

Beckman	
Parameter	Method
RBC	<ul style="list-style-type: none"> <li>Electrical Impedance (WBC, RBC, PLT)</li> </ul>
WBC, PLT, NRBC, WBC Differential	<div> <ul style="list-style-type: none"> <li>Electrical Impedance</li> <li>Conductivity</li> <li>5-angle light scatter</li> </ul> </div> <div> <p><b>VCS</b> (<u>Volume, Conductivity, Scatter</u>)</p> <ul style="list-style-type: none"> <li>Volumetric sizing of cells by impedance</li> <li>Conductivity measurements of cells</li> <li>Laser light scatter</li> </ul> </div>
Hemoglobin	<ul style="list-style-type: none"> <li>Modified Cyanmethemoglobin <ul style="list-style-type: none"> <li>Measured after RBC are lysed before WBC are counted</li> </ul> </li> </ul>
HCT	<ul style="list-style-type: none"> <li><math>(RBC \times MCV)/10</math></li> </ul>
MCV	<ul style="list-style-type: none"> <li>Mean of RBC volume distribution histogram</li> </ul>
MCH and MCHC	<ul style="list-style-type: none"> <li>Calculated Indices <ul style="list-style-type: none"> <li><math>MCH = (HGB/RBC) \times 10</math></li> <li><math>MCHC = (HGB/HCT) \times 100</math></li> </ul> </li> </ul>
RDW	<ul style="list-style-type: none"> <li>CV (%) of RBC histogram or RDW-SD (fL)</li> </ul>
Retic Count	<ul style="list-style-type: none"> <li>Supravital staining</li> <li>Impedance volume conductivity</li> <li>Light scatter measurement</li> </ul>

### **Beckman:**

- RBC, WBC, and Platelets are measured directly
  - o Electrical impedance
    - Used to count/discriminate RBCs and Platelets
    - WBC count
  - o Hemoglobin is measured by lysing of RBCs before WBCs are counted in a channel
    - Modified cyanmethemoglobin
- VCS (Volume, Conductivity, Scatter)
  - o Evaluates WBC to determine 5 part differential
    - 3 methods:
      - Volumetric sizing of cells by impedance
      - Conductivity measurements of cells
      - Laser light scatter
  - o Shows clear separation of lymphocytes, monocytes, neutrophils, eosinophils, and basophils

Sysmex	
Parameter	Method
RBC	<ul style="list-style-type: none"> <li>• Impedance</li> </ul>
WBC, Retic, NRBC, WBC Differential	<ul style="list-style-type: none"> <li>• Fluorescent staining</li> <li>• Forward light scatter</li> <li>• Side fluorescent light detection</li> </ul>
PLT Count	<ul style="list-style-type: none"> <li>• Impedance</li> <li>• Fluorescent staining</li> <li>• Forward light scatter</li> <li>• Side fluorescent light detection</li> </ul>
HGB	<ul style="list-style-type: none"> <li>• Sodium lauryl sulfate- HGB (555 nm)</li> </ul>
HCT	<ul style="list-style-type: none"> <li>• Cumulative RBC pulse height detection</li> </ul>
MCV, MCH, MCHC	<ul style="list-style-type: none"> <li>• Calculated Indices <ul style="list-style-type: none"> <li>○ <math>MCV = (HCT/RBC) \times 10</math></li> <li>○ <math>MCH = (HGB/RBC) \times 10</math></li> <li>○ <math>MCHC = (HGB/HCT) \times 100</math></li> </ul> </li> </ul>
RDW	<ul style="list-style-type: none"> <li>• RDW-SD (fl) or RDW-CV (%)</li> </ul>

### **Sysmex:**

- 5 channels
  - WBC, RBC, HGB, HCT, and PLT are directly measured
    - WBC channel
    - RBC/platelet channel
      - Platelet fluorescent count in addition to impedance and optical count
        - Differentiated based on differences in intensity of the fluorescence combined with forward scattered light
    - Hemoglobin channel
- Uses hydrodynamic focusing
  - RBC/platelet channel
    - Floating thresholds used to discriminate each population
    - Hemoglobin measured through sodium lauryl sulfate method
    - Advanced analyzers has 7 part differentials, reticulocyte count, and NRBCs
- Calculated indices:
  - MCV, MCH, MCHC, RDW-CV, RDW-SD, MPV

<b>Abbott</b>	
<b>Parameter</b>	<b>Method</b>
RBC	<ul style="list-style-type: none"> <li>• Impedance</li> </ul>
WBC	<ul style="list-style-type: none"> <li>• Light scatter (primary count)</li> <li>• Impedance (secondary count)</li> </ul>
HGB	<ul style="list-style-type: none"> <li>• Modified cyanmethemoglobin (540 nm)</li> </ul>
HCT	<ul style="list-style-type: none"> <li>• <math>(RBC \times MCV)/10</math></li> </ul>
MCV	<ul style="list-style-type: none"> <li>• Mean of RBC volume distribution histogram</li> </ul>
MCH and MCHC	<ul style="list-style-type: none"> <li>• Calculated Indices <ul style="list-style-type: none"> <li>○ <math>MCH = (HGB/RBC) \times 10</math></li> <li>○ <math>MCHC = (HGB/HCT) \times 100</math></li> </ul> </li> </ul>
PLT	<ul style="list-style-type: none"> <li>• Dual-angle light scatter analysis</li> <li>• Impedance count for verification</li> <li>• Optional CD 61 monoclonal antibody count</li> </ul>
RDW	<ul style="list-style-type: none"> <li>• Relative value (equivalent to CV)</li> </ul>
Retic Count	<ul style="list-style-type: none"> <li>• Fluorescent staining</li> <li>• Low-angle scatter</li> <li>• Fluorescent light detection</li> </ul>
NRBC	<ul style="list-style-type: none"> <li>• Red fluorescent dye staining</li> <li>• Forward light scatter</li> <li>• Fluorescent light detection</li> </ul>
WBC Differential	<ul style="list-style-type: none"> <li>• Multiangle polarized scatter separation (MAPSS)</li> <li>• Three-colored fluorescent detection</li> </ul>

### **Abbott:**

- Uses 3 measurement channels:
  - Impedance channel
    - Determine RBC and PLT
  - Hemoglobin channel
    - Modified cyanmethemoglobin method
  - MAPSS (multi-angle polarized light scatter separation)
    - Accurate WBC enumeration and identification
    - 4 light scatter detectors to determine various cellular features
      - 0°-related to size
      - 0 to 10°-related to cellular complexity
      - 90° polarized side scatter - related to nuclear lobularity/segmentation
      - 90° deep polarized size scatter -related to eosinophil granules

Siemens	
Parameters	Method
RBC	<ul style="list-style-type: none"> <li>• Low-angle and high-angle laser light scatter</li> </ul>
WBC	<ul style="list-style-type: none"> <li>• Light scatter and absorption</li> </ul>
HGB	<ul style="list-style-type: none"> <li>• Modified cyanmethemoglobin (546 nm)</li> </ul>
HCT	<ul style="list-style-type: none"> <li>• <math>(RBC \times MCV)/10</math></li> </ul>
MCV	<ul style="list-style-type: none"> <li>• Mean of RBC volume distribution histogram</li> </ul>
MCH and MCHC	<ul style="list-style-type: none"> <li>• Calculated Indices <ul style="list-style-type: none"> <li>○ <math>MCH = (HGB/RBC) \times 10</math></li> <li>○ <math>MCHC = (HGB/HCT) \times 100</math></li> </ul> </li> </ul>
PLT Count	<ul style="list-style-type: none"> <li>• Low-angle and high angle light scatter</li> <li>• Refractive index</li> </ul>
RDW	<ul style="list-style-type: none"> <li>• CV (%) of RBC histogram</li> </ul>
Retic Count	<ul style="list-style-type: none"> <li>• Supravital staining (oxazine 750)</li> <li>• Low-angle and high-angle light scatter and absorbance</li> </ul>
NRBC	<ul style="list-style-type: none"> <li>• Multiangle light scatter measurements in the two WBC differential channels</li> </ul>
WBC Differential	<ul style="list-style-type: none"> <li>• Peroxidase staining</li> <li>• Light scatter and absorption</li> <li>• Basophil differential lysis</li> <li>• Low-angle and high-angle laser light scatter</li> </ul>

### **Siemens:**

- Uses 4 measurement channels:
  - RBC/PLT channel
    - Light scatter
  - Hemoglobin channel
    - Cyanmethemoglobin method at 546 nm
  - Peroxidase channel
    - WBC differential
    - WBC are fixed using formaldehyde and placed in the presence of hydrogen peroxide
    - Cells containing myeloperoxidase form a dark precipitate
      - Characterized by their light scatter and light absorption properties
        - Neutrophils, monocytes, eosinophils
    - Cytogram
      - X axis: increasing intensity of peroxidase staining

- Y-axis: increasing cell size
- Basophil Lobularity channel
  - Used for WBC differential
  - Treated with nonionic surfactant in an acidic solution
    - Strips the cytoplasm of the RBC, PLT, and WBC except for basophils
  - WBCs pass through a laser flow cell and two-angle light scatter is then used to determine cell size and nuclear density
  - Cytogram
    - X-axis: nuclear complexity
    - Y-axis: cell size

<u>Parameters</u>	<u>Beckman</u>	<u>Sysmex</u>	<u>Abbott</u>	<u>Siemens</u>
WBC	-Impedance Volume -Conductivity -5-angle light scatter measurement	-Fluorescent staining -forward light scatter -side fluorescent light detection	-Light scatter (primary count) -Impedance (Secondary Count)	Light scatter and absorption
RBC	Impedance	Impedance	Impedance	Low-angle and high-angle laser light scatter
HGB	Modified cyanmethemoglobin (525 nm)	Sodium lauryl sulfate- HGB (555 nm)	Modified cyanmethemoglobin (540 nm)	Modified cyanmethemoglobin (546 nm)
HCT	(RBCxMCV)/10	Cumulative RBC pulse height detection	(RBCxMCV)/10	(RBCxMCV)/10
MCV	Mean of RBC volume distribution histogram	(HCT/RBC) x 10	Mean of RBC volume distribution histogram	Mean of RBC volume distribution histogram
MCH	(HGB/RBC) x10	(HGB/RBC) x10	(HGB/RBC) x10	(HGB/RBC) x10
MCHC	(HGB/HCT) x100	(HGB/HCT) x100	(HGB/HCT) x100	(HGB/HCT) x100
Platelet Count	-Impedance Volume -Conductivity -5-angle light scatter measurement	-Impedance -Fluorescent staining -Light scatter -Forward light scatter -Side fluorescent light detection	-Dual-angle light scatter analysis -Impedance count for verification -Optional CD61 monoclonal antibody count	-Low-angle and light-angle light scatter -Refractive index
RDW	RDW as CV (%) of RBC histogram or RDW-SD (fL)	RDW-SD (fL) or RDW-CV (%)	Relative value, equivalent to CV	CV (%) of RBC histogram
Retic Count	-Supravital staining; -impedance volume - conductivity -light scatter measurement	-Fluorescent staining -Forward light scatter -Side fluorescent light detection	-Fluorescent staining -Low-angle scatter -Fluorescent light detection	-Supravital staining (oxazine 750) -Low-angle and high-angle light scatter and absorbance
NRBC	-Impedance Volume -Conductivity -5-angle light scatter measurement	-Fluorescent staining -Forward light scatter -Side fluorescent light detection	-Red fluorescent dye staining -Forward light scatter -Fluorescent Light Detection	-Multiangle light scatter measurements in the two WBC differential channels
WBC Differential	-Impedance Volume -Conductivity -5-angle light scatter measurement	-Fluorescent staining -Forward and side light scatter -Side fluorescent light detection	-Multiangle polarized scatter separation (MAPSS) -Three-colored fluorescence detection	-Peroxidase staining -light scatter and absorption -Basophils: differential lysis, low-angle and high-angle laser light scatter

