zero	1.750 A b 1.500 S 1.250 1.000 0.750 0.500 0.250 0.000 0 0	1 1 1	10	- I - I	20	1 1 1	30 Conc	I. 1	40
Inject method Atomizer									-
Atomizer set Gas: 1.00 Oxid gas: 0.00	No 1 F 2 F 3 F 4 F	Name 31 ank 31 ank 31 ank Average Std	Abs 0.000 0.000 0.000 0.000 0.000 0.007	Conc 0.000 0.000 0.000 0.000 1.000	BG	SD (%) 0.000	RSD(%) 0.000	remark •	Blank Standard Sample
	6 5 7 5 8 4	Std Std Average	0.066 0.065 0.066	1.000 1.000 1.000		0.001	1.515		Reread Call standard
Ę									

Figure 5-27

13. Complete testing of two standard samples according the methods described above. After the standard sample testing is complete, the screen will be shown as that in Figure 5-28. After the standard sample testing is complete, the concentration of the unknown sample has also been obtained after calculation.



Figure 5-28

- 14. If you are not satisfied with the test results, you may restart the testing. See "**Standard Sample Rereading and Deletion, and Name Modification**" for information of the method.
- 15. Start testing the samples with the method the same as that for testing of "Unknown samples", as shown in Figure 5-29.



Figure 5-29

After the testing is completed, you can save and print the test results.

Curve Standard Addition Method

Take a Cu lamp for example, and lamp 1 is the one currently being used.

- 1. For light source correction, see "Light source correction".
- 2. For igniting the flame, see "**Ignition operation**".
- 3. Enter a proper value in the "Integration time" field and select a proper reading method in the "Instrument parameters" screen.
- 4. As shown in Figure 5-30, select "Quantitative analysis" in the pull-down list.



Figure 5-30

orrection curve and slope fact	Instrumen or readjustment	t parameters parameters	Flame atomizer parameters setup
Equation Curve standard e	uddi ti on 💌	🔽 Standard bl	ank correction
	Name	Conc	
Average 3	Blank		
	Unknown		
Digits D	Std1		
bigits 3 🖂	Std2		
	Std3		
Conc unit mg/L 💌	Std4		Ô
	Std5		
Expansion 1.0	Std6		- X - X - X - X - X - X - X - X - X - X
	Std7		JLo
🔽 Slope readjust required?	Std8		

Figure 5-31

5. Press "Settings" to enter the "Correction curve and slope factor readjustment parameters" screen, as shown in Figure 5-31.

Quantitative Analysis Curve Standard Addition Method

	Instrumor	t perspeters	
Correction curve and slope fact	or readjustment	parameters	Flame atomizer parameters setur
		-	,
The second se	11111		
Equation curve standard a	addition •	V Standard Di	Lank correction
	Nege	I Cana	-
Average 2	Blowly	Cone	-
werder 15	Undersone		
	C+ 21	1	
Digits 3 —	5101		
	5102	2	7
Conc unit mg/L -	Stab	- 21	
	St d4		
Expansion 1.0	5145		I U 1
	5100		15 T
	5101		
Stope readjust required:	Stuo		
	-		

Figure 5-32

6. Select "**Curve standard addition method**" in the "Equation selection" pull-down list. Input the required value. See Figure 5-32.

ATTENTION At least 3 standard sample points should be entered, when the curve standard addition methods is used.

7. Press "OK" to close the dialog. Now, the "Standard blank" button should be enabled. See Figure 5-33.



Figure 5-33

- 8. Start testing the samples with the method the same as that in "**Linear Standard Addition Method**".
- 9. After the standard sample testing is complete, the screen is shown as that in Figure 5-34.

AA WorkStation File(E) Condition setting(S) Help(H)	System setting				
🌾 🐟 블 <table-cell> Zero</table-cell>	AA: BG:	0.148	Си		
Mode Quantitativ Setting Adjust Zero	0.150 A b 0.125 ^S 0.100 0.075				
Inject method Atomizer	0.050 0.025 0.000 r = 0.0000	1.000 Conc (2.000 mg/L]	3.000	4.00
Alomizer set Gas: 1.00 Oxid gas: 0.00	No Name 10 Std 11 Std 12 Average 13 Std 14 Std 15 Std 16 Std	Abs Conc 0.122 2.000 0.122 2.000 0.122 2.000 0.148 4.000 0.148 4.000 0.148 4.000 0.148 4.000	BG SD (%)	RSD(%) remark •	Blank Standard Sample
	10 Average	0.146 4.000	0.000	v. 000	Call standard

Figure 5-34

- 10. If you are not satisfied with the test results, you may restart the testing. See "**Standard Sample Rereading and Deletion, and Name Modification**" for information of the method.
- 11. Start testing the samples.

After the testing is completed, you can save and print the test results.

Single-Point Method

Single-point method is the simplest correction method, which is suitable for determination of elements with linear standard curves passing the origin. However, the concentration of individual standard sample should be close to that of the tested sample to avoid errors.

Take a Cu lamp for example, and lamp 1 is the one currently being used. Take a Cu lamp for example, and lamp 1 is the one currently being used.

- 1. For light source correction, see "Light source correction".
- 2. Enter a proper value in the "Integration time" field and select a proper reading method in the "Instrument parameters" screen.
- 3. As shown in Figure 5-35, select "Quantitative analysis" in the pull-down list.



Figure 5-35

ethod setting			
Correction curve and slope fact	Instrumer or readjustment	it parameters . parameters	Flame atomizer parameters setup
Equation Linear	-	🔽 Standard bl	ank correction
	Name	Conc	
Average 3	Blank		
	Std1		
Distant Inc.	Std2	2	
Digits 3 🖂	Std3	23	
	Std4		
Conc unit mg/L 💌	St d5		
	St d6		וו
Expansion 1.0	St d7		• X-2
	St d8		0
☐ Slope readjust required?	St d9		
,			
			OK

Figure 5-36

- 4. Press "Settings" to enter the "Correction curve and slope factor readjustment parameters" screen, as shown in Figure 5-36.
- 5. Select "Single-point method" in the "Equation selection" pull-down list. Determine the conditions based on the actual needs. See Figure 5-37.

ethod setting				2
Correction curve and slope fact Equation <mark>single-point</mark>	Instrument or readjustment 💌	parameters parameters ┌──Standard b	Flame atomizer parameters setup	C
Average 3	Name	Conc	-	
Digits 3 🚞	Standard			
Cone unit mg/L 💌 Expansion 1.0				
Slope readjust required?				5
			OK	

Figure5-37

- 6. The methods for condition setting and sample testing method are the same as those for the "**Linear method**".
- 7. The spectrum obtained is shown in Figure 5-38.

File(E) Condition setting(S) Help(E) S	yrtem retting					
🌾 🐟 블 🕷 Zero	Z					
Medi Guantitativ - Setting Adjust Zero	1.750 b 1.250 1.250 1.000 0.750 0.250					
	0.250					
Inject method Momizer	0.000	10	~	22		
Manual Telame Y		14		-30	40	
Atomizer set				Conc		
Atomizer set				Conc		
Atomizer set				Conc		
Atomizer set Gas: 0.0 Oxid gas: 0.0	No Name Abb	s Conc BG	SD(%) RSD(%) remark •	Conc		
Atomizer set Gas: 0.0 Oxid gas: 0.0	No Name Abr	s Conc BG	50(%) RSD(%) remark -	Blank		
Atomizer set Ges: 0.0 Oxid ges: 0.0	No Name Ab	s Conc BG	SD(%) RSD(%) remark •	Conc Blank Standard		
Atomizer set Gess, 0.0 Oxid ges: 0.0	No Name Abi	s Conc BG	30 (%) [RSD (%) remark •	Blank Standard Sampte		
Atomizer set Gess: 0.0 Oxid ges: 0.0	No Naze Abi	s Conc BG	50 (%) RSD (%) remark •	Diank Standard Sample		
Abmizer set Gess. 0.0 Oxid gas: 0.0	No Name Abr	s Conc BG	[30(%) RSD(%) resark =	Dlank Standard Sample		
Abmizer et Ges 1 0.0 Ovd ges 1.0	Ko Naze Abr	s Conc BG	50(%) R5D(%) resark •	Blank Standard Sample Reread Call standard		
Annizer set Gray, 8.0 Oxid gas: 8.0	No Naze Abi	s Conc DG	30 (8) (50 (8) resark -	Dank Standard Sample Reread Call standard		
Abmitter set	Ko Name Abr	s Conc DG	(3)(b) (R3)(b) remark a	Conc Dlank Standard Sample Percad Call standard		
Annizer est	No Nare Ab	s Conc BG	(3)(8) (KD)(8) resark •	Diank Standard Sample Reread Call standard		
Annizer set Gen, 0.8 Oxforgen: 0.0	No Name Ab	e Conc BG	(3)(1) S2)(0) resark .	Diank Standard Sample Fiercad Call standard		
Anniber set	No Hase Abr	s Conc BG	30(k) (KD)(k) remark •	Diant Standard Sample Reread Call standard		

Figure 5-38

After the testing is completed, you can save and print the test results.

Standard Deviation

1. Select "Quantitative analysis" as shown in Figure 3-39a.



Figure 5-39a

Correction curve and slope fact	Instrume: or readjustmen	nt parameters t parameters	Flame atomizer parameters setup
Equation Linear	•	🔽 Standard b	lank correction
	Name	Conc	-
Average 3 🕂	Blank	(c)	7. (c. 1997) - C. 1997 - C. 199
	Std1	22	
Dista Doral	Std2	22	
Digits 3 .	Std3	22	
	Std4	22	
Conc unit mg/L 💌	Std5	22	$(\bigcirc$
	Std6	22) [0
Expansion 1.0	Std7	22	· · · · · · · · · · · · · · · · · · ·
	Std8		J [o'
🔽 Slope readjust required?	Std9	22	
	×		

Figure 5-39b

- 2. Press "Settings" to enter the "Correction curve and slope factor readjustment parameters" screen, as shown in Figure 3-39b.
- 3. Select "Standard deviation" in the "Equation selection" pull-down list. Enter the parameters as shown in Figure 3-39c.

Correction curve and slope fact	Instrum or readjustme	ent parameters nt parameters	Flame atomizer parameters setup
Equation standard deviati	on 💌	┌─ Standard b	lank correction
	Name	Conc	ī
Average 3 🕂	Std1		-
	Std2		
Digite Desi	Std3		
Digits 3	Std4		
	St d5		
Conc unit mg/L 💌	St d6		0
	Std7		
Expansion 1.0	Std8		- X
	Std9		lo
Slope readjust required?			
,			

Figure 5-39c

4. Press "OK", and the screen is as shown in Figure 3-39d.



Figure 5-39d

5. Spray and suck the blank sample. Press "Blank", and the screen will be shown as that in Figure 3-39e.

l∉AA WorkStation									X
<pre>File(E) Condition setting(S) Help(H) :</pre>	System setting								
🌾 🐟 블 Zero		AA: BG:	0.000			Cu			
Mode Quantitativ Setting Adjust Zero	1.750 A 1.500 S 1.250 0.750 0.500 0.250 0.000 0	1. 1. 1.	10	- I I.	20	I. 1. 1.	30 Conc		40
Manual V Flame									<u> </u>
Atomizer set Gas: 1.00 Oxid gas: 0.00	No 1 S	Name ample	Abs	<u>B1 ank</u> 0. 000	subtract	standard	RSD(W)	remark •	Blank Standard Sample
								•	Reread Call standard

Figure 5-39e

6. Spray and suck the standard sample. Press "Test sample", and the screen will be shown as that in Figure 3-39f.

L∉AA WorkStation					- F 🛛
$File(\underline{F})$ Condition setting(\underline{S}) $Help(\underline{H})$ S	ystem setting				
🌠 🐟 🚔 🤘 Zero		AA: -0.001 BG:	C	u	
Mode Quantitativ v Setting Adjust Zero	1.750 Å 1.500 S 1.250 1.000 0.750 0.500 0.250 0.000 0	10	20	30 Conc	40
Inject method Atomizer					
Manual Flame 👻					_
Atomizer set Gas: 1.00 Oxid gas: 0.00	No N	Name Abs pple 0.000	Blank subtract stand 0.000	lar(RSD(%) remark	Blank Standard Blank
					Reread Call standard

Figure 5-39f

7. Spray and suck the blank sample again, and Press "Blank".



Figure 5-39g

8. Repeat the steps above for seven times and the screen will be shown as that in Figure 3-39h.

MAA WorkStation	_				
File(E) Condition setting(S) Help(H)	System setting				
🥢 🔗 블 🕺 Zer	AA: BG:	-0.001	Cı	l	
Mode Quantitativ Setting Adjust Zero	1750 Å 1500 8 1250 0 0750 0 0500 0 0500 0 0000 0	10	20	30 Conc	40
Inject method Atomizer					<u>*</u>
Atomizer set	No Name 1 Sample 2 Sample 3 Sample 4 Sample 6 Sample 7 Sample 8 AverageSm	Abs Bland 0.101 0.00 0.100 0.09 0.099 0.09 0.099 0.09 0.099 0.09 0.098 0.09 0.098 0.09 0.098 0.09 0.098 0.09	subtract stands 1 0.055 9 0.001 9 0.000 9 0.000 9 0.000 9 0.000 9 0.000 9 0.000 9 0.000 9 0.001 9 -0.001 9 0.008	arc(RSD(%) rer	nark Blank Standard Blank Reread Call standard

Figure 5-39h

Sample Rereading and Deletion, and Name Modification

Rereading

1. If you are not satisfied with the test data after testing of the samples, you may restart the testing. For example, if the results of sample 5 are unsatisfactory, move the curve to select the item as shown in the figure below.



Figure 5-40a

2. Spray and suck the sample again. Press "Reread", and the screen will be shown as that in Figure 5-40b.



Deletion

1. After the standard sample testing is complete, you can conduct deletion operation. Move the curve onto the number of a standard sample to be deleted, and pressure the right mouse key. The screen will be shown as that in Figure 4-40c.

No	Name	Abs	Conc	BG	SD(%)	RSD(%)	remark 🔺	Blank
	7 Std	0.070	1.000					
	8 Average	0.070	1.000		0.000	0.000		Standard
-	alc+3	0.133	2.000					Comple
	Delete	0.133	2.000	1				Sample
	Undelete	0.133	2.000					
1	ZAverage	0.133	2.000		0.000	0.000		
1	3 Std	0.261	4.000					Reread
1	4 Std	0.260	4.000					Call standard
1	5 Std	0.260	4.000				-	Can stanuaru

Figure 5-40c

2. Press "Delete", and the screen will be shown as that in Figure 5-40d.

No	Name	Abs	Conc	BG	SD(%)	RSD(%)	remark 🔺	Blank
7	Std	0.070	1.000					
8	Average	0.070	1.000		0.000	0.000		Standard
9	Delete	0.133	2.000					Cample
10	Delete	0.133	2.000					Sample
11	Delete	0.133	2.000					
12	Delete	0.133	2.000		0.000	0.000		
13	Std	0.261	4.000					Reread
14	Std	0.260	4.000					Call standard
15	Std	0.260	4.000				-	Can Standard



3. To undelete a deleted standard sample, move the cursor onto the deleted standard sample and press the right mouse key. The screen will be shown as that in Figure 5-40d, and then select "Undelete".

				25					
No	Name	Abs	Conc	BG	SD(%)	RSD(%)	remark	•	Blank
7	Std	0.070	1.000						
8	Average	0.070	1.000		0.000	0.000			Standard
	Dellate	0.133	2.000						Cample
_	Defete	0.133	2.000						Sample
	Undelete	0.133	2.000					-	
12	Delete	0.133	2.000		0.000	0.000			1
13	Std	0.261	4.000						Reread
14	Std	0.260	4.000						Call etandard
15	Std	0.260	4.000				-	-	



ATTENTION: If sample testing has been done, it is impossible to delete standard samples.
Name Modification

During testing, you may change certain names based on your needs. For example, if you want to modify the name of sample 5 shown in Figure 5-40d, double click the name, and the screens will be shown as those in Figure 5-41a and 5-41b.



Figure 5-41a

L∉AA WorkStat	ion									
File(E) Condition s	etting(S) Help(H)	System setti:	ng							
🌾 🛷 🛔	Zero	7	AA: BG:	0.089			Cu			
M	ode Quantitativ V Setting Adjust Zero	1.750 A b 1.500 S 1.250 0.750 0.500 0.250 0.000								
1		0		10		20		30		40
	NEW YORK							Conc		
Inject method	Atomizer									
Manual 💌	Flame									
	Atomizer eet									
	Atomizer act	No	Name	Abs	Conc	BG	SD(%)	RSD(%)	remark 🔺	Blank
Gar: 1.00			Blank	0.000	0.000					Chandrad
048. 1.00			Blank	0.000	0.000					stanuaru
Oxid gas: 0.00			Auspege	0.000	0.000		0.00	2		Sample
			Std	0.000	1 000		0.00			
		6	Std	0.090	1.000					
		7	Std123	0.090	1.000					Reread
		8	Average	0.090	1.000		0.00	0		Call standard
	()								-	Can standard
	· ·									
		J								Data

Figure 5-41b

Slop Factor Readjustment

The sensitivity may drift after testing for period of time. The slop factor readjustment may be used in such case.

To set parameters as shown in Figure 5-42, select "Slope factor readjustment" and enter the value 2, which means readjustment for sample 2. Enter other conditions based on the actual needs.

	Instrume	nt parameters	
Correction curve and slope fact	or readjustmen	t parameters	Flame atomizer parameters setup
Equation linear	•	🖵 Standard bl	lank correction
	12 ML		2
· · · · · · · · · · · · · · · · · · ·	Name	Conc	
Average 3 🕂	Std1	1	L
	Std2	2	2
Digits 2	Std3		3
	Std4		
	Std5		
Conc unit mg/L 💌	Std6		0
-	Std7) 0
Expansion [1.0	Std8		N - F
	Std9		
✓ Slope readjust required?			
			-67



ATTENTION: The slope factor readjustment usually is used for the linear method and the linear standard addition method.

Steps: To conduct the slope factor readjustment, spray and suck standard sample 2 again, press the button for readjustment on the toolbar as shown in Figure 5-44 to start the slope factor readjustment, and continue testing of the sample.





Saving and Printing

Saving

1. After sample testing is completed, press the "Save" button on the toolbar, as shown in Figure 5-45. Alternatively, select "Save data" in the "File" menu, as shown in Figure 5-46.A dialog will appear as shown in Figure 5-47.



Figure 5-45

CAA HorkStation	
File(E) Condition setting(S) Help(H)	System setting
New(§) Ctrl+	5
Call method(E)	7
Call data(C)	
Save aethod	
Save data(S) Ctrl+S	
Divert print (D)	
direct princip	
Pravi au (V)	
Print satting (R)	
Edit report to be printed(E)	
Same terminte (W)	
	- 00
Set up serial port	
Exit(E)	18
🖉 🖉 🖉 🤍 🖉 🖉	0.290
/	0.1%
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
lolect method Momister	0000
Inject meanor Anomaco	0.000 4.000 8.000 12.000 16.000 20.000
Manual Flame Y	Conc (mg/L)
Atomizer net	R = 0.9993 K= 22.0164
Photo Sec	
C 88	
Gas: 0.0	
Oxid gas: 0.0	No Nore Abs Conc PG SD(9) RSD(9) repark +
	15 Average? 0.401 8.000 0.001 0.353
	16 Std 0.502 10.000 Standard
0	17 Std 0.493 10.000
	18 Average2 0.498 10.000 0.006 1.279 Sample
	19 Std 0. 925 20.000
	20 Std 0.932 20.000
	21 Average2 0.929 20.000 0.004 0.457 Reread
The second secon	Pall standard
	JI
Same	

Figure 5-46



Figure 5-47

- 2. Enter sample name, operator name, data and remarks in the fields of the "Display information" dialog.
- 3. Press "Save", and screen will be shown as that in Figure 5-48. Enter the file name and press "Save" to save the file.

Gave As			? 🛛
Save in: 🧀 45300	GF-E	• •	• 🖬 🖬 •
AA4530-3.0 Adjust Communication Data Debug DrawView	hlp init ibi print Release res	TestDataFile 전 Al-2-09-04-29 전 Al-09-04-29 전 Al-09-05-12 전 Al-Qiu-1 전 Al-Qiu-1 전 Al-Qiu-2	Cu1-08-07-28 DL-Cu-08-09-0 Fe- 09-05-07 Sample systeminfo
K	ple		Save
Save as type: Sam	ple Files(*.dat)	•	Cancel

Figure 5-48

Export

1. Press the "Export" button to export the data into an Excel file.

🛃 AA WorkStation		K
File(F) Condition settin	ing(5) Help(H) System setting	
%	Rev Zero Zero	
	Display content	1
	Instrument condition	
	Element: K Atomic Flame Read mode: continuous 0.750 K	
	HCL(mA): 2.5 D2current(mA): Integrate-T(s): 2.0 0.500 s	
	NHV (V): 188 Signal mode: atomic Slit: 0.2	
1	Wave(nm): 766.5 E	
, <i>S</i>		
	Sample Information	
	C Sample: Dat hic3993 K= 22.0184	
	Remark:	í.
	Excel file Linear	L
Inject method		4
Manual	107 Sample Export Cancel	1
	108 Average2	L
	110 Sample 0.329 6.568 020 Blank	L
Gas: 0.0	111 AverageSm 0.327 6.534 0.002 0.648 Standard	L
Oxid gas: 0.0	V 000 Sample	L
	Conc (mg/L)	L
_	Save Export Calidata Cancel Print	L
	Heread	L
	Call standard	L
<u></u>		L
E		•
	Data	Ĩ

2. Press the "Browse" button.

Fle(F) Condition setting	(5) Help(H) System setting		
Inject method	Display content Instrument condition Element: k HCL(mA): 2.5 NHV (V): 138 Ware(rm): 766.5 Sample Information Sample: Remark: 100 1017 103 103 None 103	Atomic Flame Read mode: continuous Document(mA): Integrate T(5): 2.0 Str. 0.2 Open Look in \$4500FE Adaption Continuous Adaption Continuous Adaption Continuous Adaption Continuous Adaption Continuous Open Look in \$4500FE Adaption Continuous Open Continuous Adaption Continuous Open Continuous Adaption Continuous Open Continuous Continuous Open Continuous Open Continuous Open Continuous Open Continuous Open Continuous Open Continuous Open Continuous Open Continuous	k
Gas: 0.0 Oxid gas: 0.0	Save Exp	0.327 6.534 0.002 0.648 0.00 0.0 0.5 10 15 cont Cal data Cancel Print Cal data Cancel Cal data Cancel Cal data Cancel Cal data Cancel Cal start	ard le ad adard

4. Select the file to be exported.



4. Press the "Export" button. Export is completed.



Printing

After the testing is completed, you can directly print the test results. Steps:

1. Select "Directly printing > Quantitative analysis printing" in the "File" menu, as shown in Figure 5-49. The "Display information" dialog will appear as shown in Figure 5-50.



Figure 5-49



Figure 5-50

2. Press "Print", and a dialog will appear as shown in Figure 5-51.



3. You may select from the functions available in the dialog based on your needs.

6

Background Correction Flame Mode

Background Correction Flame Mode

Lamp 1 is the one currently being used.

- 1. For igniting the flame, see "**Ignition operation**".
- 2. Select the "Quantitative analysis" mode.
- 3. Press "Instrument adjustment" to show a dialog as shown in Figure 6-1.



Figure 6-1

4. Press "More parameters" in the "Instrument adjustment" dialog to show another dialog as shown in Figure 6-2.

	11	istrument paramet	ers	
Periodic table Element Cu HCL (mA): 2.00	Emission D2 0:00 (mA)	Signal method aa-absorp C bg-absorp C bg-correc	atomic method Flame C Graphite C H2	Lamp holder
NHV (V): 220	Background mo	de C D2 mode	C peak hei	Lift setting
nteggrate-T 2.0	Slit C 0.1 @ C 1.0 C	0.2 C 0.4 2.0	C peak are	Lamp warm up

Figure 6-2

5. Select element Cu, select "Background correction" for the signal mode and "Deuterium lamp" for the background mode, and set other parameters as shown in Figure 6-3.

Correction curve and SI	ope factor readjustment paramete Instrument paramet	ers flame att ters	miler parameters setup
riodic table of elemen Element Cu 💽 HCL (mA): 2.00	D2 lamp: 40 (mA) Signal method C as-absorp C bg-absorp C bg-correc	atomic method Flame Graphite H2 Read method	Lamp holder position © 1 Cu © 2 Mn © 3 As © 4 Mn © 5 Cs © 6 Cd © 7 Hg © 8 Cu
NHV (V): 220 Wave (nm): 324.80	Background mode C Self-absorj 💿 D2 mode	C peak hei	Lift setting Lamp warm-up
Integgrate-T 2.0 🔆	Slit ○ 0.1 ○ 0.2 ○ 0.4 ○ 1.0 ○ 2.0	(continuo	

Figure 6-3

6. Press "OK", and the screen for light source adjustment will appear as shown in Figure 6-4. See "**Light source correction**" for the steps.

🛃 🗚 WorkStation				_ 2 🛛
文件(E) 条件设置(E) 帮助(E) 系统	気質			
🍻 🔿 🚔 *	样品 调零 AA: BG:	3.889 1.372	Си	
方式 定量分	/析 ▼ 1.750 €			7
设 置				
((彼器) を (使器) を (使る) を (使) (使る) (使) (手动调整 技峰 平衡 波长(mn): 124.40 · 支送 负高压(V): 180 · 灯架调整 /打架调整 通定	00 60 40 20 0 3243	AA BG	40 建 • 标准空白 标准择品
an雲帮助,遗校F1键				学体

Figure 6-4

7. After light source correction has been completed, as shown in Figure 6-5, press "Balance" to balancing the deuterium lamp and the element lamp.



Figure 6-5

8. Press "Balance", and the screen will appear as shown in Figure 6-6.



Figure 6-6

9. After the balancing is complete, press "OK" to close the dialog.

10. Press "Settings" to enter the "Correction curve and slope factor readjustment parameters" screen. Select "Linear method" in the "Equation selection" pull-down list. Enter the conditions as shown in Figure 6-8.

correction curve and slope fact	Instrum or readjustme:	ent parameters nt parameters	Flame atomizer parameters setu
Equation linear	•	🔽 Standard bla	ank correction
	Name	Conc	
Average 3	Blank	1	
	Std1	2	
Distante la la	Std2	3	
prents 3	Std3	4	
	Std4		
Conc unit mg/L 💌	Std5		0
	Std6		
Expansion 1.0	Std7		
	Std8		Jlo
☐ Slope readjust required?	Std9		
·	3		

Figure 6-8

11. Press "Zero" to zero the instrument. After zeroing is entered, spray and suck the standard sample 1. Press "Standard blank", and the screen will appear as shown in Figure 6-9.

LOAA WorkStation File(F) Condition setting(S) Help(H) S	System setti	ng								3 🗙
🎸 🛷 블 🛚 Zero		AA: BG:	0.000			Cu	l			
Mair Quantitativ V Setting Adjust Zero	1.750 A b 1.500 S 1.250 0.750 0.500 0.250 0.000 0		10	1	20	- 1 1 1	30 Conc	1-1-1-1	40	
Manual Fiame Admizer set Gas: 1.00 Oxid gas: 0.00		Name B1 ank	Abs 0.000	Conc 0.000	BG	SD (%)	RSD (%)	remark •	Blank Standard Sample Reread	-
								Ţ	Call standard	-

Figure 6-9

12. Spray and suck the standard sample 1 again. Press "Standard blank", and the screen will appear as shown in Figure 6-10.

🕼 🗛 WorkStation									- B X
File(E) Condition setting(S) Help(H) S	ystem setti:	ng							
🌾 🛷 🚔 🥺 Zero		AA: BG:	0.067			Си			
Made Quantitativ v Setting Adjust Zero	1.750 A b 1.500 S 1.250 1.000 0.750 0.500 0.250 0.000								
	0		10		20		30		40
Inject method Atomizer							Conc		
Manual Telame									<u> </u>
tteminer ent									
Atomizer set	No	Name	Abs	Conc	BG	SD(%)	RSD(%)	remark 🔺	Blank
Gas: 1.00	1	Blank	0.000	0.000		_			Standard
Quid and 9.00	2	Blank	0.000	0.000					Standard
0xia gas. 0.00	4	Average	0.000	0.000		0.000	0,000		Sample
	5	Std	0.067	1.000					
									Rercad Call standard
									- Data

Figure 6-10

13. Complete testing of another two standard samples according the methods described above. After the standard sample testing is complete, the screen will appear as shown in Figure 6-11. The standard sample testing is complete.

LØAA WorkStation										7 🗙
$\texttt{File}(\underline{\texttt{F}}) \texttt{Condition setting}(\underline{\texttt{S}}) \texttt{Help}(\underline{\texttt{H}})$	System settir	ng .								
🀼 🐼 블 <table-cell> Zero</table-cell>		AA: BG:	0.126			Cu				
Modr Quantitativ V Setting Adjust Zero	0.125 A b 0.100 0.075					_	_	_		
	0.050 0.025 0.000 R = 1.000	10 K= 16.5	0.500	Conc ('mg/L)	1.000		1.500	-te-te-te-s	2.000
Inject method Atomizer										-
Atomizer set	N-	N	[A1 -]	C	D/C	len (w)	DCD (K)			
	NO	Name .	ADS 0.066	1 000	DG	SD (10)	NSD(%)	remark -	Blank	
Gas: 1.00		Std	0.065	1.000					Standard	
Ovid cas: 0.00	8	Average	0,066	1.000		0, 001	1.515			1
ond gub. blob	9	Std	0.127	2,000					Sample	
	10	Std	0,126	2,000						
	11	Std	0.126	2.000						1
	12	Average	0.126	2.000		0.001	0.457		Reread	
					_			_	Call standard	
								•		
										•
									Data	

Figure 6-11

- 14. If you are not satisfied with the test results, you may restart the testing. See "**Standard Sample Rereading**" for the steps.
- 15. Start testing the samples with the method described above.
- 16. After the testing is completed, you can save and print the test results.

Self-Absorption

ATTENTION

L-2433 heavy duty element lamps from Hamamatsu Photonics of Japan or other competent manufacturers should be used for selfabsorption background correction. If a regular element lamp is used, the performance of the lamp may be degraded.

Lamp 1 is the one currently being used.

- 1. For igniting the flame, see "**Ignition operation**".
- 2. Select the "Quantitative analysis" mode.
- 3. Press "Instrument adjustment" to show a dialog as shown in Figure 6-12.



Figure 6-12

4. Press "More parameters" in the "Instrument adjustment" dialog to show another dialog as shown in Figure 6-13.

riodic table of elemen Element Cu ▼	Emission	-Signal method aa-absorp	atomic method	Lamp holder position
HCL (mA): [2.00	D2 0.00 (mA)	C bg absorp C bg correc	C Graphite C H2	C 3 As C 4 Mn C 5 Cs C 6 Cd C 7 Hg C 8 Cu
NHV (V): 220 Wave (rum): <u>324,80</u>	-Background mod C Self-absorp	C D2 mode	C peak hei	Lift setting Lamp warm-up
Integgrate-T 227, 40 216, 50	C 0.1 @ C 1.0 C	0.2 0.4	(continuo	E.

Figure 6-13

Background Correction Flame Mode Self-Absorption Mode

5. Select element Cu, select "Background correction" for the signal mode and "Self-absorption" for the background mode, and set other parameters as shown in Figure 6-14.

	Instrume	ent parameters		
Periodic table Element Cu 💌 HCL (mA): 2.00	Emission Self-abson 2 (mA)	nal method aa-absorp bg-absorp bg-correc	atomic method 7 Flame 7 Graphite 7 H2	Lamp holder © 1 Cu C 2 Mn C 3 As C 4 Mn C 5 Cs C 6 Cd C 7 Hg C 8 Cu
NHV (V): 220 Wave (nm): 324.80	Background mode © Self-absory (° D	2 mode	Read method C peak hei C peak are	Lift setting Lamp warm-up
Integgrate-T 2.0	Slit C 0.1 © 0.2 C 1.0 C 2.0	C 0.4	• continuo	

Figure 6-14

6. Press "OK", and the screen for light source adjustment will appear as shown in Figure 6-15. See "**Light source correction**" for the steps.



Figure 6-15

Background Correction Flame Mode Self-Absorption Mode

7. After light source correction has been completed, as shown in Figure 6-16, press "Balance" to balancing the deuterium lamp and the element lamp.



Figure 6-16

8. Press "Balance", and the screen will appear as shown in Figure 6-17.





- 9. After the balancing is complete, press "OK" to close the dialog.
- 10. Select the desired testing method to conduct testing of the samples.

7

Calling Data

Calling Data

To call testing data files of qualitative analysis, you have to select a quantitative analysis mode first before opening a file.

1. Select "Call data" as shown in Figure 7-1. Alternatively, press the "Open" button on the toolbar. See Figure 7-2.



Figure 7-1



Figure 7-2

2. Select the file to be opened. Press "Open" to obtain the saved data, as shown in Figure 7-3, and then you can print the data.



Figure 7-3

8

Setting Templates

Edit a Report to Be Printed

Edit a report to be printed according to the following steps:

1. Select "System information" in the "System settings" menu, as shown in Figure 8-1.

Table Oracle of each of the second of the	AA WorkStation					
Cu Hold of the second	File(E) Condition petting(5) Help(E)	ystem setting				
Model 200 General 200 Model 200	🌠 🛷 블 🥺 Zer	Wavelength correction Communication diagnosis System information	Си			
Namier Namier Manier Namier	Made Quantitative 2	1.500 Å				
Inject endition Manipulation Import		0.750 0.500 0.250				
Manal Tenso No <	Inject method Atomizer	0.000				
Annicer set Image: Constraint of the set of the	Manual Flame V	0	10	20	30	40
Gas: L40 Dod gas: L50 Egge: L41 Egge: L51 Egge: L52 L52 <thl52< th=""> <thl52< th=""> <thl52< th=""></thl52<></thl52<></thl52<>	Atomizer set					
Gas: 1.80 Odd gas: 8.30 Image: Solution of the solution of th						
Box gave 3.80 Box Page Bag Core Box Solution Plane Plane </th <th>Gas: 1.00</th> <th></th> <th></th> <th></th> <th></th> <th></th>	Gas: 1.00					
	Oxid gas: 0.00	No Name Abs	Conc BG SD(%)	▲ Blan		
				Standa	ed.	
				Gamel		
				sampl	c	
					- 7	
	=			Rerea	d	
	• • • • •			Call stan	dard	

Figure 8-1

2. A dialog will appear, as shown in Figure 8-2. Enter corresponding information based on your needs.

1	
Operator:	^p assword Again
ATSAA4530	

Figure 8-2

- 3. After the necessary information has been entered, press "OK" to close the dialog.
- 4. Select "Edit report to be printed" in the "File" menu, as shown in Figure 8-3.

Hote device metricing in big into entropy in the second se	AA WorkStation							
	File(E) Condition setting(§) Bel	lp120 System se	tting					
ter droff Correlation of the second of the s	New(g) Call setbod(g) Call data(g) Save method	Ctries						
Are grand and a contract of the second and a	Save data(S)	Ctrl+S	۵					
Nation 100 20 20 40 Image: Internal in	First print(2) Transien(2) Tr	Ctr2+P 500 250 250 250 250 250 250	b e					
Numeric No No </td <td>Inject method Atomizer</td> <td>0.000</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Inject method Atomizer	0.000						
Conc Conc Order pect L1 Image: Conc Image: Conc <td>Manual Flame</td> <td>-</td> <td></td> <td>10</td> <td>20</td> <td>30</td> <td>40</td> <td></td>	Manual Flame	-		10	20	30	40	
Get. 0.8 0.04 spc. 0.1	domizer se	et				Cent		
PRINT_REPOIL_EDIT	Geo; 0.8 Oxid geo: 0.8		o Name Abr	Conc BG	(50%) (530%) remark	Dhark Strotted Sample Percad Call standed		
	PRINT_REPORT_EDIT							

Figure 8-3

5. A dialog will appear as shown in Figure 8-4.(In the dialog, the fields of "Time scanning", "Wavelength scanning" and "Standard mode" correspond to the time scanning, wavelength scanning and quantitative analysis mode respectively)

Graphics • Time scanning	ОК
C Wavelength sc	New template
C Overdend and	Call template
Standard mode	Cancel

Figure 8-4

6. For example, to print the spectrum and data of time scanning, select "Time scanning", "Spectrum" and "Data", as shown in Figure 8-5.



Figure 8-5

7. In the screen, you may move and zoom in and out based on your needs.

8. Then, select "Print preview" in the "File" menu as shown in Figure 8-7, and as the screen will appear as shown in Figure 8-8.



Figure 8-8

- 9. You may use functions available in the dialog.
- 10. Press the "Print" button when you are satisfactory with the edited report.

9

Wavelength Scanning and Time Scanning

Wavelength Scanning

(Attention: This mode is only used for testing the instrument.)

Generally, wavelength scanning is used to test the resolution of the instrument and check the emission line positions of light sources (hollow cathode lamps).

Take a Cu lamp for example, and lamp 1 is the one currently being used.

- 1. For light source correction, see "Light source correction".
- 2. After the light source correction is complete, press "More parameters" to show another dialog as shown in Figure 9-1a. Select "Emission", and press "OK" to close the dialog. The screen will appear as shown in Figure 9-1. Select "Wavelength scanning" in the "Mode" pull-down list.

Correction curve and sl	ope factor readjustment paramete Instrument paramet	rs Flame ato ers	mizer parameters setup
'iodic table of element Element Cu HCL (mA): 2.00 NHV (Y):	Image: Signal method D2 0.00 (mA) Background mode Image: Self-absorp Image: Display Self-absorp D2	atomic method Flame C Graphite Fl2 Read method C peak hei	Lamp holder position $\bigcirc 1$ Cu $\bigcirc 2$ Mn $\bigcirc 3$ As $\bigcirc 4$ Mn $\bigcirc 5$ Cs $\bigcirc 6$ Cd $\bigcirc 7$ Mg $\bigcirc 8$ Cu Lift setting
Wave(nm): 324.80 ▼	Slit C 0.1 C 0.2 C 0.4 C 1.0 C 2.0	C peak are c continuo	Lanp warm-up

Figure 9-1a



Figure 9-1

3. As shown in Figure 9-1, select "Wavelength scanning" in the "Mode" pulldown list, and a dialog will appear as shown in Figure 9-2.

Warning!	
Mode change wou lost of previous d want to change m	uld cause the ata. Do you node?
Confirm	Cancel



4. In the dialog as shown in Figure 9-2, press "OK" to select the wavelength scanning mode. The screen will appear as shown in Figure 9-3.

Cu Cu Cu Cu Cu Cu Cu Cu Cu Cu	EAA WorkStation							- e 🗙
Image: Section of the section of t	File(E) Condition retting(S) Help(E)	System setting						
Market Workstragt Address Add	🌾 🛷 🚔 🕷 Zero				Cu			
State N Dist Dis Dist Dist Di	Hole Weeking - Setting Aquet Say	1080 800 T 800 420 200						
Instance Waverleing C Gen: 1.03	Injectmethod Atomizer	0.0 :	323.6	334.0	324.6	325.0	325.5	228.0
Ger. 1.01 Dolar pri 1.01 None None None	Annual and a				Wave (am) 42			
Society 100	Addition of the							
Def get 1.01 5 Base V Conc. 50 (20.3) Image: Conc. Image:	Gas: 1.00							
	Oxid gas: 0.00	No 1	fane NT	Conc BG	SD(N)	Black		
						Sample		
Kathand						Recent		
	6.0		_			Call standard		

Figure 9-3

5. Press "Settings" to show the "Wavelength setup" dialog, as shown in Figure 9-4. The range of wavelengths is 190-900, and the ranges of scanning intervals are 0.01 and 0.1-1.0.

Start WL(nm)	323.30	Setup coordinate	
F- 4 444 ()	200 00		
End WL(nm)	326.30	End Y:	
Interval(s)	0.10	120	
	OK	Cancel	

Figure 9-4

6. For example, set the range of wavelengths to be 300 - 350nm, the transmittance range to be 0-100%, and the scanning interval to be 0.1 s. Press "OK" to close the "Wavelength setup" dialog. Press "Start" to start scanning, and the spectrum will be shown in real time. See Figure 9-5.



Figure 9-5

- 7. After the scanning is complete, you may resize the spectrum. Two methods are available for enlarging a section of curve.
 - (1) Press and hold the left mouse key on the upper left part of the curve section to be enlarged, drag the mouse to include the entire section to be enlarged, and release the left mouse key. Now, the curve is enlarged.
 - (2) To reset the X and Y coordinates, press the right mouse key in the spectrum area, and the screen will appear as shown in Figure 9-6. Set the coordinates as shown in Figure 9-7, and then the spectrum will be shown in the new coordinates. Continuously click for two times on an enlarged spectrum to restore the spectrum to the original size.



Figure 9-6

Wavelength Scanning and Time Scanning Wavelength Scanning

Start WI (nm)	323 30	Setup coordinate
	122120	Start Y:
End WI (nm)	326 30	.
end rre(init)	1020.00	End Y:
Interval(s)	0.10	120
R		
	OK	Cancel

Figure 9-7

osition	Value			
326.60	0.021	-		
326.70	0.042			ок
326.80	0.103		-	
326.90	0.103			
327.00	0.090			
327.10	26.635			
327.20	57.790	_	Max:	57.790
327.30	45.830			
327.40	11.187		Wave:	327.20
327.50	0.032			
327.60	0.034	and a second		
327 70	2 598			

Figure 9-8

- 8. You can view scanning data during and after scanning. Press the right mouse key, and the screen will appear as shown in Figure 9-6. Select "Show data", and the screen will appear as shown in Figure 9-8.
- 9. Print: Select "Directly printing" in the "File" menu, as shown in Figure 9-9. If "Spectrum" is selected, the spectrum will be printed. Otherwise, the spectrum and data will be printed.



Figure 9-9

- 10. Call a spectrum: The methods are available for calling a spectrum:
 - a) Press the "Open" button on the toolbar, as shown in Figure 9-10, and the "Open" dialog will appear, as shown in Figure 9-11. Enter the file name to be opened in the "File name" field, and press "Open" to obtained desired data.



Figure 9-10

Wavelength Scanning and Time Scanning Wavelength Scanning

Save in: 🗀 45300	GF-E	1) 💣 📰 •
AA4530-3.0 Adjust Communication Data Debug DrawView	hlp init lib print Release res	C TestDataFile 전 Al-2-09-04-29 전 Al-09-04-29 전 Al-09-05-12 전 Al-Qiu-1 전 Al-Qiu-1 전 Al-Qiu-2	Cu1-08-07-28 DL-Cu-08-09-0 Fe- 09-05-07 Sample systeminfo
<]	>
File name: Sam	ple		Save
Save as type: Sam	ple Files(*.dat)	•	Cancel

Figure 9-11

b) Select "Call data" in the "File" menu, as shown in Figure 9-12.A dialog will appear as shown in Figure 9-11.



Figure 9-12

Time Scanning

The time scanning is usually used to test the static and dynamic baseline stability of the instrument.

Take a Cu lamp for example, and lamp 1 is the one currently being used.

- 1. For light source correction, see "Light source correction".
- 2. After the light source correction is complete, press "Zero" to zero the instrument, as shown in Figure 9-13.Press "OK" to close the dialog.



Figure 9-13

 Select "Time scanning" in the "Mode" pull-down list, as shown in Figure 9-14.



Figure 9-14

4. Press "OK" to confirm selection of the time scanning mode.

Wavelength Scanning and Time Scanning Time Scanning

 Press "Settings" to show the settings dialog, as shown in Figure 9-15. The unit of integration time is second; the unit of scanning time (X coordinates) is second; and the unit of absorbance values (Y coordinates) is (Abs).

ntegration-T(S):	Start Y:
2.00	0
Scan time(S):	End Y:
80.00	4
ОК	Cancel

Figure 9-15

6. For example, to read very 10 seconds for 30 minutes, enter 10 in the "Integration time" field and enter 1800 in the "Scanning time" field. The X coordinates should be determined based on actual needs. For example, enter -0.005 in the "Start Y value" field, and 0.005 in the "End Y value" field. Press "OK" for confirmation and closing the dialog as shown in Figure 9-16a.

Integration-T(S):	Start Y:	
1.00	-0.005	
Scan time(S):	End Y:	
1600.00		
ОК	Cancel	

Figure 9-16a

7. Press "Start" to start time scanning (The "Start" button has been changed to the "Stop" button now). The spectrum and data is being shown in real time.



Figure 9-16b

- 8. You may stop time canning at any time during the scanning process. The scanning will be immediately stopped when the "Stop" button is pressed. Now, the "Stop" button has been changed to the "Start" again.
- 9. The steps for viewing data and printing spectrums are the same as those for the "Wavelength scanning" mode.

4530F Atomic Absorption Spectrometer

Quality Certificate

Product No.:

This is to certify that the instrument has been inspected in accordance with the inspection procedures and has been found in compliance with the standard Q/YXWZ80.

Inspector:

Date:
4530F Atomic Absorption Spectrometer Packing List

Instrument No.:

- 1. Instrument
- 2. Accessories (See the List of Accessories and Spare Parts)
- 3. Documents
 - a) User Manual
 - b) Quality Certificate

Date:

4530F Atomic Absorption Spectrometer

List of Accessories and Spare Parts

SN	Code & Model	Description & Specification	Qty	Unit
1	ASA1.670.802SM	User Manual	1	Сору
2	ASA1.670.803ZM	Quality Certificate	1	Сору
3	HPSF6.382.801	Burner (100mm)	1	Piece
4	HPSF6.385.807	Expansion chamber part	1	Piece
5	ASA8.940.831	Nut (Gas pipe connector)	8	Piece
6	SF8.210.030	Lining	8	Piece
7	SF8.215.065/12	Threaded bushing	8	Piece
8	SF8.370.206	Seal ring	8	Piece
9	SF8.370.350	Seal lining ring (part for acetylene cylinder)	4	Piece
10	SF8.402.900	Light check board	1	Piece
11	SF8.470.056	Connector of pressure reducing valve	1	Piece
12	SF8.470.113	Connector (leakage detection)	1	Piece
13	SF8.470.201	Input connector	1	Piece
14	SF8.470.202	Output connector	1	Piece
15	ASA8.811.800	Cover (dustproof)	1	Piece
16	04-01-580	Oring φ6×1.9	6	Piece
17	07-01-609	Polyvinyl chloride pipe $\phi 8 \times 11$	3	Meter
18	07-06-011B	Polyvinyl chloride pipe φ6×4	20	Meter
19	20-14-010	O ring φ10×12	10	Piece
20	20-14-014	Oring φ14×2	6	Piece
21	20-14-032	O ring φ32×2.65	3	Piece
22	20-14-040	O ring φ40×2.65	3	Piece
23	20-17- 008/012/017	Double open mind wrench 8×10,12×14,17×19	1 for each	Piece
24	20-17-050	2" screw driver	1	Piece
25	20-17-075	3" screw driver	1	piece
26	30-01-030	Fuse wire 0.5A	4	Piece
27	26-21-033	Fuse wire RF1-30 3A	3	Piece
28	31-01-020	VEKY-1 hollow cathode lamp Mn	1	Piece
29	31-01-080	VEKY-2 hollow cathode lamp Cu	1	Piece
30	32-02-140	Acetylene pressure reduction valve	1	Set
31	32-02-171	AAS-HPSF glass debulizer	2	Piece
32	32-04-139	HP printer	1	Piece
33	HPSF8.866.830	Guarantee Card	1	Сору
34	33-01-110	Water separation air filter (or air water filter) G1/4"	1	Piece
35	33-04-020	Air compressor	1	Piece
36	34-02-638	Power cord	1	Piece
37	20-23-004	Printing paper	500	Piece

38	34-02-660	RS232 communication cable	1	Piece
39	SF8.045.125	Piece	1	Piece
40	ASA7.000.800	Workstation software	1	Сору
41	SF9.026.008	Explosion protection spring	1	Piece