

**mindray**

# BS-2000 Modular System

Clinical Chemistry Solution



# Mindray Clinical Chemistry Solution

## High Throughput

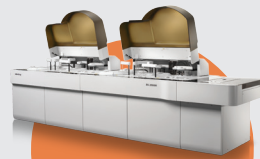
2000 photometric tests/hour

Up to 600 tests/hour for ISE

Up to four modules integrated capability

Flexible scalability

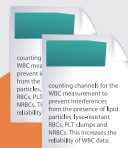
High Performance Instrument



BS-2000  
Modular System



Original Calibrators  
and Controls



Quality Management  
System

Professional Service

## Advanced Software

Results traceability

Reflex function

Flexible STAT & rerun

Real-time status monitoring

CAUTION  
LIQUID PROBE COLLISION  
If the probe is not properly  
inserted, it may damage the probe.



## Reliable Results

- Advanced mechanical system
- Complete reference system
- Integral traceability system
- International traceability certificate

Reliable Results

Standardization  
Laboratory

Reference  
Laboratory

Dedicated Chemistry  
Reagents

Dedicated Reagent System

## Dedicated Reagent System

- Wide panel clinical chemistry assays
- Original calibrators and controls
- Reliable performance
- ISO standard quality

# BS-2000 Modular System

## Reagent Carousel 2

1. 70 positions (40 outer and 30 inner) for R2 and R4
2. 2°C-8°C constant cooling compartment
3. Reagents can be loaded continuously while instrument is running

## Probe R21 and Probe R22

1. 10µl-200µl, with increment of 0.5µl
2. Bubble detection, liquid level detection
3. Collision protection and auto recovery from collision

## Probe R11 and Probe R12

1. 80µl-200µl, with increment of 0.5µl
2. Bubble detection, liquid level detection
3. Collision protection and auto recovery from collision

## Reagent Carousel 1

1. 70 positions (40 outer and 30 inner) for R1 and R3
2. 2°C-8°C constant cooling compartment
3. Reagents can be loaded continuously while instrument is running

## Reaction Carousel

1. 80µl minimum reaction volume
2. 412 glass cuvettes for permanent use
3. Direct solid heating

## 6-head Sample Mixer

1. Flat mixing bar with high efficiency
2. Two-step washing with pre-heated detergent and water
3. Easy replacement and maintenance



## Return Lane

## ISE Module

1. Na<sup>+</sup>, K<sup>+</sup>, Cl<sup>-</sup> electrodes for serum, plasma and urine
2. 30,000 tests or three months
3. Easy maintenance

## Dual-neck

1. 1.5µl-25µL
2. Clog detection and detection a
3. Collision protection and auto recovery from collision

# System Layout

## 6-head Reagent Mixers

Efficiency  
Pre-heated  
Maintenance

## 8-stage Cuvette Wash Station

1. Cuvette washing with pre-heated detergent and water
2. Independent water blank measurement

## Sample Delivery Module (SDM)

1. Up to 300 samples can be loaded in one batch
2. Continuous sample loading and offloading
3. 5 types of racks

## Sample Carousel

1. 140 positions for different types of sample tubes
2. 25 positions in cooling compartment for calibrators and controls
3. Flexible for STAT, rerun or other routine samples with higher priority

## STAT and RUN buttons

1. Flexible STAT rack loading
2. One touch to initiate analysis

## Needle Sample Probe

with increment of 0.1µL  
Bubble detection, level  
and tracking  
Protection and auto recovery  
on

## Passing Lane

1. Higher priority for STAT, calibrator, control and rerun racks
2. For routine sample racks to be transferred to other analytical unit(s)

## Normal Lane



# Advanced Software



## User-friendly Interface

- Unified platform for BS-2000 series, BS-800 series, BS-480 and future instrument
- Real-time status monitoring of analytical unit, SDM and carousels



## Real-time QC Status Monitoring

- Westgard Rules and Two-Control Evaluation check
- Levey-Jennings chart and Twin-Plot chart for review
- Real-time alarm and locating when QC result(s) is out of range
- Auto QC setup capability

## Traceable Test Results

- Reagent, calibrator and control information can be recalled from archive history
- User-friendly, intuitive software design, easy to trace results



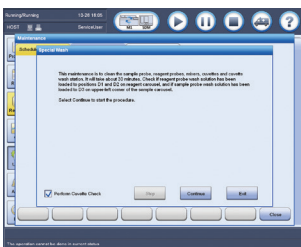
## Reflex Function

- Pre-defined reflexive assays will be performed automatically when preset criteria is met
- Each assay may involve multiple reflexive criterias
- Each criteria may initiate up to a maximum of 20 relevant assays



## Test Summary

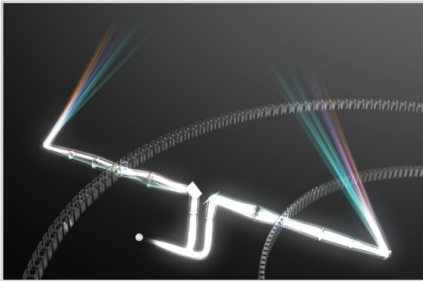
- Test summary during certain period, including calibration, QC, sample, valid tests and rerun tests
- Facilitate to computation of total test costs within a defined period
- The summary can be archived into excel files or printed to review and backup



## Step-by-step Maintenance Guide

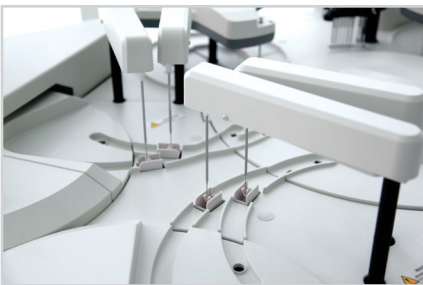
- Scheduled maintenance and maintenance guide for chemistries and ISE
- Ensure performance reliability and reduce unnecessary service calls
- Error report transferrable to service engineers for immediate troubleshooting; minimize instrument downtime

# Reliable Results



## Enhanced Optical System

- Dual-optical system with same light source
- Dual-lens and dual-diaphragm technology
- 80 $\mu$ L minimum reaction volume



## High Precision Aspirating

- 1.5 $\mu$ L-25 $\mu$ L, with increment of 0.1 $\mu$ L for sample probe
- Non-touch dispensing for sample
- 80 $\mu$ L-200 $\mu$ L, with increment of 0.5 $\mu$ L for R11 and R12 probes
- 10 $\mu$ L-200 $\mu$ L, with increment of 0.5 $\mu$ L for R21 and R22 probes

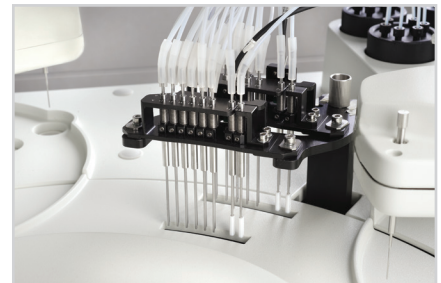
## High Performance Reaction System

- Two 6-head mixing units for reagent and samples
- Direct solid heating for reaction carousel
- Glass cuvettes for permanent use



## Efficient Washing System

- Interior & exterior probe washing with high pressure pre-heated water
- Programmable enhanced washing with detergent for reagent and sample probes
- 8-stage cuvette wash station, washing cuvettes with pre-heated detergent and water
- Two-step mixer washing with pre-heated detergent and water



## Stable Cooling Compartment

- 2°C-8°C constant cooling compartment for reagents
- Constant cooling compartment for calibrators and controls in sample carousel



## Accurate, Reliable Results

To ensure accuracy, reliability and correlation of diagnostic data, Mindray utilizes the International Standard in result reporting. To assure ease of report retrieving, Mindray establishes the Mindray Clinical Chemistry Measurement System for result traceability.



### Standard reference system

- Adopt JCTLM reference system
- IFCC primary method for enzyme, ID/MS method for substrate
- NIST, IRMM reference materials



JCTLM, Joint Committee On Traceability In Laboratory Medicine

NIST, National Institute of Standards and Technology, USA

IRMM, Institute for Reference Materials and Measurements, EU

IFCC, International Federation of Clinical Chemistry and Laboratory Medicine

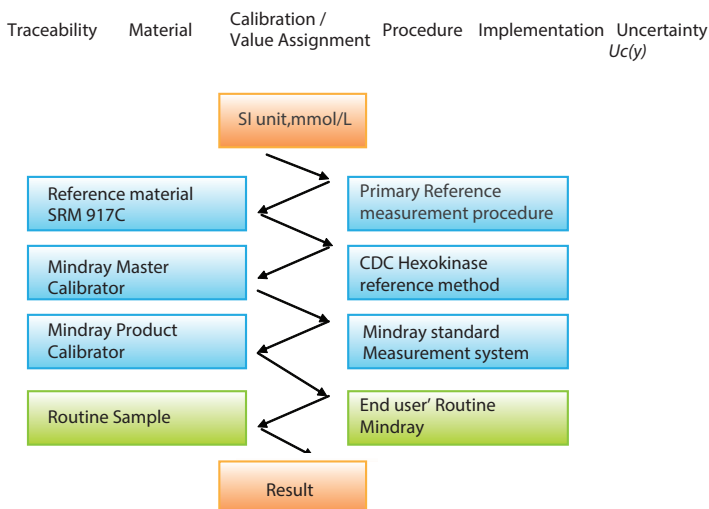
### Complete traceability process

- Complete calibration hierarchy and traceability chain based on ISO standard (EN/ISO17511) from reference system to routine measurement system

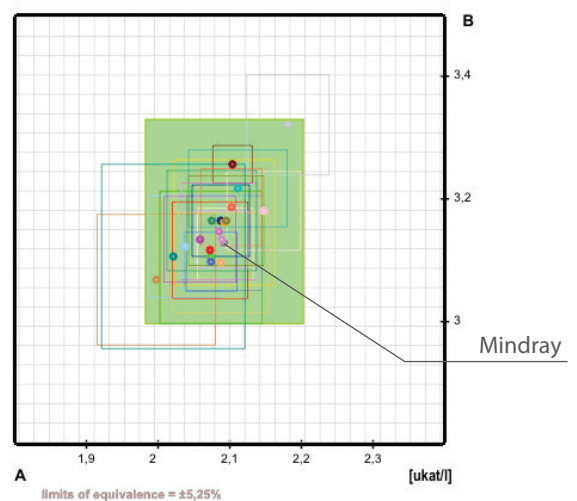
### Proficiency testing for reference measurement

- Participate RELA (External quality control for reference laboratory) to verify the accuracy of the value assignment procedure.

#### Traceability chain of Mindray measurement system (Glu)



ALT





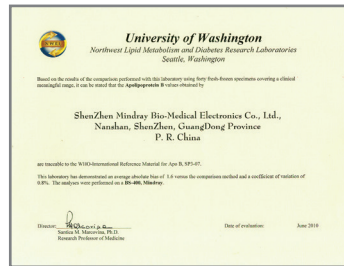
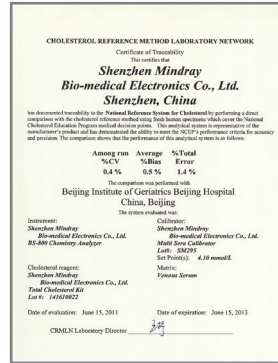
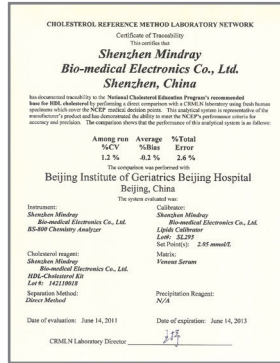
## International standardization certification

- International Standardization certificates of Cholesterol and Hba1c from CRMLN and NGSP.

More information refers to website (<http://www.cdc.gov>).

CRMLN (Cholesterol Reference Method of Laboratory Network)

NGSP(National glycosylated hemoglobin standardization program)



## Matched calibrators and controls

- Dedicated calibrators with traceability and specific target value
- Convenient design of multi items of calibrators and controls combined into one vial
- Long shelf life of lyophilized powder

## Dedicated, high-quality reagents

- Diagnostic function test panels

Test panels such as : Hepatic panel, renal panel, pancreatic panel, lipid panel, cardiac panel, diabetic panel, rheumatic factor panel

- Reliable analysis performance

EP series standard (CLSI)-evaluate and optimize reagent system for reliable performance in precision, linearity, stability, specificity and anti-interference capability

- ISO standard manufacturing

Mindray follow straightly the ISO Certified manufacturing process to ensure every lot of reagent in production are of supreme quality

# Reagent Menu

## Hepatic Panel

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Alanine Aminotransferase (ALT)  
Aspartate Aminotransferase (AST)  
Alkaline Phosphatase (ALP)  
 $\gamma$ -GlutamylTransferase ( $\gamma$ -GT)  
Direct Bilirubin (D-Bil) DSA Method  
Direct Bilirubin (D-Bil)VOX Method  
Total Bilirubin (T-Bil) DSA Method  
Total Bilirubin (T-Bil)VOX Method  
Total Protein (TP)  
Albumin (ALB)  
Total Bile Acids (TBA)  
Prealbumin (PA)  
Cholinesterase (CHE)  
 $\alpha$ -L-fucosidase (AFU)  
5'-nucleotidase (5'-NT)

## Renal Panel

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Urea (UREA)  
Creatinine (CREA) Modified Jaffé Method  
Creatinine (CREA)Sarcosine Oxidase Method  
Uric Acid (UA)  
Carbon dioxide (CO2)  
Microalbumin  
 $\beta$ 2-Microglobulin ( $\beta$ 2-MG)  
Cystatin C (CysC)  
Retinol binding protein( RBP)

## Cardiac panel

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Creatine Kinase (CK)  
Creatine Kinase-MB (CK-MB)  
Lactate Dehydrogenase (LDH)  
 $\alpha$ -Hydroxybutyrate Dehydrogenase( $\alpha$ -HBDH)  
High sensitive C-reaction protein( HS-CRP)  
Homocysteine (HCY)  
Myoglobin(MYO)  
D-Dimer(D-Dimer)

## Inorganic & Anemia

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Iron (Fe)  
Ferritin (FER)  
Transferrin (TRF)  
Calcium (Ca)  
Magnesium (Mg)  
Phosphate Inorganic (P)  
Unsaturated iron binding capacity (UIBC)  
Glucose-6-phosphate dehydrogenase (G6PD)

## Lipid Panel

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Total Cholesterol (TC)  
Triglycerides (TG)  
HDL-Cholesterol (HDL-C)  
LDL-Cholesterol (LDL-C)  
Apolipoprotein A1 (ApoA1)  
Apolipoprotein B (ApoB)  
Lipoprotein(a) [Lp(a)]

## Immune Panel

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Immunoglobulin A (IgA)  
Immunoglobulin G (IgG)  
Immunoglobulin M (IgM)  
Immunoglobulin E (IgE)  
Complement C3 (C3)  
Complement C4 (C4)

## Diabetes Panel

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Glucose (Glu) GOD-POD Method  
Glucose (Glu) HK Method  
Hemoglobin A1c (HbA1c)  
Fructosamine (FUN)  
 $\beta$ -Hydroxybutyrate( $\beta$ -HB)

## Rheumatism Panel

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C-reactive protein (CRP)  
Rheumatoid Factor (RF)  
Antibodies Against Streptolysin O (ASO)

## Pancreatitis Panel

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$\alpha$ -Amylase ( $\alpha$ -AMY)  
Lipase (LIP)

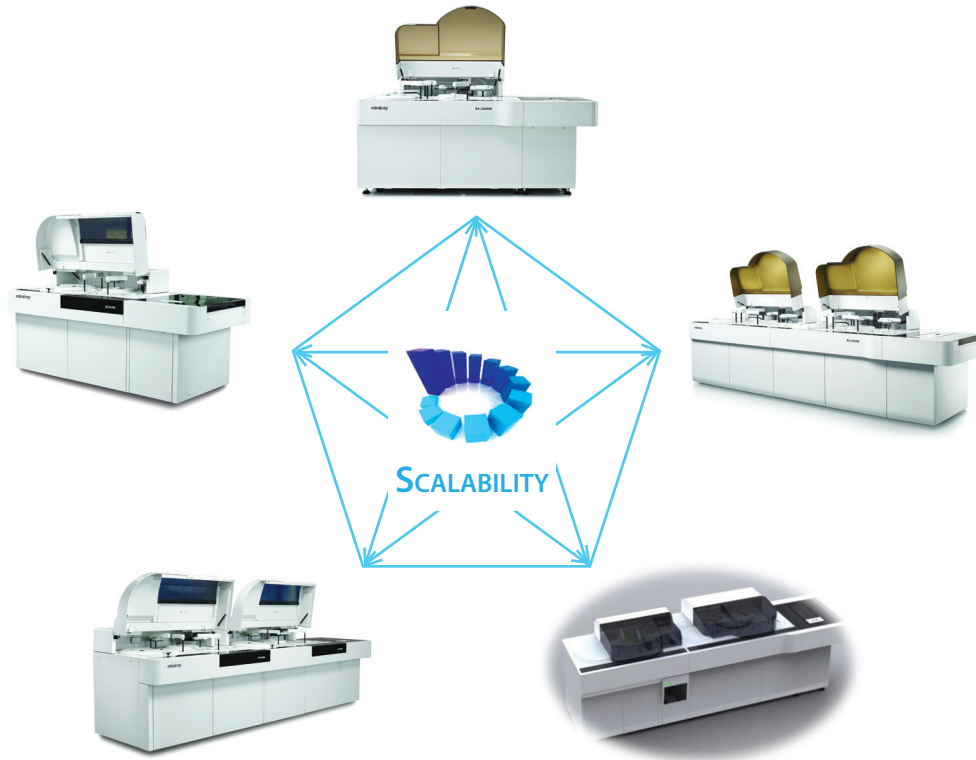
## Lung Panel

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Adenosine Deaminase (ADA)  
Angiotensin Converting Enzyme(ACE)



## Flexible Scalability



BS-2000 Modular System, the highest throughput chemistry system ever designed by Mindray, is a brand new solution package for hospitals and clinical laboratories with high sample volumes. It combines innovation and high performance into a fully integrated solution, together with the complete line of original reagents, calibrators with metrological traceability and controls. It offers customers a versatile solution with high efficiency, automation and scalability. Furthermore it will lay the foundation for further modular integration with Mindray's future products.



## Technical Specifications \*

### System function

Fully automated, discrete, random access, STAT sample priority  
Throughput: 2000 photometric tests/hour, up to 600 tests/hour for ISE  
Measuring Principles: Colorimetry, Turbidimetry and ISE method  
Methodology: End-point, Fix-time, Kinetic, optional ISE

### Sample Handling

Sample Carousel: 140 positions, 25 cooling positions for calibrators and controls  
Sample Delivery Module (SDM): Up to 30 racks can be loaded simultaneously  
Racks can be loaded continuously while instrument is running  
Sample Racks: 10 samples/rack  
Sample Probe: Liquid level detection, clot & bubble detection, horizontal and vertical collision protection  
Sample Volume: 1.5 $\mu$ l-25 $\mu$ l, with increment of 0.1 $\mu$ l  
Probe Washing: Interior and exterior probe washing  
Programmable enhanced washing with detergent  
Carry over < 0.1%  
Automatic Sample Dilution: Pre-dilution,  
post-dilution and auto-dilution for sample  
Dilution ratio: 4~134  
Barcode Reader: Integrated bar code scanner in SDM  
Sample carousel barcode scanner (optional)

### Reagent Handling

Reagent Carousel: 140 positions  
Refrigerated compartment (2~8 $^{\circ}$ C)  
Reagent Bottle: Mindray 20ml and 62ml  
Barcode Reader: Bar code scanner for two reagent carousels  
Reagent Probe: Liquid level detection, clot & bubble detection, horizontal and vertical collision protection  
Reagent Volume: 80 $\mu$ l-200 $\mu$ l, with increment of 0.5 $\mu$ l for R11 & R12 probes  
10 $\mu$ l-200 $\mu$ l, with increment of 0.5 $\mu$ l for R21 & R22 probes  
Probe Washing: Automatic interior and exterior probe washing  
Programmable enhanced washing with detergent  
Carry over < 0.1%  
Reagent Loading: Reagent bottles can be loaded continuously while instrument is running

### Reaction System

Reaction Carousel: 412 permanent glass cuvettes with 8-stage automatic washing  
Cuvette: Optical length 5mm  
Reaction Volume: 80 $\mu$ l-280 $\mu$ l  
Reaction Temperature: 37 $^{\circ}$ C with fluctuation of  $\pm$  0.1 $^{\circ}$ C  
Mixing Unit: Two 6-head highly polished mixing bar units for reagent mixing and sample mixing; two-step washing with pre-heated detergent and water

### Optical System

Light Source: 12V/50W Halogen-tungsten lamp  
Photometer: Holographic concave flat-field gratings  
Wavelength: 13 wavelengths: 340nm~850nm  
Absorption Range: 0~3.5A (10mm conversion)  
Resolution: 0.0001Abs

### ISE Module (Optional)

Indirect Method, Na<sup>+</sup>, K<sup>+</sup>, Cl<sup>-</sup> tests, with 22 $\mu$ l sample volume

### Operation Unit

Operation System: Window XP Professional or Windows 7 Professional (32bit)

### Working Conditions

Power Supply: 110V/115V~, 60Hz; 220V-240V~, 50Hz; 220V/230V~, 60Hz  
Input Power: 4500VA for each analytical unit, SDM: 800VA  
Operating Temperature: 15 $^{\circ}$ C~30 $^{\circ}$ C  
Relative Humidity: 35%RH~85%RH, without condensation  
Water consumption: <85L/hour De-ionized water  
Dimension: 1600mm(Length) $\times$ 1050mm(Depth) $\times$ 1300mm (Height)  
for each analytical units, 710mm(Length) $\times$ 1020mm(Depth)  
 $\times$ 1000mm(Height) for SDM  
Weight:  $\leq$ 550Kg for each analytical unit, 150kg for SDM

\*For single analytical unit