1904C
Chemistry Analyzer
User' s Manual

Rev: 1.3

How to use the manual

Thank you to be the user of 1904C.

This manual is a user's guide for 1904C Chemistry Analyzer, and contents system installation, operating procedures, System parameters setting and maintenance. We suggest that the user read the manual carefully.

Please read the ext. Printer manual for the system with ext. Printer.

The instruments with different versions or collocations will have some differences in functions

Note: *Contain useful tips on using your instrument. They appear in italicized type.*

Cautions: cautions should be followed carefully to ensure your instrument operates correctly and is not damaged. Cautions appear in bold type like this.

Chapter 1 A Brief Description

1904C is a universal photometric chemistry analyzer. The advanced software based on Windows CE gives the instrument a friendly interface which meet the individual requirements of clinical chemistry laboratory.

- 47 of the most commonly assays are stored in the flashing RAM of the 1904C, which enables user can start working right away with the instrument. 130 of assays can be programmed.
- 6 Analytical Modes:
  Endpoint
  Bichromatic
  Liner regression
  Multi-Calibration
  Two-point
  Kinetics

- The user could connect the unit to the PC of clinic lab by RS232 interface.
- Options:
  Keyboard
  CRT

1.1 Installation

1.1.1 Unpacking

Carefully unpack the instrument, removing it from its plastic bag. Keep the boxes and packaging material until being assured that nothing is missing, that the unit has no (internal) transport damage and are working properly.

1.1.2 Instruments location

The 1904C should be located on a flat surface, which is not exposed to heavy vibrations (i.e. centrifuges, etc.) and direct sunlight. The ventilation openings in the bottom plate and at the rear of the instrument should not be blocked.

Note: *Environmental requirements*

Ambient temperature (operating):	*15-32 C*
Relative humidity:	*20% - 85%*

1.1.3 Power requirements

- AC110V ~AC250V
- 50~60 Hz
- 150W max

1.1.4 Connect the instrument to AC power

Plug the power cord into the instrument. Plug the power cord into an AC electrical wall outlet.

Caution:

- **AC power outlet must be connected to ground.**
- **Shut(Power) off the power if smog, special smell or special sounds from the inside of the instrument, and contact your supplier.**
- **Hold the connector when you pull off the power cord. Never pull the cord directly.**

1.1.5 Paper Installation

- Remove the paper cover by pulling up at the top end of the cover.
- Unroll about 10 inches of paper and place the roll on the table behind the instrument.
- Feed a cleanly cut edge of the paper from the back into the printer.
- A ragged edge or wrinkled paper will be difficult to load and could cause a paper jam.
- Feed just over 1 inch of paper in and then press the feed paper key several times to feed over 3 inches of paper. Drop the roll of paper into the printer paper well in back.
- Feed the paper through the paper slot of the cover, then close the cover

1.1.6 Set the screen in properly position

Set the screen in properly position.

Figure 1.1

1.1.7 Flow cell and cuvette system

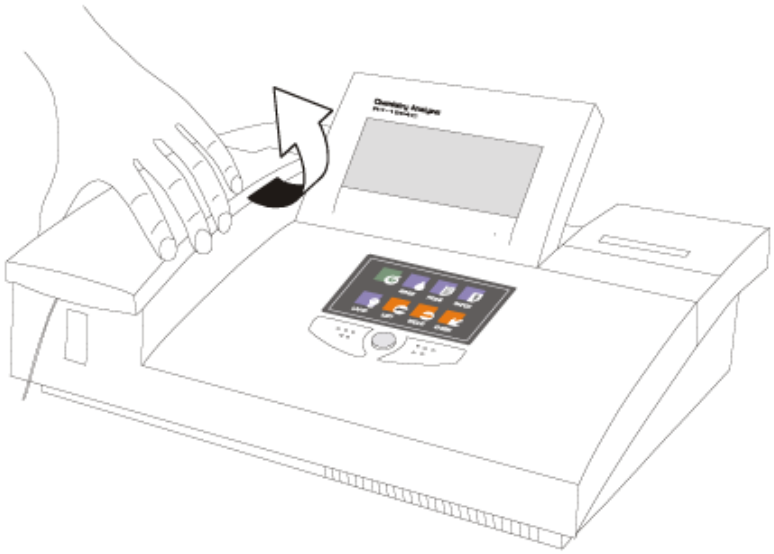


Figure 1.2

- Remove flow cell cover
- Insert the flow cell or cuvette into the flow cell holder
- Make sure the surface with characters of the flow cell is faced to user.

Note: *Keeping the surface of the flow cell or cuvette clean. Don't touch it by fingers.*

1.2 System overview

1.2.1 Front View

1) Pump cover: Open the cover, user could change the lamp or maintain the pump.
2) Flow cell cover
3) Sample tube
4) Sample button
5) LCD Screen
6) Hot-key
7) Left, Right key of the mouse (just for 1904C plus version)
8) Mouse (just for 1904C plus version)
9) Power-on indicator
10) Printer cover

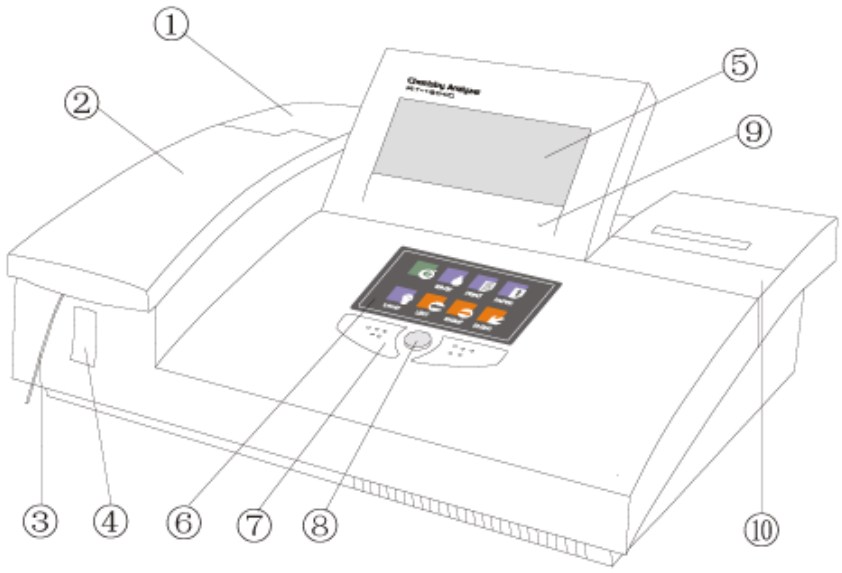


Figure 1.3

1.2.2 Keyboard Functions

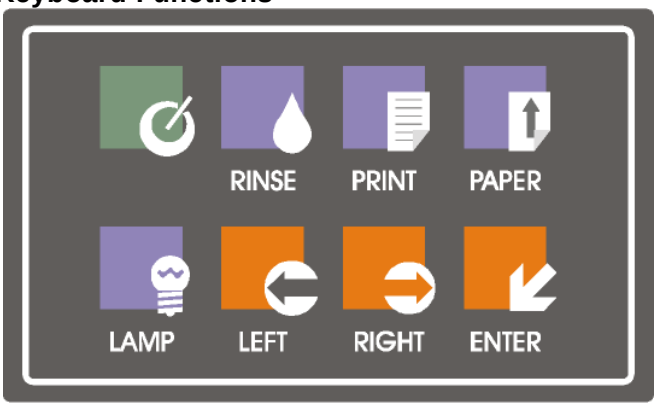


Figure 1.4

1)  Soft keyboard: Open or close soft keyboard.

2)  Rinse On, Off: Pressing this control will switch on the sipper pump in a continuous mode. Press the key again will stop the pumping action at the end of a complete cycle.

3)  Feed Paper: Control the printer paper for the embedded printer.

4)  Print: Set the printer enable or disable.

5)  Lamp On, Off: Turn off or turn on the Lamp.

6)  Left: This key is used to go backwards in a procedure.

7)  Right: This key will advance the cursor to the next position.

8)  Enter: This key is used to confirm an entry via the keyboard.

1.2.3 Rear view

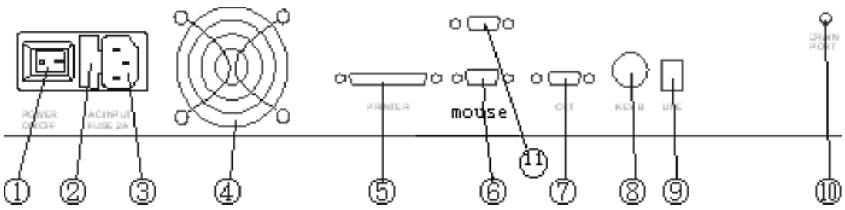


Figure 1.5

1) Power switch
2) Fuse
3) AC power connector
4) Fan
5) Printer interface
6) RS-232 interface -1
7) CRT connector
8) Ext. Keyboard
9) PSTN connector
10) Drain port
11) RS-232 interface –2

1.2.4 Flow cell and cuvette

The following sketches will help you locate and identify the flow cell parts.

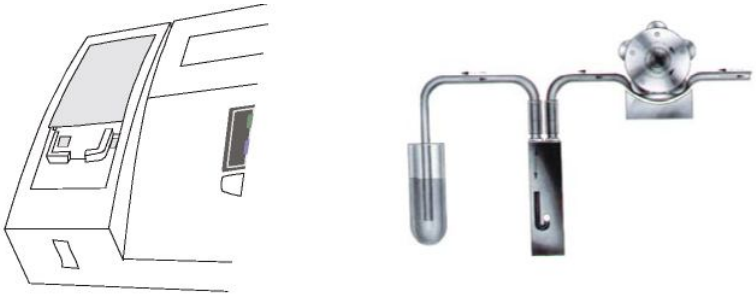


Figure 1.6

1.2.5 Lamp and sipper pump

1) Remove the lamp cover and flow cell cover.
2) The sketches of the lamp and the sipper pump are as show in the following figure1.7, 1.8:

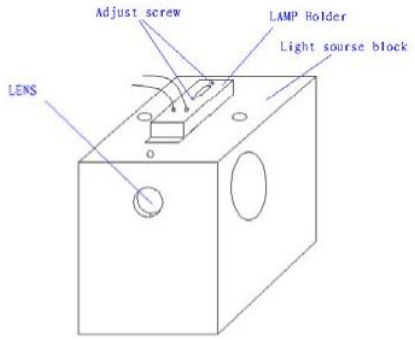


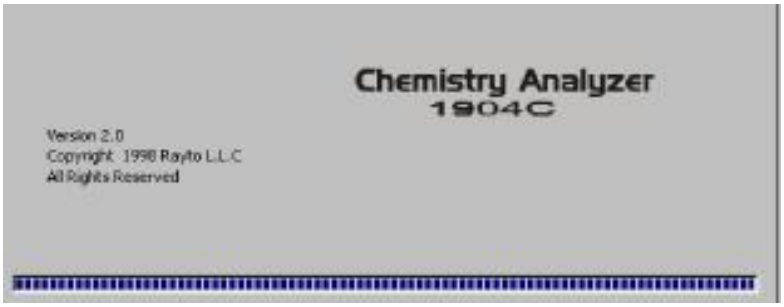
Figure 1.7

Figure 1.8

Chapter 2 Operating Procedures

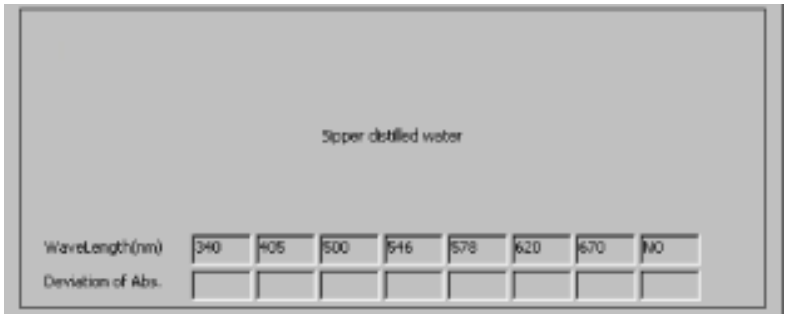
2.1 Powering on

Turn the instrument on using the power switch on the rear panel. The screen will display the following:



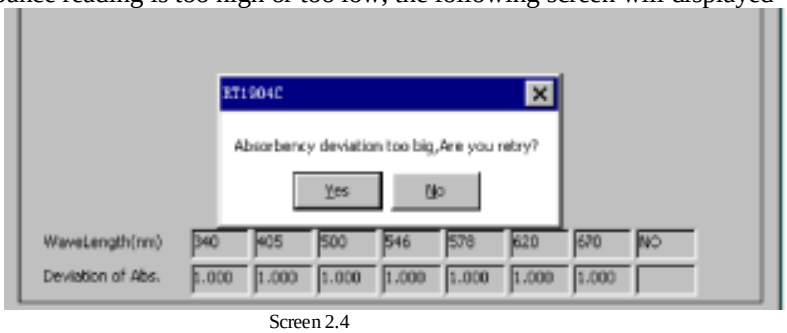
Screen 2.1 System initialization

The instrument will be waiting the lamp stable in 2 minutes. Then the screen will display as following:



Screen 2.2

Raise a test tube of distilled water up to the aspiration tube press **Rinse** key to rinse the flow cell for about 20 seconds then press the "Sample Button" to aspirate the distilled water. After you hear the control unit valve cycle, remove the tube. The chemistry analyzer will now read and save the absorbance reading for water for all seven filters in the machine. If the absorbance reading is too high or too low, the following screen will displayed



Screen 2.4

Select "No", the system will ignore the deviation above and move to test menu. Select "Yes", and raise the test tube of water up to the aspiration tube, and press **Rinse** to rinse the flow cell. After a few seconds, press **Rinse** again to stop the rinse, then press the "Sample Button". If the above screen still displayed, contact the supplier.

2.2 Basic operating

2.2.1 Mouse

The instrument has different configure for different version.

- 1904C plus: has a special mouse designed for PDA or instruments
- 1904C lite: Normal mouse for PC (RS-232 interface)

2.2.2 Keyboard(option)

Connect the ext. Keyboard to the instrument when the analyzer powered off. You can use the keyboard just like to operating a PC keyboard.

2.2.3 Soft-keyboard

You can use the hot-key 

Or the mouse to click the icon (soft-key) to pop a soft-keyboard, (Screen 2.5 Soft keyboard) and click the icon again, the soft-keyboard will be close.

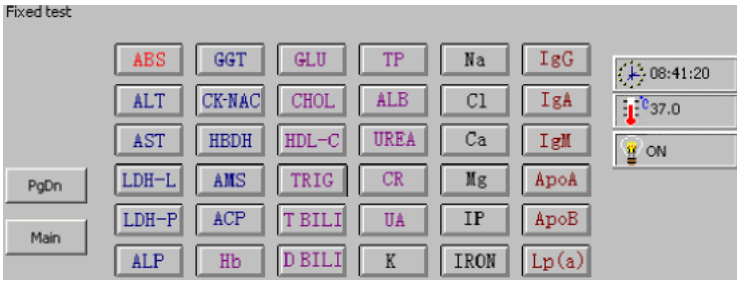
If you want to move the keyboard, please click the its upper blank area and drag it away.

icon (soft-key)

Screen 2.5 Soft keyboard

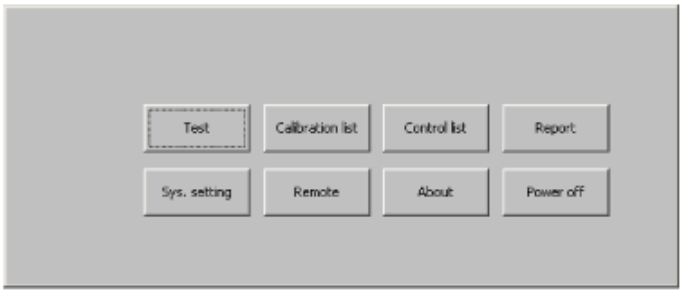
2.3 Main menu and system parameters setting

After the instrument initialization, the screen will display the following:



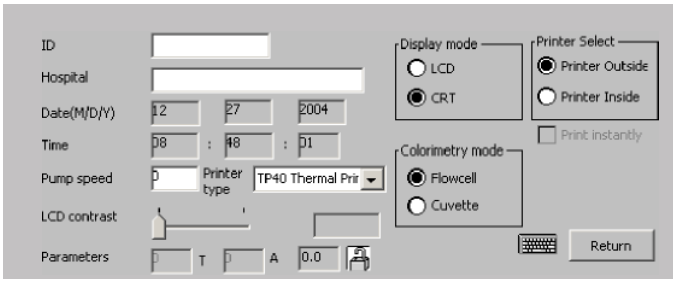
Screen 2.8 Test survey menu

Select “Main ”, the screen will change to:



Screen 2.9 Main menu

Click “Sys Setting”,



S

creen 2.10 Sys setting menu

1) Setting time and date
2) Changing the display mode
   - Click “CRT”.
   - Turn off power switch.
   - Connect the CRT to the instrument.
   - Powering on the CRT, turn on the system again. The CRT will display the initialization screen.
   - Select LCD mode by the same way.

3) Adjusting contrast of LCD
4) Printer Select
   - Printer Inside: If you select “Printer Inside”, the Printer type can not be selected.
   - Printer Outside: If you select this, you need to select the printer type also.

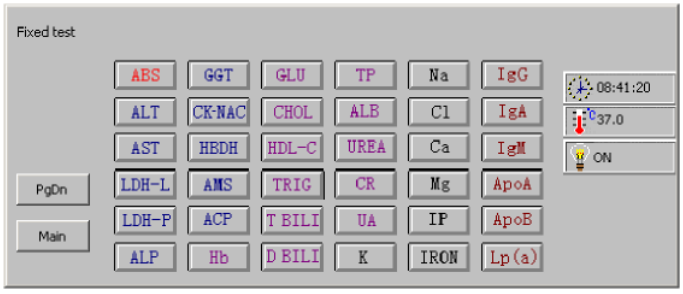
5) Inputting the Hospital name

2.4 Programming test parameters

1904C has a built-in menu of 130 assays. 47 assays of most commonly applied data reduction formulae are pre-programmed.

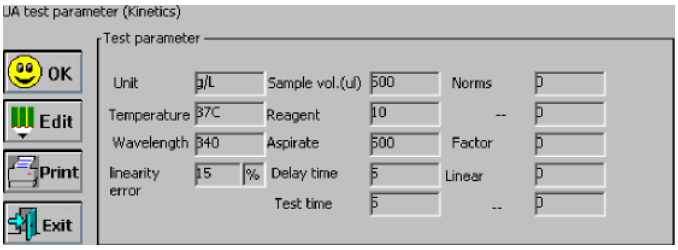
2.4.1 Modifying preprogram

Click “Test” button in main menu. The screen will display the following:



Screen 2.11 Test survey menu

1) Click the button which will be modified, such as “UA”, The screen will display the following:

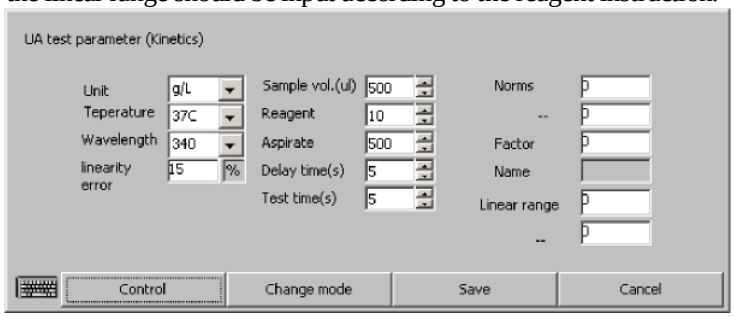


Screen 2.12 Test Enter menu

- Select “Edit” to modify the parameter of the test.

2) Modifying parameters

Note: the linear range should be input according to the reagent instruction.



Screen 2.13 Programming menu

3) Click “Save” button to save the modification, or click “Cancel” to ignore.

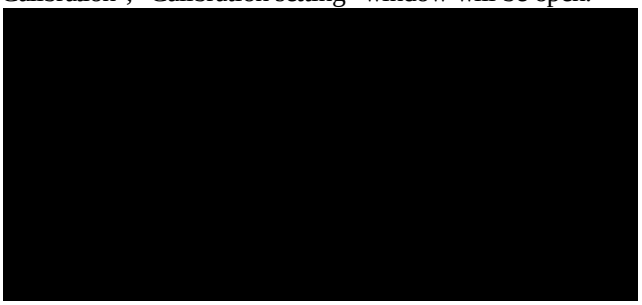
2.4.2 Programming a new assays

1) Select a free button of assays by clicking “Pgdn” button, then click the button 2) Input parameters

3) Save the input

2.4.3 Calibration parameter

Select “Calibration”, “Calibration setting” window will be open.



1) Calibration for linear tests

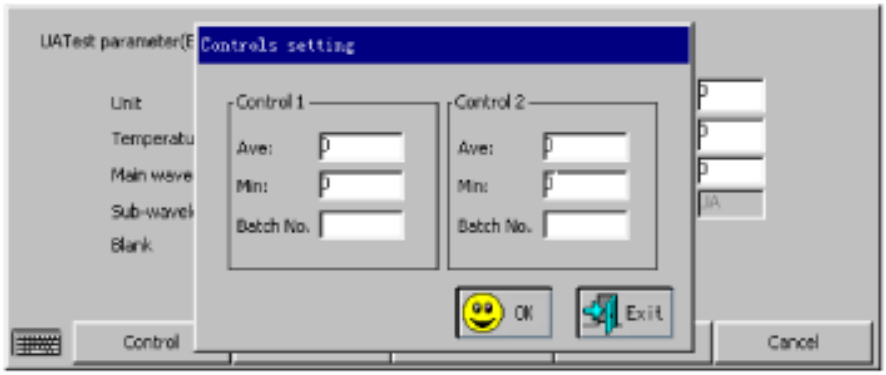
- Standard number means that how many standards will be measured. The measured results will be averaged. Input the number by clicking the window.
- Repeat number: This parameter determines how many standards (with the same concentration) will be used for calibration. The results of multiple measurements will be averaged by the system.
- Select “OK” to confirm the selecting.
- Select “Exit” to go back to above menu with modify

2) Calibration for non linear tests

- Standard number means that how many standards will be measured. The standards are different concentrations. The measured results will be a calibration curve. Input the number by clicking the window.
- Repeat number: This parameter determines how many standards (with the same concentration) will be used for calibration. Possible inputs are 1, 2 and 3.The results of multiple measurements will be averaged by the system.
- Select “OK” to confirm the selecting.
- Select “Exit” to go back to above menu.

2.4.4 Control parameter

Select “ Control” for programming control. The follow window will appears:

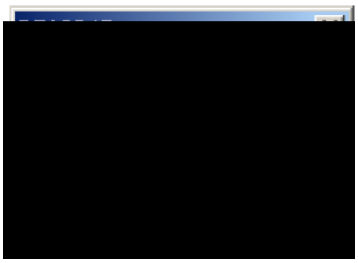


Screen 2.15 Controls setting menu

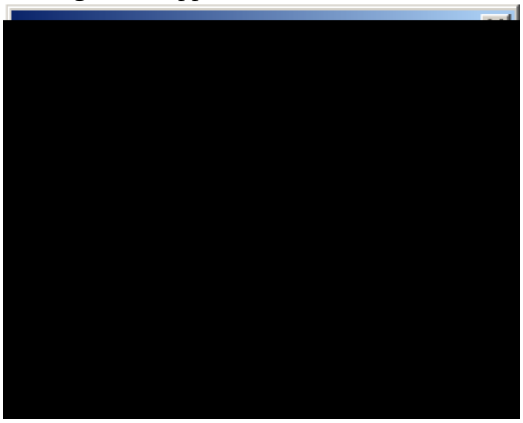
a) Control 1 and control 2: Two controls could be defined.
b) Mean value: Input the mean value of the control.
c) Minimum: Input the minimum of the control.
d) Batch number: The different batches of a control will have different values. Enter the batch number.
e) Select “OK” to confirm the programming. Select “Exit” to go back the above menu without modifies.

2.4.5 Selecting a Mode

Into the menu of the “Programming” (screen 2.13), click “Change mode”. A window will be pop-up.



Select “Yes”, the following screen appears:



a) Endpoint

After a required incubation time, the reaction reaches its maximum color development, or its Endpoint. The color of the reaction will remain stable and constant for certain period of time. During this time a measurement in Absorbance is taken.

b) **Endpoint Bichromatic**

Bichromatic is actually endpoint determination measured at two different wavelengths. The advantage is that some unwanted interference due to the color of the serum sample can be eliminated by subtracting the measurement done with the second wavelength filters. This can be done when you select a sub-wavelength in “Parameter change” menu. It was described in **2.4.1.**

c) **Endpoint determinations against a standard Curve**

d) Endpoint determinations against a Multi-standard Curve

This is a normal endpoint determination, in which linearity may not be perfect throughout the whole range that is interest. As a result it is calibration curve (a number of standards) instead of a single standard.

e) Kinetic

Kinetic determinations are tests whose enzyme activity is measured continuously over a certain period of time and finally referred to 1 minute.

f) Twopoint

After a pre-defined incubation time, two absorbance readings are taken at different and programmed time interval. From the delta absorbance between the two measurements the final result is calculated. Each of the measurements taken is a mean of a large number of readings taken in quick succession.

2.4.6 Save the Change

After select the measure mode, Select "Save change" to save the selection. The menu will change to the "test enter" menu. Select "Enter" to perform the test procedure.

2.4.7 Return

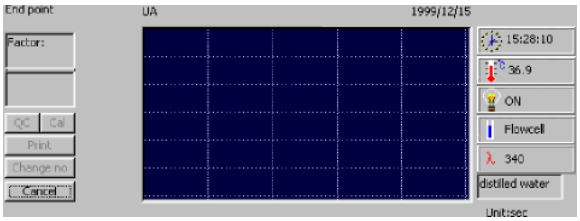
Select "Exit" to go back to the "test enter" menu.

2.5 Perform tests

Select the test to be performed in the menu of "test overview", and select "OK" to go to the menu of "test procedure" in the menu of "Test enter".

2.5.1 Test procedure menu

The menu of "test procedure" is displayed as following:



Screen 2.18 Test procedure menu

1) Factor window: Factor
2) Result window: Test result
3) Control: Perform the control test.
4) Calibration: Perform the calibration test.
5) Print: Print the test result.
6) Change No.: Change the sequence number tested.

7) Time:	Display the time.
8) Temperature:	Display the temperature of the flow cell.
9) Lamp:	Show the status of the lamp: On/Off.
10) Wavelength:	Show the wavelength selected. Display the
11) Instruction window:	instruction information. Return back to
12) Return:	above menu.
13) Reaction window:	A curve will be displayed to represent the reaction.

2.5.2 Perform

Follow the instructions displayed on the “instruction window”.

Screen 2.19

1) Instruction window: **Aspirating distilled water**
Put a tube with distilled water under the sample tube and press **Sample key** (figure 1.4).
The measure result will be displayed on the “result window” and on the “reaction window”.

2) Instruction window: **Aspirating reagent blank** or **Aspirating Sample blank ,** Hold the reagent blank or sample blank under the sample tube and press **Enter** key or sample button The programmed solution will be aspirated and measured. The process and result of the measurement will be displayed.

3) Instruction window: **Aspirating Sample**
Hold the sample under the sample tube and press **Sample button.** The programmed solution will be aspirated and measured. The process and result of the measurement will be displayed.

4) Calibration: will be described in **Chapter 3**

5) Control: will be described in **Chapter 4**

2.5.3 Changing test

When changing over from one test to another, washing of the flow cell is required, to prevent reagent carry over, causing wrong calibration and measurement result.

To wash the flow cell:

- Place a container of distilled water under the sample tube. Press **Rinse** key. The aspiration/flow cell system will be washed continuously now, until the **Rinse** key is pressed again. Let the flushing continue for about 30 seconds.
- Go back to the "Fixed test" menu, the new assay can be started now.

Chapter 3 Calibration by standard

3.1 General

Certain tests require calibration by 1 or more Standards. Calibration results are stored in the flash memory of the analyzer and can be used again for future measurement. Calibration can be programmed and subsequently done for different measurement mode: Endpoint or Twopoint. For Endpoint, the calibration could be with/without Reagent Blank and/or Sample Blank. For Twopoint, the calibration could only be with or without Reagent Blank.

The calibration by standard should be performed depending on the stability of the reagents, batch of the reagent, and type of test. The new ones will overwrite the previous calibration data in the flash memory.

3 procedures should be performed for the calibration by standard:

- Program calibrations
- Measurement of calibrations
- List calibrations

3.2 Program calibration

The calibration parameters could be programmed in the menu “parameter modify”, see the screen 2.14. The setting was described in **2.4.2.**

3.3 Perform linear tests

For linear tests, the relation between Absorbance and Concentration is a (linear) straight line. This type of test is normally calibrated with one or more standard(s) of 1 concentration and with or without Reagent Blank.

The calibration can be run at any time during a test run, after the test has been selected. Select “Calibration” in menu of “test procedure”:

1) Instruction window will appear: **Standard “#”**

   Hold the standard sample “#” under the sample tube and press **Sample button.** The programmed volume will be aspirated and measured. The process and result of the measurement will be displayed.

2) Instruction window: **Standard “#”, Repeat #**

   Following the instruction on the “instruction window”.

Screen 3.1

3) The result will be displayed on the result window, and the standard curve will be displayed in same time. User can save and print the result

3.4 Perform the calibration of non linear tests

Non linear tests are those tests where the relation between Absorbance and Concentration is not linear. These tests are normally calibrated on more than 1 standard of different concentrations. The analyzer has a special arithmetic to link the calibration points to a calibration curve. The measurements for patient or controls are then interpolated automatically depending on the curve.

The calibration can be run at any time during a test run, after the test has been selected. Select "Calibration" in menu of "test procedure":

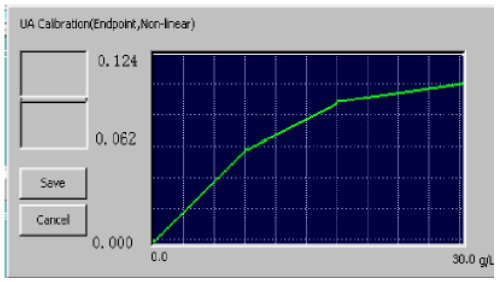
1) Instruction window will appear: **Aspirating Standard "#"**

Hold the standard sample "#" under the sample tube and press **Sample button.** The programmed volume will be aspirated and measured. The process and result of the measurement will be displayed.

2) Instruction window: **Aspirating Standard "#", Repeat #**

Following the instruction on the "instruction window".

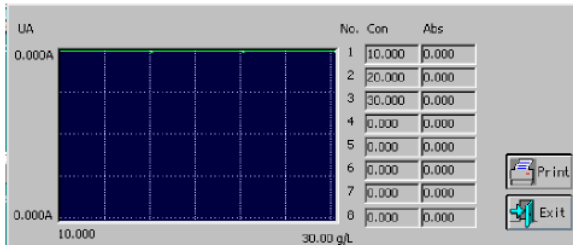
3) The result will be displayed on the result window, and the standard curve will be displayed in same time. User can save and print the result.



Screen 3.2

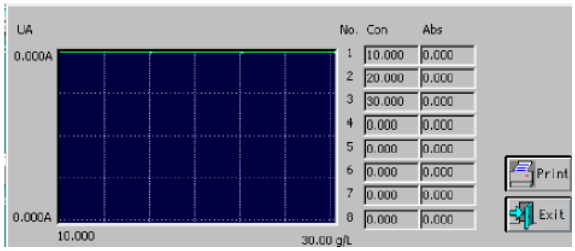
3.5 List calibration

Select **"Calibration"** in "Main menu", to list the calibrations. The list screen will be displayed:



Screen 3.3

1) Select the test which one will be checked. Click “OK”.
2) The result of the test will be displayed on the screen:



Screen 3.4

3) Print the result by selecting the “Print”.
4) Select “Exit” to go back to the above menu.

Chapter 4 Control

4.1 General

The control program gives the possibility of storage and statistical evaluation of controls measured on the instrument.

For all 130 tests programmed in the unit, 2 controls can be defined. The result of controls for 130 tests of 365 days could be stored automatically. 3 operating should be performed for the controls:

- Program controls
- Measurement of controls
- List statistics

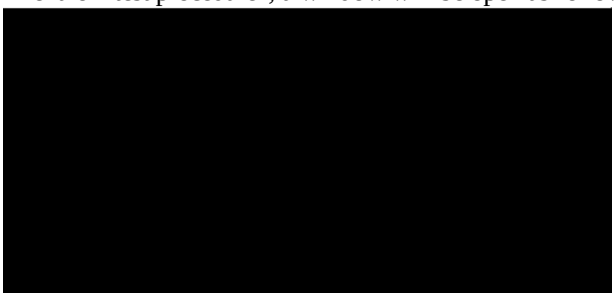
4.2 Program controls

The control parameters could be programmed in the menu “parameter modify”, see the screen 2.15. The setting was described in **2.4.3.**

4.3 Measurement of controls

A control can be run at any time during a test run, after the test has been calibrated.

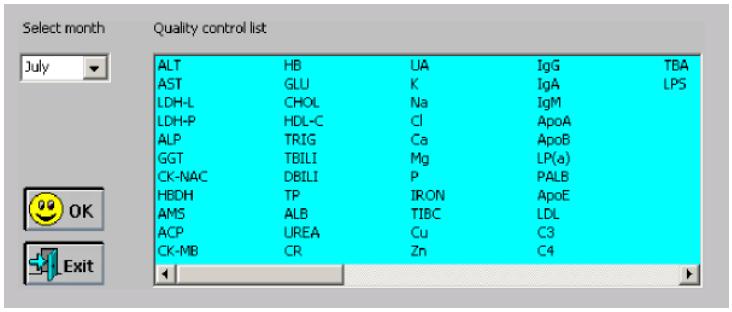
Select “Controls” in menu of “test procedure”, a window will be open as following:



1) Choice “1” if only measuring 1 control, and choice “2” if 2 controls will be measured. Select “Enter” to confirm the choice.
2) Instruction window will display: **Control “#”**
   Hold the control requested by analyzer under the sample tube and press **Sample button.** The programmed volume will be aspirated and measured. The process and result of the measurement will be displayed.
3) The result will be added to the statistical memories automatically. The evaluation of control results can be accessed through the main menu and described in **4.4.**

4.4 List controls

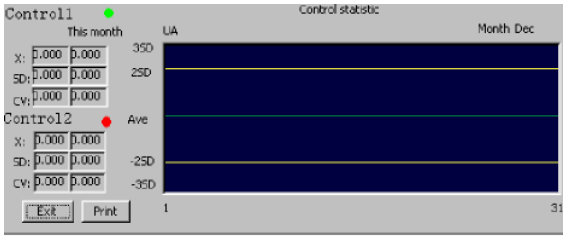
Select “Control” in main menu, to list the statistics of controls. The list screen will be displayed:



Screen 4.2

1) Select the test, and the month will be checked. Click "Enter".

2) The statistic of the controls will be displayed on the screen:



Screen 4.3

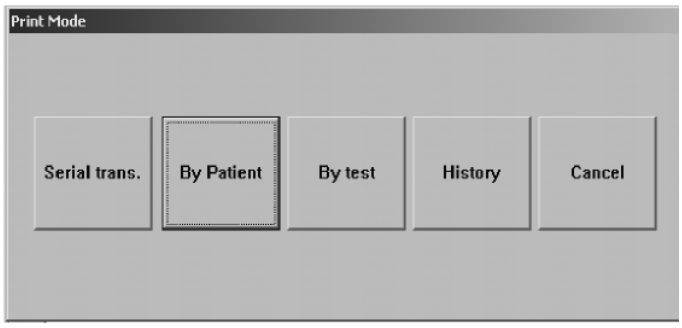
3) Print the result by selecting the "Print".

4) Select "Exit" to go back to the above menu.

Chapter 5 Report

5.1 Summary

In this part, four report styles are provided: “Serial trans.”, “By patient”, “By test” and “History”, you can select one style from four according your requirement.



Screnn 5.1

5.2 Serial transfer

Select “Serial trans”

The test result in 1904C can be transferred to Desktop PC through standard RS232 Cable, The serial port of PC should be set as following:

19200 baud, Even Parity, 8 bit of data and 1 bit of stop.

Details of Protocol please see Appendix **II:.**

5.3 Print by patient

In the state of Screen 5.1, select “By patient” , a new window will be open.

Operation guide:

1. Update patient information

Select one patient, the correspondent line is activated. Input name, department,age and sex , click “Update”, then the patient information is change into what you have input.

2. Add a patient

If you want to add one or more new patients, you can click “Add” after the patient information has been input. Each new patient will a different patient NO. If you want to test the patient’s sample, just change the present sample No. into the patient No..

3. Select print mode

In this part, seven print modes are provided, “General”, “Liver function”, “Kidney function”, “CK enzymes”, “Lipids”, “Iron” and “Electrolytes”.

General: Print all item tested in the test order.

Liver function: If this mode is selected, 18 items are included.

1 ALB
2 TP 3 GLB
4 ALB/GLB 5 T
BILI 6 D BILI 7
I BILI 8 AST 9
ALT 10
AST/ALT 11
GGT 12 ALP 13
LDH
14 LDH/AST 15
GGT/AST 16 TBA
17 PALB 18 GLU

Kidney function: If this mode is selected, 6 items are included.

1 UREA
2 CR
3 UA
4 TP
5 ALB
6 GLU

CK enzymes: If this mode is selected, 4 items are included.

1 CK
2 CK-MB
3 AST
4 LDH

Lipids: If this mode is selected, 8 items are included.

1. CHOL
2. TRIG
3. HDL-C
4. HDL-C
5. ApoA

6. ApoB
7. ApoA/ApoB
8. ApoE

Iron: If this mode is selected, 2 items are included.

1 IRON
2 TIBC

Electrolytes: If this mode is selected, 11 items are included.

1 K
2 Na
3 Cl
4 Ca
5 Mg
6 P
7 Cu
8 Zn
9 GLU
10 AMS
11 LPS

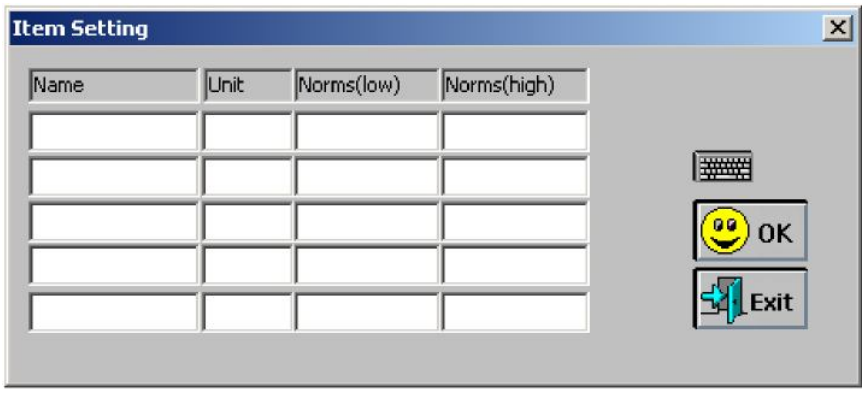
Input patient NO which need to be printed, patient NO can be input as following:

1. 3,6
1. 1-5
2. 1-4,5-6
3. 3,4,5-7
4. If all patients need be selected, you can select the check box "select all"

Click "Print" , the report will be printed . If some item in the mode hasn't been tested, there will have no correspondent data in the report.

4. Input no-chemistry item

Setting: Directly inputting a no-chemistry item and result is also permitted, this item will be printed in the "General" mode report. In the window of "By patient", click "setting", a window will be open as Screen 5.2. "Test name", "Unit", "Normal (low)" and "Normal (high)" are all need to be input, and each can't be longer than eight characters. All the no-chemistry items will be saved if 1904 is closed correctly.



Screen 5.2

Edit: In the window of "By patient", select one patient line, then click "setting". In the "Item edit" window, input no-chemistry item result, this item will be printed in General mode report.

5.4 Print by test

In the state of Screen 5.1, click "By test", a new window will be open.
Select the Item to be printed, then click "Print", all test result of selected item will be printed. If you want print all items, just select the "Select all" check box.

5.5 Print history records

In the state of Screen 5.1, click "History", a new window will be open.
1904C can store 500 pieces of records at most. In the new window, drag the scroll bar, you can see about all test results of history.
Input the order No. of patient, then click "print", all selected records will be printed out in a history records list. Patient No. can input as following:

1. 3,6
5. 1-5
6. 1-4,5-6
7. 3,4,5-7

Chapter 6 Remote service

1904C Lite Version can't support the remote service!

Chapter 7 Close system

At the end of the working, you must perform the Closing procedure by selecting "Power off" in the "Main menu".

1) The system will store the parameters and the results of tests.
2) The screen will display "aspirating distilled water".
3) Place a container of distilled water under the tube. Press **Sample button,** Rinse will take few minutes
4) The screen will display " Turn off the System"
5) Turn off the power.

Caution: Never power off the system without performing the closing procedure. It will cause that lost of the data and influence the measurement.

Chapter 8 Maintenance

8.1 General

The 1904C is a Clinical Chemistry Analyzer, which requires only a minimum amount of maintenance.

Some general maintenance is necessary to keep the instrument in an optimal condition.

8.2 Cleaning the outside

Always keep the outside of the instrument clean and free dust. You can wipe the outside with a damp (not wet) cloth and a mild detergent Wipe the display screen with a soft, nonabrasive cloth.

Caution: Do not use any type solvent, oil, grease, silicone spray, or lubrication on the instrument.

8.3 Clean procedure for the flow cell

The inside of the flow cell should be kept as clean as possible, to assure good and reliable measurements.

To keep the inside clean, follow the following procedures:

8.3.1 Washing when Changing tests

When changing over one test to another, some washing of the flow cell is required. **To wash the flow cell:**

- Place a container of distilled water under the tube. Press **Rinse** key. The flow cell system will be washed continuously now, until the **Rinse** key is pressed again. Let the flushing continue for about 2 minutes.

8.3.2 Washing twice a day

The following procedure is needed twice a day, to wash out those residues from the wall of the flow cell, which cause bad filling of the cell:

- With the solution of neutral detergent (such as Tweenum 20). Let the neutral detergent stay in the flow cell for 2-3 minutes. The distilled water added some detergent is better. The ratio of the detergent is depending on the detergent used. Normally a 1-5% solution is adequate.
- Rinse with distilled water without detergent for about 1 minute.

8.3.3 Closing the system by the closing procedure

At the end of the working, you must perform the Closing procedure by selecting "Closing system".

1) The system will store the parameters and the results of tests.
2) The screen will display " distilled water".
3) Place a container of distilled water under the tube. Press **Sample button,** Rinsing will take few minutes. Leaving the distilled water inside the flow cell.
4) The screen will display " Turn off the System"
5) Turn off the power.

Caution: Never leave Sample/Regent inside the flow cell for a long period of time.

8.4 Replacement the lamp

8.5 Replacement of the internal tubing

8.6 Replacement the fuse

The fuse is situated at the rear side of the analyzer. It is mounted in the fuse holder beside the power switch. Pull out the fuse holder lid and the fuse can be replaced easily. Replacement fuse should be the following rating:

Fuse rating: **250V, 3.15A**

Caution: Never mount fuse of wrong rating!

8.7 Trouble shooting

1) The analyzer could not power on	--- Check the power cord --- Check the fuse --- Check AC power
2) The lamp couldn't turn on	--- Check the connector of the lamp --- Change the lamp
3) Not Print	--- Check the setting Check the cable --- Assure that printer powered on firstly.
4) Non aspiration of sample	--- Check the pump tube --- Check tube pipeline --- Rinse and check the flow cell
5) The result of water blank is too high	--- Check the lamp --- Change the distilled water

6) Repeats are not good	--- Rinse the flow cell --- Check if there is air bubble in flow cell
7) Controls out of the target	--- Reagent validity --- Assure the program is correct. --- The quality of controls --- To test again by changing the mode --- Check the flow cell and select a new reagent and control
8) The aspirate volume not stable	--- Liquid system blocked, Rinse the tube pipeline, or change the tube.

8.8 The instrument's disassembly

If the user meets some problems and needs to open the instrument, you can do as follow:

1) Turn over the instrument.
2) From bottom of the instrument you can see seven plastic pillars with screw hole. Uses a screwdriver unscrew these seven screws. (Figure 8.1)
3) Turn the instrument back to normal position.
4) Set the LCD screen to vertical position. (Figure 8.2)
5) Lift the top cover of instrument gradually, and open the front side about 3 inches first. Do not use too much force, because there are cables between top and foot cover.
6) After open the machine, you can see the inside distribute of top and foot cover like figuer8.3
7) Find the LCD connector on the main board, and open it carefully.
8) Then turn over the top cover, disconnect 5 other cables

Set up the machine in reverse order.

Figure 8.1

Figure 8.2

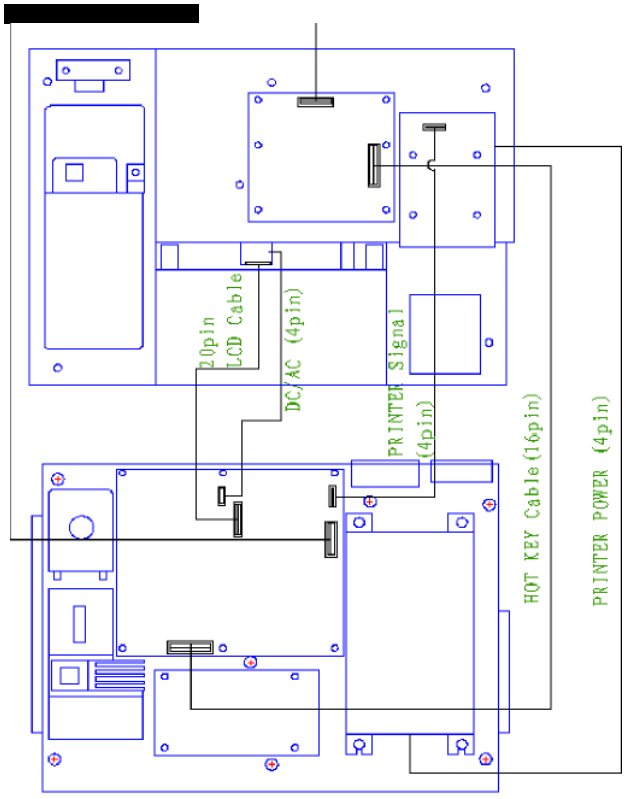


Figure 8.3

Appendix I: General Specifications

Weight:	**10 kg**
Dimension:	**450mm(L)x330mm(W)x140mm(H)**
Power supply:	**90-250VAC, 50/60Hz**
Power consumption:	**150 W max**
Fuses:	**3.15A, slow-blow type 5x20mm**
Operating condition:	**15ć to 32ć; RH 85% max**
Storage condition:	**-20ć to 50ć; RH 85% max**
Display:	**7" color LCD (640x240, 256 colors)**
Measurement range:	**0.000-2.500 abs**
Resolving power:	**0.001 abs (display), 0.0001 abs (calculation)**
Interference filters:	**340nm, 405nm, 500nm, 546nm, 578nm, 620nm, and 670nm**
Half band width:	**<10nm**
Lamp:	**Tungsten halogen lamp 6V/10W**
Temperature control:	**Peltier. 25ć, 30ć ,37ć ±0.1ć and ambient temperature.**
Flow cell:	**30ul quartz flow cell.**

Appendix II: Serial Connection protocol

1. Serial port state

Data is transmitted at 19200 baud,
With 1 stop bit
8 data bit and Even Parity

8. Message format

The initial parameter must be the capital letter "R",each line consists of 12 data in following order:

Parameter	**Possible values**	**Space mark**
Initial parameter	"R"	,
Patient name	Character or NULL	,
Department	Character or NULL	,
Sex	Character or NULL "0" = Male "1" = Female	,
Patient No.	Character	,
Name of test	Character	,
Result	Character	,
Units of measurement	Character	,
Checksum	Character	

Checksum = All of parameter + All of space mark

9. Send over

1904C sends a character string "TRANSFER FINISH", when the task has been completed.

Example:
R,Biachi,, 0, 43, 1, TP, 136.00, g/L, 0794
R,Rossi,,1, 40, 2, TP, 147.00, g/L, 0765
R,Tony,,0,6,3,TP,35.00,g/L,069d
TRANSFER FINISH