

# Hematology analyzers—efficiency through automation

Anne Ford

**Predicting the future used to be** a much more exciting enterprise. Underwater cities, robot maids, commuting via jetpack—the guiding principle seemed to be “Make it up, and it might come true.” These days, nobody’s holding out for androids in aprons, and predicting the future of high-volume hematology analyzers, at least, is much less fanciful. “The needs of tomorrow’s laboratory aren’t going to be all that different from the needs of today,” says Mary Beth Johnson, Beckman Coulter hematology marketing manager. “The lab of the future is still going to need to be equipped with systems that are ready to deliver an accurate result at a moment’s notice. That’s one of the reasons more-automated systems are growing in popularity.” Hence the profusion of automated systems and capabilities in this month’s instrumentation survey (see next page), which features high-volume hematology analyzers from five vendors.

Abbott, for example, “has focused its research and development efforts on providing automated instrument systems that maximize the efficiency of the analytical phase of the hematology workflow process,” says James Schwartz, director of global public affairs and marketing communications. New from his company: the Cell-Dyn

Sapphire, which performs CBC analyses via Abbott’s Multi-Angle Polarized Scatter Separation technology “plus three-color fluorescence,” Schwartz says. He adds, “Industry-leading first-pass CBC efficiency, even in the face of challenging pathologies, is our primary goal.” The Sapphire also offers automated random-access monoclonal antibody analysis. In 2006, the company plans to introduce a sister instrument, the Cell-Dyn Ruby, aimed at mid-size laboratories; it will, Schwartz says, “streamline operations within the laboratory by offering reduced manual interventions in an easy-to-use, Windows-based customizable operating software package.” Already available is Abbott’s Accelerator Decision Manager software, which “provides postanalytical connectivity and functionality across the entire laboratory in an open architecture.”

Automation’s latest incarnation at Beckman Coulter has taken the shape of the LH 1500 series, a completely integrated hematology system. The LH 1500 was previously available only as a custom system, says Johnson, who adds that it’s designed to help high-volume laboratories “manage the purple tubes with automated preanalytical processing, testing, and analysis of results, and postanalytical sorting and storage.” Available in 12 configurations, the LH 1500 includes an automation track line that can connect up

to four of the company’s LH 750 hematology analyzers or LH 755 workcells. “Technologists place samples directly in the inlet module,” Johnson explains. “The tubes are then routed automatically to a connected hematology analyzer or sorted.”

Meanwhile, Bayer has increased the automated capabilities of its Advia 2120 hematology system with the advent of the Advia Autoslide, a fully automated slide maker and stainer that is available as an integrated option for the system. Processing up to 120 slides per hour, the Autoslide lets the user “define reflexive slide sampling criteria based on morphology, ranges, flags, and demographics for the right results the first time,” says worldwide hematology marketing manager Pat Frank. Also new is the Advia 2120 MultiSpecies software package, which offers fully automated hematology testing on up to 21 species and strains and lets users identify 30 additional species. With Advia hematology systems, “laboratories can optimize their workflow and deliver a patient-focused approach to results management,” Frank says. Additionally, outside the United States, the company has introduced the NRBC method for its Advia 2120 systems. (The method has been submitted to the FDA and is pending 510(k) clearance.)

Horiba ABX is anticipating the release of a double differential matrix

with three immature cell line indexes—IMG, IMM, and IML—on its Pentra DX 120 analyzer. The Pentra DX 120 features more than 40 other parameters as well, such as reticulocyte analysis and NRBC enumeration, and can perform automated reruns or reflex testing in real time. Another new offering, the SPS Evolution, is “an integration slide maker/stainer available for both Pentra DX and DF systems,” says Jim Knowles, U.S. hematology marketing manager.

Finally, Sysmex is celebrating the recent FDA clearance of two parameters, reticulocyte hemoglobin and immature platelet fraction, on its XE-2100 hematology analyzer. Body fluids on the analyzers in the XT series remain under investigation for FDA submission, says senior market manager Brian Verne. Also forthcoming, he says, is the result of his company’s partnership with Bio-Rad Laboratories: the availability of Bio-Rad’s Variant II Turbo hemoglobin testing system on the Sysmex HST-N hematology automation line. Expected to be available in 2006, “this initiative brings all testing of lavender-top sample tubes into the hematology laboratory,” Verne says. “Some of the benefits are automated processing, elimination of sample splitting, and increases in operational efficiency with cost reductions.” □

Anne Ford is a writer in Chicago.

High-volume hematology analyzers

<div>Part 1 of 11</div> <div>See related article, page 33</div>	<div>Abbott Diagnostics Hematology Business Unit 5440 Patrick Henry Dr. Santa Clara, CA 95054 800-933-5535 www.abbottdiagnostics.com</div>	<div>Abbott Diagnostics Hematology Business Unit 5440 Patrick Henry Dr. Santa Clara, CA 95054 800-933-5535 www.abbottdiagnostics.com</div>
<div>Name of instrument</div> <div>First year sold—installed in U.S./outside U.S.</div> <div>No. units installed in U.S./outside U.S./list price</div>	<div>CELL-DYN 3200</div> <div>1997/1997</div> <div>&gt;700/&gt;1,500/\$165,000</div>	<div>CELL-DYN 3700</div> <div>1999/1999</div> <div>&gt;300/&gt;500/\$180,000 SL Model, \$140,000 CS Model</div>
<div>Test menu:</div> <div>All instruments have: WBC, RBC, Hb, Hct, MCV, MCH, MCHC, Plt, %&amp;# neut, mono, lymph, eos, baso</div> <div>FDA-cleared tests but not clinically released</div> <div>Tests not available but submitted for clearance</div> <div>Tests in development</div> <div>For research use only</div> <div>Tests unique to analyzer</div>	<div>standard menu (left) plus: RDW, MPV</div> <div>band #&amp;%, IG #&amp;%, variant lymph #&amp;%, blast #&amp;%, PCT, PDW, NRBC #&amp;%</div> <div>band, IG, variant lymph, blast, NRBC, NWBC, RRBC, FWBC, RBC morph., high/low interp. message, LRI, URI, LURI, WBC</div> <div>none</div> <div>none</div> <div>none</div> <div>atypical depolarization flag outside U.S.</div> <div>3-D optical RBC analysis with advanced MCV measurement</div>	<div>standard menu (left) plus: RDW, MPV, retic #&amp;%, IRF</div> <div>band, IG, variant lymph, blast, PCT, PDW, NRBC #&amp;% and retic scatter profile</div> <div>suspect populations, band, blast, variant lymph, IG, NRBC, RRBC, NWBC, LRI, URI, LURI, RBC morph., FWBC, high/low interp. message, WBC</div> <div>none</div> <div>none</div> <div>none</div> <div>none</div> <div>IRF</div>
<div>Differential method(s) used</div> <div>Linearity:</div> <div>Precision:</div> <div>Accuracy of automated diff. compared with manual diff. (per NCCLS H-20A), regression equation</div> <div>Interfering substances:•WBC</div> <div>•RBC</div> <div>•MCV or Hct</div> <div>•Platelet</div> <div>•Hb</div> <div>Interfering substances: differential</div>	<div>MAPSS (Multi-Angle Polarized Scatter Sep.)</div> <div>0–250/0–8</div> <div>0–25/0–1,750</div> <div>34–172 (MCV)</div> <div>2.7%/ 1.5%</div> <div>1.0%/ 4.0%</div> <div>1.0 % (MCV)</div> <div>neut #&amp;%= 0 .95, n/a; lymph #&amp;%= 0 .94, n/a; mono #&amp;%= 0.8 6, n/a; eos #&amp;%= 0 .84, n/a; baso #&amp;%= 0.7 3, n/a</div> <div>NRBCs, lytic-resistant RBCs, Plt clumps, cryoglobulin and cryofibrinogen, fragile WBCs</div> <div>elevated WBC count, increased No. of giant Plts, autoagglutination, in vitro hemolysis</div> <div>MCV: elevated WBC count, hyperglycemia, in vitro hemolysis, increased No. of giant Plts</div> <div>WBC fragments, in vitro hemolysis, microcytic RBCs, cryoglobulins, Plt clumping, increased No. giant Plts</div> <div>elevated WBC count, incr. plasma substances (triglycerides, bilirubin, in vivo hemolysis), lyse-resistant RBCs</div> <div>n/a</div>	<div>MAPSS (Multi-Angle Polarized Scatter Sep.)</div> <div>0–250/0–8</div> <div>0–24/0–2,000</div> <div>50–200 (MCV)</div> <div>2.5%/ 1.5%</div> <div>1.2%/ 5.0%</div> <div>1 .0% (MCV)</div> <div>neut #&amp;%= 0.9 5, n/a; lymph #&amp;%= 0.9 4, n/a; mono #&amp;%= 0 .86, n/a; eos #&amp;%= 0.84, n/a; baso #&amp;%= 0 .73, n/a</div> <div>NRBCs (WIC only), lytic-resistant RBCs, Plt clumps, cryoglobulin and cryofibrinogen, fragile WBCs</div> <div>increased No. giant Plts, autoagglutination, in vitro hemolysis</div> <div>MCV: elevated WBC count, increased No. giant Plts, hyperglycemia, in vitro hemolysis</div> <div>WBC fragments, in vitro hemolysis, microcytic RBCs, cryoglobulin, Plt clumps, increased No. giant Plts</div> <div>increased plasma substances (triglycerides, bilirubin, in vivo hemolysis), lyse-resistant RBCs</div> <div>n/a</div>
<div>Age- and sex-specific reference ranges</div> <div>Max. CBCs per hr/max. CBCs &amp; diffs. per hr</div> <div>Recommended average frequency of calib.</div> <div>•Modes calibrated/parameters calibrated</div> <div>Frequency of blood/latex controls</div> <div>Min. specimen vol. open/closed/sample dead vol. closed</div> <div>Tube sampling supported</div> <div>Veterinary capability</div> <div>Microsample capability</div> <div>Prepares microscopic slides automatically or flags problems for slide prep</div> <div>If auto. slidemaker available, No. installed/list price</div>	<div>yes</div> <div>71/71</div> <div>6 months verification</div> <div>open &amp; closed/WBC, RBC, Hb, MCV, Plt, MPV</div> <div>as per regulatory requirement/n/a</div> <div>150 µL/250 µL/1 mL (sample loader)</div> <div>yes</div> <div>no</div> <div>yes</div> <div>yes</div> <div>n/a/\$125,000</div>	<div>yes</div> <div>90/90</div> <div>6 months</div> <div>open &amp; closed/WBC, RBC, Hb, MCV, Plt</div> <div>as per regulatory requirement/n/a</div> <div>130 µL/355 µL/1.0 mL</div> <div>yes (13x75 mm)</div> <div>yes</div> <div>yes</div> <div>yes (flags only)</div> <div>n/a/\$125,000</div>
<div>Archives patient data for later comparison</div> <div>Patient-specific archiving</div> <div>Max. archived data accessible when system online</div> <div>Memory capacity—numeric results—No. specimens</div> <div>Memory capacity—histo/cytograms—No. specimens</div> <div>•Stored in conjunction with CBC data</div> <div>•Histo/cytogram images &amp; CBC data printed as 1 report</div> <div>Saved results can be recalled and retransmitted</div> <div>Saved data can be sorted for reprocessing or report transmission</div> <div>Performs delta checks</div> <div>Tags and holds results for followup, confirm. testing, or rerun</div> <div>Parameters for flags for holding samples are defined by</div> <div>Some results can be transmitted to LIS while others held</div> <div>Scattergram display: cell-specific color</div> <div>Histogram display: color with threshold</div> <div>Choice of desired specimen &amp;/or result info. displayed</div>	<div>yes</div> <div>yes</div> <div>10,000 results</div> <div>10,000 results</div> <div>10,000 results</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>no</div> <div>yes</div> <div>user or vendor</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div>	<div>yes</div> <div>yes</div> <div>10,000 results</div> <div>10,000 results</div> <div>10,000 results</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>no</div> <div>yes</div> <div>user or vendor</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div>
<div>LIS interface formats supported</div> <div>Information transferred on LIS interface</div> <div>LOINC codes transmitted with results</div> <div>How labs get LOINC codes for reagent kits</div> <div>Optional data mgmt. or collation system</div> <div>• Software features</div> <div>Interface avail. or planned to auto. specimen-handling system</div> <div>Bar-code symbologies read on tube</div> <div>Accommodates bar-code placement per NCCLS standard Auto2A</div>	<div>proprietary</div> <div>numeric &amp; flag results, histograms &amp; scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast</div> <div>no</div> <div>n/a</div> <div>yes, proprietary</div> <div>enhanced QC, data archiving, data collation from multiple instruments</div> <div>Lab-InterLink, MDS/Autolab, Roche (planned), Labotix</div> <div>Codabar, codes 39 &amp; 128, interl. 2 of 5</div> <div>yes</div>	<div>proprietary</div> <div>numeric and flag results, histograms and scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast</div> <div>no</div> <div>n/a</div> <div>yes, proprietary</div> <div>enhanced QC, data archiving, data collation from multiple instruments</div> <div>Lab-InterLink (planned), MDS/AutoLab, Roche (planned), Labotix (planned)</div> <div>Codabar, codes 39 &amp; 128, interl. 2 of 5</div> <div>yes</div>
<div>Time required for maintenance by lab personnel</div> <div>Onboard maintenance records</div> <div>Time from communication of problem to engineer on site</div> <div>Onboard diagnostics/limited to software problems</div> <div>Mftr. can perform diagnostics via modem</div>	<div>daily: 30 sec; weekly: 5 min; monthly: 10 min</div> <div>yes</div> <div>same day</div> <div>yes/no</div> <div>in development</div>	<div>daily: 30 sec; bi-weekly: 5 min; monthly: 10 min</div> <div>yes</div> <div>same day</div> <div>yes/no</div> <div>in development</div>
<div>Acquisition program based on cost-per-reportable result</div>	<div>yes</div>	<div>yes</div>
<div>Distinguishing features</div>	<div>MAPSS cell-by-cell analysis provides a better diff.; focused flow</div> <div>2-D optical RBC and Plt analysis provides better separation between microcytic RBCs and large Plts; uses only 3 reagents; 3-D MCV</div>	<div>MAPSS cell-by-cell analysis provides a better diff.; retic with reportable IRF (immature retic. fraction); 60-species veterinary package</div>

Tabulation does not represent an endorsement by the College of American Pathologists



# High-volume hematology analyzers

<i>Part 3 of 11</i>	Bayer HealthCare Diagnostics Nancy Lavon 555 White Plains Rd. Tarrytown, NY 10591 800-431-1970 www.bayerdiag.com	Bayer HealthCare Diagnostics Nancy Lavon 555 White Plains Rd. Tarrytown, NY 10591 800-431-1970 www.bayerdiag.com
<i>See related article, page 33</i>		
Name of instrument First year sold—installed in U.S./outside U.S. No. units installed in U.S./outside U.S./list price	Advia 70 2001/2001 100/300/\$89,000	Advia 2120 Hematology System 2004/2004 >60/>70/\$225,000
Test menu:  All instruments have: WBC, RBC, Hb, Hct, MCV, MCH, MCHC, Plt, %&# neut, mono, lymph, eos, baso	•Chartable  •Laboratory  •Flags  — — — Pct, PDW —	standard menu (left) plus: RDW, MPV  none  diff., WBC, N, B, L, RBC, ABN, PL, CI, Pit/RBC        none NRBC MPC, MPM IRF, CSF, eos CHCM, HDW, Chr, CHCMr, cellular Hgb, MPC, MPM, CSF: WBC, RBC, PMN, MN, neut, lymph, mono
Differential method(s) used	optical & enhanced impedance	peroxidase WBC—peroxidase cytochem. staining w/ light scatter & absorption; baso—cytochem. stripping w/ 2-angle laser light scatter
Linearity:	•WBC count (10 <sup>9</sup> /L)/RBC count (10 <sup>12</sup> /L) 0.1–99/0.02–9.99 •Hemoglobin (g/dL)/platelet (10 <sup>9</sup> /L) 1.5–30/10–2,000 •MCV (fL) or Hct (%) 30–150 (MCV)	0.02–400; CSF WBC 0–5,000/0–7.0; CSF RBC 0–1,500 0–22.5/5–3,500 30–180 (MCV)
Precision:	•WBC count/RBC count 2.0%/1.2% •Hb/platelet 1.0%/3–10% •MCV or Hct 1.0% (MCV)	2.7%/1.2% 0.93%/2.93% 0.78% (MCV)
Accuracy of automated diff. compared with manual diff. (per NCCLS H-20A), regression equation	neut% r=0.983, y=1.02x-3.3; lymph% r=0.983, y=0.96x+1.4; mono% r=0.797, y=1.02x+1.8; eos% r=0.963, y=0.91x+0.1; baso% r=0.322, y=0.30x+0.1	neut% r=0.997, y=1.02x-0.6; lymph% r=0.997, y=1.00x+0.8; mono% r=0.943, y=0.85x-0.3; eos% r=0.979, y=0.87x+0.2; baso% r=0.772, y=0.67x+0.0; luc% r=0.994, y=0.92x+0.6
Interfering substances:•WBC •RBC •MCV or Hct •Platelet •Hb	incomplete RBC lysis cold agglutinins extremely high white blood cell count (Hct) RBC fragments lipemia, elevated WBC	incomplete RBC lysis (peroxidase only) cold agglutinins, extreme sickle cell none none extreme lipemia, high WBC, extreme high bili. interference w/ colorimetric Hb only, none with cellular Hb
Interfering substances: differential	NRBCs, unlysed RBC, platelet clumps	incomplete RBC lysis, complete myeloperox. deficiency
Age- and sex-specific reference ranges Max. CBCs per hr/max. CBCs & diffs. per hr Recommended avg. frequency of calib. •Modes calibrated/parameters calibrated Frequency of blood/latex controls Min. specimen vol. open/closed/sample dead vol. closed Tube sampling supported Veterinary capability Microsample capability Prepares microscopic slides automatically or flags problems for slide prep If auto. slidemaker available, No. installed/list price	yes 70/70 every 6 months per governmental requirements open & closed/all measured parameters one level per shift/not required 90 µL/180 µL/120 µL yes (12x75) no yes yes Advia S60,>100/\$35,000	yes 120/120 6 months autosampler, closed, open/all measured parameters once per shift/not required 175 µL/175 µL/<300 (tube size dependent) yes (2, 3, 5, 7 mL—all sizes open) yes yes if integrated to Advia Autoslide Advia Autoslide, n/a/\$98,000
Archives patient data for later comparison Patient-specific archiving Max. archived data accessible when system online Memory capacity—numeric results—No. specimens Memory capacity—histo/cytograms—No. specimens •Stored in conjunction with CBC data •Histo/cytogram images & CBC data printed as 1 report Saved results can be recalled and retransmitted Saved data can be sorted for reprocessing or report transmission Performs delta checks Tags and holds results for followup, confirm. testing, or rerun Parameters for flags for holding samples are defined by Some results can be transmitted to LIS while others held Scattergram display: cell-specific color Histogram display: color with threshold Choice of desired specimen &/or result info. displayed	yes yes 100,000 100,000 100,000 yes yes yes yes no yes user all results for that sample are transmitted at once yes yes yes yes	yes no 10,000 10,000 10,000 yes yes yes yes yes yes user or vendor yes yes yes yes
LIS interface formats supported Information transferred on LIS interface  LOINC codes transmitted with results How labs get LOINC codes for reagent kits Optional data mgmt. or collation system • Software features  Interface avail. or planned to auto. specimen-handling system Bar-code symbologies read on tube Accommodates bar-code placement per NCCLS standard Auto2A	proprietary, ASTM 1394, E 1381 numeric & flag results, instrument to LIS; patient demographics, orders, LIS to instrument— broadcast  — online documentation in development  — Codabar, code 39, interl. 2 of 5 yes	proprietary numeric & flag results, histograms & scatterplots, instrument to LIS; patient demographics, patient orders, LIS to instrument— broadcast; host query for patient demographics and orders (when bar code is read, host is queried for orders) no online documentation yes (Centralink) enhanced QC, data archiving, data collation from multiple instruments, auto validation, integrated diff. pad, remote diagnostics, remote workstations LabCell (Bayer) Codabar, codes 39 & 128, interl. 2 of 5 —
Time required for maintenance by lab personnel Onboard maintenance records Time from communication of problem to engineer on site Onboard diagnostics/limited to software problems Mfr. can perform diagnostics via modem	daily: 0; weekly: 0; monthly: 20 min yes territory dependent yes/no in development	daily: 0; weekly: 15 min; monthly: 15 min yes territory dependent yes/no yes
Acquisition program based on cost-per-reportable result	yes	yes
Distinguishing features	microsampling; auto recount; dual WBCs; automatic wakeup and shutdown; no daily or weekly maintenance	unique laser technology provides direct cellular Hb for RBCs and retics; 2-D Pit analysis that eliminates interference from RBC fragments and exclusion of large Pits; dual WBC counts with a linearity of up to 400,000; CSF assay

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High-volume hematology analyzers

<div>Part 4 of 11</div> <div>See related article, page 33</div>	<div>Beckman Coulter Inc. Martha M. Diaz/Cellular Analysis Marketing mmdiaz@beckman.com 200 S. Kraemer Blvd. Brea, CA 92822-8000 714-993-8847 www.beckmancoulter.com</div>	<div>Beckman Coulter Inc. Martha M. Diaz/Cellular Analysis Marketing mmdiaz@beckman.com 200 S. Kraemer Blvd. Brea, CA 92822-8000 714-993-8847 www.beckmancoulter.com</div>
<div>Name of instrument</div> <div>First year sold—installed in U.S./outside U.S.</div> <div>No. units installed in U.S./outside U.S./list price</div>	<div>LH 1500 Hematology Automation Series</div> <div>2002/2003</div> <div>&gt;30/5/varies</div>	<div>Coulter LH 700 Series</div> <div>2001</div> <div>&gt;1,600/&gt;1,500/LH 750: \$195,000; LH 755: \$367,500</div>
<div>Test menu:</div> <div>All instruments have: WBC, RBC, Hb, Hct, MCV, MCH, MCHC, Plt, %&amp;# neut, mono, lymph, eos, baso</div> <div>•Chartable</div> <div>•Laboratory</div> <div>•Flags</div> <div>FDA-cleared tests but not clinically released</div> <div>Tests not available but submitted for clearance</div> <div>Tests in development</div> <div>For research use only</div> <div>Tests unique to analyzer</div>	<div>standard menu (left) plus: RDW, MPV, retic %&amp;#, IRF, graded RBC morph, NRBC %&amp;#, TNC &amp; RBC on CSF, synovial and serous fluids</div> <div>—</div> <div>user-definable age-, gender-, &amp;/or location-based ref. intervals; action &amp; critical limits; user-def. RBC morph.; user-selectable sensitivity for diff., abnormal population suspect messages</div> <div>none</div> <div>none</div> <div>n/a</div> <div>PCT, PDW, high light scatter retics, mean sphered cell volume (MSCV)</div> <div>NRBC, MSCV, body fluids</div>	<div>standard menu (left) plus: RDW, MPV, retic %&amp;#, IRF, MPV, graded RBC morph, NRBC %&amp;#, TNC &amp; RBC on CSF, synovial and serous fluids</div> <div>—</div> <div>user-definable age-, gender-, &amp;/or location-based ref. intervals; action &amp; critical limits; user-def. RBC morph.; gradient msgs. (=+, ++, +++); user-selectable sensitivity for diff. abnormal population suspect messages</div> <div>—</div> <div>none</div> <div>none</div> <div>PCT, PDW, high light scatter retics, mean sphered cell volume</div> <div>NRBC, mean sphered cell volume, body fluid analysis</div>
<div>Differential method(s) used</div> <div>Linearity:</div> <div>Precision:</div> <div>Accuracy of automated diff. compared with manual diff. (per NCCLS H-20A), regression equation</div> <div>Interfering substances:•WBC</div> <div>•RBC</div> <div>•MCV or Hct</div> <div>•Platelet</div> <div>•Hb</div> <div>Interfering substances: differential</div>	<div>Coulter's 3-D VCS biophysical flow cytometry with IntelliKinetics, AccuGate &amp; Accuflex technologies</div> <div>0–400/0–8.0</div> <div>0–25/0–3,000</div> <div>50–200 (MCV)</div> <div>&lt;1.7%/&lt;0.8%</div> <div>&lt;0.8%/&lt;3.3%</div> <div>&lt;0.8% (MCV)</div> <div>lymph% = ±3.0%, n/a; neut% = ±3.0%, n/a; mono% = ±2.0%, n/a; eos% = ±1.0%, n/a; baso% = ±1.0%, n/a</div> <div>unusual RBC abnormalities that resist lysing, NRBC, frag. WBC, unlysed particle &gt;35 fL, giant Plt, Plt clumps</div> <div>very high WBC, high conc. large Plt, autoagglutinins</div> <div>very high WBC, high conc. large Plt, autoagglutinins</div> <div>very small RBCs &amp; WBC frags. may interfere</div> <div>very high WBC, severe lipemia, heparin, rare lyse-resistant RBCs</div> <div>high triglycerides may affect lysing</div>	<div>Coulter's 3-D VCS biophysical flow cytometry with IntelliKinetics, AccuGate &amp; Accuflex technologies</div> <div>0–400/0–8.0</div> <div>0–25/0–3,000</div> <div>50–200 (MCV)</div> <div>&lt;1.7%/&lt;0.8%</div> <div>&lt;0.8%/&lt;3.3%</div> <div>&lt;0.8% (MCV)</div> <div>lymph% = ±3.0%, n/a; neut% = ±3.0%, n/a; mono% = ±2.0%, n/a; eos% = ±1.0%, n/a; baso% = ±1.0%, n/a</div> <div>unusual RBC abnormalities that resist lysing, NRBC, frag. WBC, unlysed particle &gt;35 fL, giant Plt, Plt clumps</div> <div>very high WBC, high conc. large Plt, autoagglutinins</div> <div>MCV &amp; Hct: very high WBC, high conc. large Plt, autoagglutinins</div> <div>very small RBCs &amp; WBC frags. may interfere</div> <div>very high WBC, severe lipemia, heparin, rare lyse-resistant RBCs</div> <div>high triglycerides may affect lysing</div>
<div>Age- and sex-specific reference ranges</div> <div>Max. CBCs per hr/max. CBCs &amp; diffs. per hr</div> <div>Recommended avg. frequency of calib.</div> <div>•Modes calibrated/parameters calibrated</div> <div>Frequency of blood/latex controls</div> <div>Min. specimen vol. open/closed/sample dead vol. closed</div> <div>Tube sampling supported</div> <div>Veterinary capability</div> <div>Microsample capability</div> <div>Prepares microscopic slides automatically or flags problems for slide prep</div> <div>If auto. slidemaker available, No. installed/list price</div>	<div>yes</div> <div>105 per analyzer on automation system/105 per analyzer on automation sys.</div> <div>twice per year on each analyzer</div> <div>primary/RBC, WBC, Hb, MCV, Plt, MPV</div> <div>per CLIA, CAP, JCAHO, state or lab SOP/once per day</div> <div>200 µL/300 µL, 550 µL with slidemaker/1.0 mL</div> <div>yes</div> <div>no</div> <div>yes</div> <div>yes</div> <div>&gt;400 U.S./\$110,000</div>	<div>yes</div> <div>105/105</div> <div>twice per year</div> <div>primary/RBC, WBC, Hb, MCV, Plt, MPV</div> <div>per CLIA, CAP, JCAHO, state or lab SOP/once per day</div> <div>200 µL/300 µL, 550 µL with slidemaker/1.0 mL</div> <div>yes (multiple sizes &amp; styles)</div> <div>no</div> <div>yes</div> <div>yes, both</div> <div>&gt;400 U.S./\$110,000</div>
<div>Archives patient data for later comparison</div> <div>Patient-specific archiving</div> <div>Max. archived data accessible when system online</div> <div>Memory capacity—numeric results—No. specimens</div> <div>Memory capacity—histo/cytograms—No. specimens</div> <div>•Stored in conjunction with CBC data</div> <div>•Histo/cytogram images &amp; CBC data printed as 1 report</div> <div>Saved results can be recalled and retransmitted</div> <div>Saved data can be sorted for reprocessing or report transmission</div> <div>Performs delta checks</div> <div>Tags and holds results for followup, confirm. testing, or rerun</div> <div>Parameters for flags for holding samples are defined by</div> <div>Some results can be transmitted to LIS while others held</div> <div>Scattergram display: cell-specific color</div> <div>Histogram display: color with threshold</div> <div>Choice of desired specimen &amp;/or result info. displayed</div>	<div>yes</div> <div>yes</div> <div>20,000 samples</div> <div>20,000</div> <div>5,000</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div>	<div>yes</div> <div>yes</div> <div>20,000 samples</div> <div>20,000</div> <div>5,000</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div>
<div>LIS interface formats supported</div> <div>Information transferred on LIS interface</div> <div>LOINC codes transmitted with results</div> <div>How labs get LOINC codes for reagent kits</div> <div>Optional data mgmt. or collation system</div> <div>• Software features</div> <div>Interface avail. or planned to auto. specimen-handling system</div> <div>Bar-code symbologies read on tube</div> <div>Accommodates bar-code placement per NCCLS standard Auto2A</div>	<div>RS-232</div> <div>numeric &amp; flag results, histograms &amp; scatterplots, instrument to LIS; patient demographics, patient orders, LIS to instrument—broadcast</div> <div>no</div> <div>—</div> <div>yes, Orchard Software Aqueduct</div> <div>enhanced QC, data archiving, data colleciton from multiple instruments, extensive decision rules, delta checking, patient results &amp; graphics</div> <div>Beckman Coulter</div> <div>Codabar, codes 39 &amp; 128, interl. 2 of 5, NW7</div> <div>yes</div>	<div>RS-232, proprietary</div> <div>numeric &amp; flag results, histograms &amp; scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast</div> <div>no</div> <div>technical support</div> <div>yes, DL 2000, Command Central, Orchard Software Aqueduct</div> <div>enhanced QC, data archiving, common database, extensive decision rules, delta checking, patient results &amp; graphics, centralized management of all instruments</div> <div>Beckman Coulter</div> <div>Codabar, codes 39 &amp; 128, interl. 2 of 5, NW7</div> <div>yes</div>
<div>Time required for maintenance by lab personnel</div> <div>Onboard maintenance records</div> <div>Time from communication of problem to engineer on site</div> <div>Onboard diagnostics/limited to software problems</div> <div>Mftr. can perform diagnostics via modem</div>	<div>daily: automation system= 5 min, analyzer=0; weekly: automation=10 min, analyzer=0; monthly: automation=15 min, analyzer=2 min</div> <div>yes</div> <div>—</div> <div>yes/no</div> <div>yes</div>	<div>daily: 0; weekly: 0; monthly: 2 min</div> <div>yes</div> <div>—</div> <div>yes/no</div> <div>yes</div>
<div>Acquisition program based on cost-per-reportable result</div>	<div>yes</div>	<div>yes</div>
<div>Distinguishing features</div>	<div>the LH 1500 hematology automation system automatically loads and unloads cassettes, performs reflex and repeat testing, sorts tubes for offline tests, stores tubes with availability for retrieval for any type of test; multiple configurations available</div>	<div>extensive decision support; enumeration of NRBCs with every differential; random access; automation ready; extended linearity for WBC and platelets using AccuCount Technology; integrated slidemaker/staining options, ProService, electronic IQAP</div>

Tabulation does not represent an endorsement by the College of American Pathologists

High-volume hematology analyzers

Part 5 of 11	Beckman Coulter Inc. Martha M. Diaz/Cellular Analysis Marketing mmdiaz@beckman.com 200 S. Kraemer Blvd. Brea, CA 92822-8000 714-993-8847 www.beckmancoulter.com	Beckman Coulter Inc. Martha M. Diaz/Cellular Analysis Marketing mmdiaz@beckman.com 200 S. Kraemer Blvd. Brea, CA 92822-8000 714-993-8847 www.beckmancoulter.com
See related article, page 33		
Name of instrument First year sold—installed in U.S./outside U.S. No. units installed in U.S./outside U.S./list price	Coulter LH 500 2003/2003 >500/1,000/\$145,000	Coulter HmX 1999 HmX AL, 1999 HmX CP AL: 1,077/2,000/\$135,000; CP: 113/300/\$200,000
Test menu:  All instruments have: WBC, RBC, Hb, Hct, MCV, MCH, MCHC, Plt, %&# neut, mono, lymph, eos, baso  FDA-cleared tests but not clinically released Tests not available but submitted for clearance Tests in development For research use only Tests unique to analyzer	•Chartable •Laboratory  •Flags  standard menu (left) plus: retic #, retic %, MRV, IRF, RDW, MPV —  user-definable age-, gender- &/or location-based ref. intervals, action & critical limits; user-def. RBC morph.; gradient msgs. none none none PCT, PDW none	standard menu (left) plus: RDW, MPV, retic #&%, graded RBC morph., IRF, MRV —  comprehensive high/low, definitive & suspect messages  none none none PCT, PDW none
Differential method(s) used  Linearity:  Precision:  Accuracy of automated diff. compared with manual diff. (per NCCLS H-20A), regression equation Interfering substances:•WBC  •RBC  •MCV or Hct  •Platelet  •Hb  Interfering substances: differential	Coulter's 3-D biophysical flow cytometry with AccuGate 500, Reaction Manager technologies 0–200/0–8.0 0–25/0–2,000 50–150 (MCV) 2.5 %/2.0 % 1.5 %/ 5.0 % 2% (MCV) lymph=±1.5 % mean diff., n/a; mono= ±1.5 % mean diff., n/a; neut= ±2.0 % mean diff., n/a; eos= ±0.5 % mean diff., n/a; baso= ±0.5 % mean diff., n/a lyse-resistant, nucleated RBCs, frag. WBCs, agglut. WBCs, unlysed particles >35 fL, very large or agg. PIts, fibrin, cell frag., or other debris very high WBC count, many very large PIts, agglut. RBCs, RBCs <36 fL, fibrin, cell fragments, or other debris MCV: very high WBC count, high concentration of very large PIts, agglut. RBCs, RBC fragments <36 fL, rigid RBCs very small red cells near the upper threshold, cell fragments, clumped PIts, PIt frag. or cellular debris near the lower PIt threshold, giant PIts, PIt clumps, red & white cell frag., electronic noise, very small red cells very high WBC count, severe lipemia, heparin, lyse-resistant RBCs, turbidity such as elevated triglycerides factors that affect WBC count above or high triglycerides that affect lysing, hypogran. granulocytes, agranul. granulocytes, lyse-resist. red cells, very small or multi-population lymphocytes, elevat. trigly., precipitated elev. proteins	Coulter's 3-D VCS technology  0–99.9/0–7.0 0–25/0–999 50–150 (MCV) <2.5%/<2.0% <1.5%/<5.0% <2.0% (MCV) lymph%= ±3.0%, n/a; mono%= ±2.0%, n/a; neut%= ±3.0%, n/a; eos%= ±1.0%, n/a; baso%= ±1.0%, n/a unusual RBC abnormalities that resist lysing, NRBC, frag. WBC, unlysed particle >35 fL, large PIt very high WBC, high conc. of very large PIt, autoagglutinins  MCV & Hct: very high WBC, high conc. of large PIt, autoagglutinins  very small RBCs & WBC frags. may cause no fit  very high WBC, severe lipemia, heparin, rare lyse-resistant RBCs  high triglycerides may affect lysing
Age- and sex-specific reference ranges Max. CBCs per hr/max. CBCs & diffs. per hr Recommended avg. frequency of calib. •Modes calibrated/parameters calibrated Frequency of blood/latex controls Min. specimen vol. open/closed/sample dead vol. closed Tube sampling supported Veterinary capability Microsample capability Prepares microscopic slides automatically or flags problems for slide prep If auto. slidemaker available, No. installed/list price	yes 75/75 timing not specified primary/RBC, WBC, Hb, MCV, PIt, MPV not specified/once per day 125 µL/185 µL/tube dependent yes (10.25 x 75 mm or less; 13 x 75 mm or less) no yes no —	gender-specific printout 75/75 timing not specified primary/RBC, WBC, Hb, MCV, PIt, MPV not specified/once per day 125 µL/185 µL/50 µL predilute/0.5 mL yes (multiple sizes & styles) no yes no n/a
Archives patient data for later comparison Patient-specific archiving Max. archived data accessible when system online Memory capacity—numeric results—No. specimens Memory capacity—histo/cytograms—No. specimens •Stored in conjunction with CBC data •Histo/cytogram images & CBC data printed as 1 report Saved results can be recalled and retransmitted Saved data can be sorted for reprocessing or report transmission Performs delta checks Tags and holds results for followup, confirm. testing, or rerun Parameters for flags for holding samples are defined by Some results can be transmitted to LIS while others held Scattergram display: cell-specific color Histogram display: color with threshold Choice of desired specimen &/or result info. displayed	yes yes 20,000 samples 20,000 5,000 yes yes yes yes yes yes yes yes yes yes yes yes yes	yes yes 5,000 samples 5,000 5,000 yes yes yes yes no yes user or vendor yes, through a selective batch process 4 colors/cell types colors without thresholds no
LIS interface formats supported Information transferred on LIS interface  LOINC codes transmitted with results How labs get LOINC codes for reagent kits Optional data mgmt. or collation system • Software features  Interface avail. or planned to auto. specimen-handling system Bar-code symbologies read on tube Accommodates bar-code placement per NCCLS standard Auto2A	RS-232, proprietary numeric & flag results, histograms & scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast no technical support yes, DL 2000, Command Central, Orchard Software Aqueduct enhanced QC, data archiving, data collation from multiple instruments, common database, extensive decision rules, delta checking, patient results & graphics, centralized management of instruments — Codabar, codes 39 & 128, ASTM, interl. 2 of 5, NW7 yes	RS-232, proprietary numeric & flag results, histograms & scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast no technical support yes, DL 2000, Orchard Software Aqueduct enhanced QC, data archiving, common database, delta checking, patient results & graphics  Beckman Coulter Codabar, codes 39 & 128, interl. 2 of 5, NW7 no
Time required for maintenance by lab personnel Onboard maintenance records Time from communication of problem to engineer on site Onboard diagnostics/limited to software problems Mftr. can perform diagnostics via modem	none yes — yes/no yes	none no — yes/no no
Acquisition program based on cost-per-reportable result	yes	yes
Distinguishing features	extensive decision support, extended linearity for WBC & PIt, lowest review rate in class, small footprint, superior reliability, ProService, electronic IQAP	VCS technology; lowest review rate in class; no routine daily maintenance; triplicate counting; aperture burn circuit; sweepflow; SmartStart system; autoloader and single sample models

Tabulation does not represent an endorsement by the College of American Pathologists



# High-volume hematology analyzers

<b>Part 6 of 11</b>  <b>See related article, page 33</b>	<b>Beckman Coulter Inc.</b> <b>Martha M. Diaz/Cellular Analysis Marketing</b> mmdiaz@beckman.com <b>200 S. Kraemer Blvd.</b> <b>Brea, CA 92822-8000</b> <b>714-993-8847</b> www.beckmancoulter.com	<b>Horiba ABX Diagnostics Inc.</b> <b>Jim Knowles</b> jknowles@us.abx.fr <b>34 Bunsen</b> <b>Irvine, CA 92618</b> <b>888-903-5001 ext. 553</b> www.abx.com
<b>Name of instrument</b> <b>First year sold—installed in U.S./outside U.S.</b> <b>No. units installed in U.S./outside U.S./list price</b>	<b>Coulter Ac•T 5diff Family; Ac•T 5diff AL</b> <b>2001/2000; 2003/2003</b> <b>1,200/2,750/\$43,500 cap pierce model; \$38,500 open vial model;</b> <b>AL: 30/—; \$54,500 autoloader</b>	<b>Pentra 60C+ Hematology Analyzer</b> <b>2000/2000</b> <b>325/440/\$49,500</b>
<b>Test menu:</b>  All instruments have: WBC, RBC, Hb, Hct, MCV, MCH, MCHC, Plt, %&# neut, mono, lymph, eos, baso <b>•Chartable</b>  <b>•Laboratory</b>  <b>•Flags</b>  <b>FDA-cleared tests but not clinically released</b> <b>Tests not available but submitted for clearance</b> <b>Tests in development</b> <b>For research use only</b> <b>Tests unique to analyzer</b>	<b>standard menu (left) plus: RDW, MPV</b>  <b>atyp. lymph. # (ATL#), atyp. lymph % (ATL%), immature cells # (IMM#), immature cells % (IMM%), PCT, PDW</b> <b>complete operator selectable flagging</b>  <b>none</b> <b>none</b> <b>none</b> <b>PCT, PDW, IMM, ATL</b> <b>none</b>	<b>standard menu (left) plus: RDW, MPV</b>  <b>atyp. lymph, atyp. lymph %, LIC, LIC %</b>  <b>operator selectable flagging</b>  <b>none</b> <b>none</b> <b>none</b> <b>none</b> <b>none</b>
<b>Differential method(s) used</b>  <b>Linearity:</b>  <b>Precision:</b>   <b>Accuracy of automated diff. compared with manual diff. (per NCCLS H-20A), regression equation</b> <b>Interfering substances:•WBC</b>     <b>•RBC</b>   <b>•MCV or Hct</b> <b>•Platelet</b> <b>•Hb</b> <b>Interfering substances: differential</b>	<b>AcV technology combining cytochemistry, focused flow impedance, and light absorbance principles of measurement</b> <b>0.4–91.3/0.3–8.0*; AL: 0.4–120.0/0.3–8.0</b> <b>0–22/10–1,000*; AL: 1.3–24.0/10.0–1,000</b> <b>1.8–63.8 (Hct)*</b> <b>&lt;2%/&lt;2%</b> <b>&lt;1%/&lt;5%</b> <b>&lt;1.0% (Hct); AL: &lt;2.0% (Hct)</b>  <b>not available in NCCLS H-20A format</b>  <b>NRBCs, Plt clumps, large Plts, lyse-resistant RBCs</b>   <b>cold agglutinins, Plt clumps, WBC overlinearity</b>   <b>Hct: lipemic samples, high WBC, cold aggluts</b> <b>RBC and WBC fragments</b> <b>elevated WBC, lipemia</b> <b>lyse-resistant RBCs, NRBCs, lipemia</b>	<b>DHSS technology combining cytochemistry, focused flow impedance, &amp; light absorbance principles of measurement</b> <b>0–120/0–8</b> <b>0.7–24/0–1,900</b> <b>0.7–67% (Hct)</b> <b>&lt;2%/&lt;2%</b> <b>&lt;1%/&lt;5%</b> <b>&lt;2% (Hct)</b>  <b>neut% r=0.99, n/a; lymph% r=0.98, n/a; mono% r=0.96, n/a; eos%r=0.89, n/a; baso% r=0.54, n/a</b> <b>NRBCs, Plt clumps, lyse-resistant RBCs</b>   <b>cold agglutinins</b>   <b>Hct: extreme leukocytosis</b> <b>microcytes, Plt clumps</b> <b>extreme lipemia/leukocytosis</b> <b>NRBC, lyse-resistant RBCs, extreme hyperbilirubinemia</b>
<b>Age- and sex-specific reference ranges</b> <b>Max. CBCs per hr/max. CBCs &amp; diffs. per hr</b> <b>Recommended average frequency of calib.</b> <b>•Modes calibrated/parameters calibrated</b> <b>Frequency of blood/latex controls</b> <b>Min. specimen vol. open/closed/sample dead vol. closed</b>  <b>Tube sampling supported</b> <b>Veterinary capability</b> <b>Microsample capability</b> <b>Prepares microscopic slides automatically or flags problems for slide prep</b> <b>If auto. slidemaker available, No. installed/list price</b>	<b>yes</b> <b>60/60; 80/80</b> <b>not specified by time</b> <b>open or closed/RBC, WBC, Hb, Hct, Plt</b> <b>not specified/none</b> <b>30 µL for CBC/30 µL/varies by tube size;</b> <b>53 µL for CBC-diff/53 µL for CBC-diff./varies by tube size</b> <b>yes (multiple sizes)</b> <b>no</b> <b>yes</b> <b>no</b> <b>n/a</b>	<b>yes</b> <b>60/60</b> <b>6 months</b> <b>closed-open/WBC, RBC, Hb, Hct, Plt, MPV</b> <b>per CLIA standards/none</b> <b>53 µL/53 µL/0.5 mL</b>  <b>yes (multiple sizes)</b> <b>yes</b> <b>yes</b> <b>no</b> <b>—</b>
<b>Archives patient data for later comparison</b> <b>Patient-specific archiving</b> <b>Max. archived data accessible when system online</b> <b>Memory capacity—numeric results—No. specimens</b> <b>Memory capacity—histo/cytograms—No. specimens</b> <b>•Stored in conjunction with CBC data</b> <b>•Histo/cytogram images &amp; CBC data printed as 1 report</b> <b>Saved results can be recalled and retransmitted</b> <b>Saved data can be sorted for reprocessing or report transmission</b> <b>Performs delta checks</b> <b>Tags and holds results for followup, confirm. testing, or rerun</b> <b>Parameters for flags for holding samples are defined by</b> <b>Some results can be transmitted to LIS while others held</b> <b>Scattergram display: cell-specific color</b> <b>Histogram display: color with threshold</b> <b>Choice of desired specimen &amp;/or result info. displayed</b>	<b>yes</b> <b>no</b> <b>10,000 samples</b> <b>10,000</b> <b>10,000</b> <b>yes</b> <b>yes</b> <b>yes</b> <b>yes</b> <b>no</b> <b>yes</b> <b>user or vendor</b> <b>yes, through user-defined criteria</b> <b>no</b> <b>yes</b> <b>yes</b>	<b>yes</b> <b>yes, with Hemalink Data Manager</b> <b>unlimited with Hemalink Data Manager</b> <b>10,000, unlimited with Hemalink Data Manager</b> <b>10,000, unlimited with Hemalink Data Manager</b> <b>yes</b> <b>yes</b> <b>yes</b> <b>yes</b> <b>yes</b> <b>yes</b> <b>yes</b> <b>user</b> <b>yes</b> <b>yes</b> <b>yes</b> <b>yes</b>
<b>LIS interface formats supported</b> <b>Information transferred on LIS interface</b>  <b>LOINC codes transmitted with results</b> <b>How labs get LOINC codes for reagent kits</b> <b>Optional data mgmt. or collation system</b> <b>• Software features</b>   <b>Interface avail. or planned to auto. specimen-handling system</b> <b>Bar-code symbologies read on tube</b> <b>Accommodates bar-code placement per NCCLS standard Auto2A</b>	<b>proprietary; proprietary ASTM</b> <b>numeric &amp; flag results, histograms &amp; diff. plots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast</b> <b>no</b> <b>technical support</b> <b>yes, DL 2000, Command Central, Orchard Software Aqueduct</b> <b>enhanced QC, data archiving, common database, optional data mgmt.,</b> <b>extensive decision rules, delta checking, patient results &amp; graphics available,</b> <b>centralized management of all instruments</b> <b>no</b> <b>Codabar, codes 39 &amp; 128, interl. 2 of 5, EAN 8 &amp; 13</b> <b>yes</b>	<b>ASTM 1394 &amp; 1238, HL7, IEEE MIB</b> <b>numeric &amp; flag results, histograms &amp; scatterplots, instrument to LIS; patient demographics, LIS to instrument—broadcast</b> <b>yes</b> <b>—</b> <b>yes</b> <b>enhanced QC, data archiving with Hemalink Data Manager</b>   <b>no</b> <b>Codabar, codes 39 &amp; 128, ASTM, interl. 2 of 5</b> <b>yes</b>
<b>Time required for maintenance by lab personnel</b> <b>Onboard maintenance records</b> <b>Time from communication of problem to engineer on site</b> <b>Onboard diagnostics/limited to software problems</b> <b>Mftr. can perform diagnostics via modem</b>	<b>none</b> <b>yes</b> <b>—</b> <b>yes/no</b> <b>no</b>	<b>weekly: 15 min</b> <b>yes</b> <b>24 hrs</b> <b>yes/yes</b> <b>yes, with Hemalink Data Manager</b>
<b>Acquisition program based on cost-per-reportable result</b>	<b>yes</b>	<b>yes</b>
<b>Distinguishing features</b>	<b>quant. 5-part WBC diff.; aspirates only 30 µL of sample; requires small space footprint and runs quietly; AL has auto repeat based on decision rules</b>	<b>reliable 5-part WBC diff. technology—MTBF over 200 days; small footprint; small sample size of 53 µL; Hemalink Data Manager</b>
<i>* linearity stated for Ac•T 5diff CP</i>		

Tabulation does not represent an endorsement by the College of American Pathologists

High-volume hematology analyzers

Part 7 of 11	Horiba ABX Diagnostics Inc. Jim Knowles jknowles@us.abx.fr 34 Bunsen Irvine, CA 92618 888-903-5001 ext. 553 www.abx.com	Horiba ABX Diagnostics Inc. Jim Knowles jknowles@us.abx.fr 34 Bunsen Irvine, CA 92618 888-903-5001 ext. 553 www.abx.com
See related article, page 33		
Name of instrument First year sold—installed in U.S./outside U.S. No. units installed in U.S./outside U.S./list price	Pentra 120 Retic Hematology Analyzer 1999/1997 96/700/\$170,000	Pentra 80 2003/2002 114/330/\$70,000
Test menu:  All instruments have: WBC, RBC, Hb, Hct, MCV, MCH, MCHC, Plt, %&# neut, mono, lymph, eos, baso FDA-cleared tests but not clinically released Tests not available but submitted for clearance Tests in development For research use only Tests unique to analyzer	•Chartable •Laboratory •Flags  standard menu (left) plus: RDW, IRF, MPV  LIC#, LIC%, atyp lymph #&%, CRC%, RETL%, RETM%, RETH%, IMR%, MRV, MFI% operator selectable flagging  none none none none —	standard menu (left) plus: RDW, MPV  atyp. lymph, atyp. lymph%, LIC, LIC% operator selectable flagging  none none none none none
Differential method(s) used  Linearity:  Precision:  Accuracy of automated diff. compared with manual diff. (per NCCLS H-20A), regression equation Interfering substances:•WBC  •RBC  •MCV or Hct  •Platelet  •Hb  Interfering substances: differential	cytochemistry, focused flow impedance, light absorbance  0–150/0.5–8.1 2–25/0–2,000 0–80 (Hct) <2%/<2% <1%/<5% <2% (Hct)  neut% r=0.99, n/a; lymph% r=0.99, n/a; mono% r=0.92, n/a; eos% r=0.97, n/a; baso% r=0.71, n/a NRBCs, Plt clumps, lyse-resistant RBCs  cold agglutinins  Hct: extreme leukocytosis  microcytes, Plt clumps  extreme lipemia/leukocytosis  NRBCs, lyse-resistant RBCs, extreme hyperbilirubinemia	DHSS technology combining cytochemistry, focused flow impedance & light absorbance principles of measurement 0–120/0–8 1.3–24/0–1,900 (>2 g/dL Hgb) 2–67% (Hct)/0–2,800 (<2 g/dL Hgb) <2%/<2% <1%/<5% <2% (Hct)  neut% r=0.99, n/a; lymph% r=0.99, n/a; mono% r=0.36, n/a; eos% r=0.61, n/a NRBCs, Plt clumps, lyse-resistant RBCs  cold agglutinins  Hct: extreme leukocytosis  microcytes, Plt clumps  extreme lipemia, leukocytosis  NRBCs, lyse-resistant RBCs, extreme hyperbilirubinemia
Age- and sex-specific reference ranges Max. CBCs per hr/max. CBCs & diffs. per hr Recommended average frequency of calib. •Modes calibrated/parameters calibrated Frequency of blood/latex controls Min. specimen vol. open/closed/sample dead vol. closed Tube sampling supported Veterinary capability Microsample capability Prepares microscopic slides automatically or flags problems for slide prep If auto. slidemaker available, No. installed/list price	yes 120/120 6 months closed, open/WBC, RBC, Hb, Hct, Plt per CLIA standards/not required 130 µL/200 µL/1 mL yes yes yes yes —/\$40,000	yes 80/80 6 months closed rack/WBC, RBC, Hb, Hct, Plt, MPV per CLIA standards/none 53 µL/53 µL/0.5 mL yes no yes no n/a
Archives patient data for later comparison Patient-specific archiving Max. archived data accessible when system online Memory capacity—numeric results—No. specimens Memory capacity—histo/cytograms—No. specimens •Stored in conjunction with CBC data •Histo/cytogram images & CBC data printed as 1 report Saved results can be recalled and retransmitted Saved data can be sorted for reprocessing or report transmission Performs delta checks Tags and holds results for followup, confirm. testing, or rerun Parameters for flags for holding samples are defined by Some results can be transmitted to LIS while others held Scattergram display: cell-specific color Histogram display: color with threshold Choice of desired specimen &/or result info. displayed	yes yes 90,000, unlimited with Hemalink Data Manager 90,000, unlimited with Hemalink Data Manager 90,000, unlimited with Hemalink Data Manager yes yes yes yes yes yes yes yes yes yes yes yes	yes yes, with Hemalink Data Manager unlimited with Hemalink Data Manager 10,000 10,000 yes yes yes yes yes yes yes yes yes yes yes —
LIS interface formats supported Information transferred on LIS interface  LOINC codes transmitted with results How labs get LOINC codes for reagent kits Optional data mgmt. or collation system • Software features  Interface avail. or planned to auto. specimen-handling system Bar-code symbologies read on tube Accommodates bar-code placement per NCCLS standard Auto2A	proprietary, ASTM 1394 & 1238, HL7, IEEE MIB numeric & flag results, histograms & scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument— broadcast; host query for demographics & orders no — yes enhanced QC, data archiving (Hemalink Data Manager), data collation from multiple instruments no Codabar, codes 39 & 128, ASTM, interl. 2 of 5 yes	proprietary, ASTM 1394 & 1238, HL7, IEEE MIB numeric & flag results, histograms & scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument— broadcast  n/a n/a yes (Medicus, Hemalink) enhanced QC, data archiving, data collation from multiple instruments  — Codabar, codes 39 & 128, ASTM, interl. 2 of 5 yes
Time required for maintenance by lab personnel Onboard maintenance records Time from communication of problem to engineer on site Onboard diagnostics/limited to software problems Mftr. can perform diagnostics via modem	weekly: 10 min; monthly: 10 min yes 4 hrs average, 24 hrs guaranteed yes/yes yes, with Hemalink Data Manager	weekly: 15 min yes — no/yes yes
Acquisition program based on cost-per-reportable result	yes	yes
Distinguishing features	automatic rerun for sample verification; MTBF>90 days; small footprint; integrated reticulocyte methodology and slidemaker/stainer; thiazole orange reticulocyte methodology	compact, reliable 5-part diff technology, autoloader, 80 samples per hour, auto rerun feature

Tabulation does not represent an endorsement by the College of American Pathologists



High-volume hematology analyzers

<div>Part 8 of 11</div> <div>See related article, page 33</div>	<div>Horiba ABX Diagnostics Inc. Jim Knowles jknowles@us.abx.fr 34 Bunsen Irvine, CA 92618 888-903-5001 ext. 553 www.abx.com</div>	<div>Horiba ABX Diagnostics Inc. Jim Knowles jknowles@us.abx.fr 34 Bunsen Irvine, CA 92618 888-903-5001 ext. 553 www.abx.com</div>
<div>Name of instrument</div> <div>First year sold—installed in U.S./outside U.S.</div> <div>No. units installed in U.S./outside U.S./list price</div>	<div>Pentra XL 80</div> <div>2004/2003</div> <div>32/90/\$90,000</div>	<div>Pentra DX120</div> <div>2005/2004</div> <div>5/50/\$196,000</div>
<div>Test menu:</div> <div><div>All instruments have: WBC, RBC, Hb, Hct, MCV, MCH, MCHC, Plt, %&amp;# neut, mono, lymph, eos, baso</div><div>•Chartable</div><div>•Laboratory</div><div>•Flags</div></div>	<div>standard menu (left) plus: automatic dilution of overrange results (WBC x 3, RBC/hgb/Plt x 2), RDW, MPV</div> <div>atyp. lymph, atyp. lymph%, LIC, LIC%</div> <div>operator selectable flagging</div>	<div>standard menu (left) plus: NRBCs, reticulocytes, IRF, MRV</div> <div>LIC%&amp;#, atyp lymphs %&amp;#, IMG %&amp;#, IML %&amp;#, IMM %&amp;#, RETL%, RETM%, RETH%, IMR%, MRU, MFI%, CRC%</div> <div>—</div>
<div>FDA-cleared tests but not clinically released</div> <div>Tests not available but submitted for clearance</div> <div>Tests in development</div> <div>For research use only</div> <div>Tests unique to analyzer</div>	<div>none</div> <div>none</div> <div>—</div> <div>none</div> <div>automatic dilution protocol</div>	<div>double-diff matrix pending 510 (k)</div> <div>double-diff matrix pending 510 (k)</div> <div>double-diff matrix pending 510 (k)</div> <div>—</div> <div>—</div>
<div>Differential method(s) used</div> <div>Linearity:</div> <div>Precision:</div> <div>Accuracy of automated diff. compared with manual diff. (per NCCLS H-20A), regression equation</div> <div>Interfering substances:•WBC</div> <div>•RBC</div> <div>•MCV or Hct</div> <div>•Platelet</div> <div>•Hb</div> <div>Interfering substances: differential</div>	<div>DHSS technology combining cytochemistry, focused flow impedance &amp; light absorbance</div> <div>0–120/0–8</div> <div>0–24/0–1,900 (&gt;2 g/dL Hb)</div> <div>0–67% (Hct)/0–2,800 (&lt;2 g/dL Hb)</div> <div>&lt;2%/&lt;2%</div> <div>&lt;1%/&lt;5%</div> <div>&lt;2% (Hct)</div> <div>neut%r=0.99, n/a; lymph% r=0.98, n/a; mono% r=0.96, n/a; eos% r=0.89, n/a; baso% r=0.54, n/a</div> <div>NRBCs, Plt clumps, lyse-resistant RBCs</div> <div>cold agglutinins</div> <div>Hct: extreme leukocytosis</div> <div>microcytes, Plt clumps</div> <div>extreme lipemia, leukocytosis</div> <div>NRBCs, lyse-resistant RBCs, extreme hyperbilirub inemia</div>	<div>cytochemistry (chlorazolic black) and absorbance</div> <div>0–150/0.5–8.1</div> <div>2–25/0–2,000</div> <div>0–80 (Hct)</div> <div>&lt;2%/&lt;2%</div> <div>&lt;1%/&lt;5%</div> <div>&lt;2% (Hct)</div> <div>neut%r=0.99, n/a; lymph% r=0.98, n/a; mono% r=0.92, n/a; eos% r=0.97, n/a; baso% r=0.71, n/a</div> <div>NRBCs, Plt clumps, lyse-resistant RBCs</div> <div>cold agglutinins</div> <div>Hct: extreme leukocytosis</div> <div>microcytes, Plt clumps</div> <div>extreme lipemia, leukocytosis</div> <div>NRBCs, lyse-resistant RBCs, extreme hyperbilirubin emia</div>
<div>Age- and sex-specific reference ranges</div> <div>Max. CBCs per hr/max. CBCs &amp; diffs. per hr</div> <div>Recommended average frequency of calib.</div> <div>•Modes calibrated/parameters calibrated</div> <div>Frequency of blood/latex controls</div> <div>Min. specimen vol. open/closed/sample dead vol. closed</div> <div>Tube sampling supported</div> <div>Veterinary capability</div> <div>Microsample capability</div> <div>Prepares microscopic slides automatically or flags problems for slide prep</div> <div>If auto. slidemaker available, No. installed/list price</div>	<div>yes</div> <div>80/80</div> <div>6 months</div> <div>open, closed/WBC, RBC, Hb, Hct, Plt, MPV</div> <div>per CLIA standards/none</div> <div>30 for CBC/53 for CBC &amp; diff/0.5 mL</div> <div>yes (autoloader 13 x 75; closed tube 16 sizes + micro)</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>—/—</div>	<div>yes</div> <div>120/120</div> <div>6 months</div> <div>open, closed/WBC, RBC, Hb, Hct, Plt, MPV</div> <div>per CLIA standards/none</div> <div>130 µL/200 µL/1 mL</div> <div>yes</div> <div>no</div> <div>no</div> <div>yes</div> <div>—/—</div>
<div>Archives patient data for later comparison</div> <div>Patient-specific archiving</div> <div>Max. archived data accessible when system online</div> <div>Memory capacity—numeric results—No. specimens</div> <div>Memory capacity—histo/cytograms—No. specimens</div> <div>•Stored in conjunction with CBC data</div> <div>•Histo/cytogram images &amp; CBC data printed as 1 report</div> <div>Saved results can be recalled and retransmitted</div> <div>Saved data can be sorted for reprocessing or report transmission</div> <div>Performs delta checks</div> <div>Tags and holds results for followup, confirm. testing, or rerun</div> <div>Parameters for flags for holding samples are defined by</div> <div>Some results can be transmitted to LIS while others held</div> <div>Scattergram display: cell-specific color</div> <div>Histogram display: color with threshold</div> <div>Choice of desired specimen &amp;/or result info. displayed</div>	<div>yes</div> <div>yes, with Hemalink Data Manager</div> <div>unlimited with Hemalink Data Manager; 10,000 instrument only</div> <div>unlimited with Hemalink Data Manager; 10,000 instrument only</div> <div>unlimited with Hemalink Data Manager</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>—</div>	<div>yes</div> <div>yes</div> <div>unlimited Data Manager; 10,000 instrument only</div> <div>unlimited Data Manager</div> <div>unlimited Data Manager</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div> <div>yes</div>
<div>LIS interface formats supported</div> <div>Information transferred on LIS interface</div> <div>LOINC codes transmitted with results</div> <div>How labs get LOINC codes for reagent kits</div> <div>Optional data mgmt. or collation system</div> <div>• Software features</div> <div>Interface avail. or planned to auto. specimen-handling system</div> <div>Bar-code symbologies read on tube</div> <div>Accommodates bar-code placement per NCCLS standard Auto2A</div>	<div>proprietary, ASTM 1394 &amp; 1238, HL7, IEEE MIB</div> <div>numeric &amp; flag results, histograms &amp; scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument— broadcast</div> <div>n/a</div> <div>n/a</div> <div>yes (Medicus, Hemalink)</div> <div>enhanced QC, data archiving, data collation from multiple instruments</div> <div>—</div> <div>Codabar, codes 39 &amp; 128, ASTM, interl. 2 of 5</div> <div>yes</div>	<div>proprietary, ASTM 1394 &amp; 1238, HL7, IEEE MIB</div> <div>numeric &amp; flag results, histograms &amp; scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument— broadcast</div> <div>n/a</div> <div>n/a</div> <div>yes (Medicus, Hemalink)</div> <div>enhanced QC, data archiving, data collation from multiple instruments</div> <div>—</div> <div>Codabar, codes 39 &amp; 128, ASTM, interl. 2 of 5</div> <div>yes</div>
<div>Time required for maintenance by lab personnel</div> <div>Onboard maintenance records</div> <div>Time from communication of problem to engineer on site</div> <div>Onboard diagnostics/limited to software problems</div> <div>Mftr. can perform diagnostics via modem</div>	<div>weekly: 15 min</div> <div>yes</div> <div>—</div> <div>no/yes</div> <div>yes</div>	<div>weekly: 15 min</div> <div>yes</div> <div>—</div> <div>no/yes</div> <div>yes</div>
<div>Acquisition program based on cost-per-reportable result</div>	<div>yes</div>	<div>yes</div>
<div>Distinguishing features</div>	<div>compact 5-part differential instrument with autoloader and autodilution capability, autorerun feature, auto validation</div>	<div>high-throughput cell counter with integrated reticulocyte methodology and slidemaker/stainer; fluorescent NRBC counting, auto rerun and reflex testing, auto validation</div>

Tabulation does not represent an endorsement by the College of American Pathologists

SURVEY  
OF INSTRUMENTS

# High-volume hematology analyzers

<i>Part 9 of 11</i>  <i>See related article, page 33</i>	Sysmex America Inc. Peggy Barranco 1 Nelson C. White Pkwy. Mundelein, IL 60060 800-379-7639 www.sysmex.com/usa	Sysmex America Inc. Peggy Barranco 1 Nelson C. White Pkwy. Mundelein, IL 60060 800-379-7639 www.sysmex.com/usa
Name of instrument First year sold—installed in U.S./outside U.S. No. units installed in U.S./outside U.S./list price	Sysmex XE-2100 2000 850/3,500/\$225,000	Sysmex XE-2100L 2001 100/300/\$200,000
Test menu:  All instruments have: WBC, RBC, Hb, Hct, MCV, MCH, MCHC, Plt, %&# neut, mono, lymph, eos, baso  •Chartable  •Laboratory  •Flags  FDA-cleared tests but not clinically released Tests not available but submitted for clearance Tests in development For research use only Tests unique to analyzer	standard menu (left) plus: NRBC %&#, retic %&#*, RDW-SD, RDW-CV, IRF, PIt-O, HPC#, MPV, IG%, IG#  none  Plt clumps, RBC agglut, turbidity, WBC ABN scattergram, RBC ABN distrib., PIt ABN distrib., RBC lyse resistance, blasts, left shift, atyp. lymph., ABN lymph./blast., ret. ABN scattergram  none none RET-He, IPF P-LCR, PCT, PDW NRBC, HPC#, IG%, IG#, RET He, IPF	standard menu (left) plus: MPV, RDW-SD, RDW-CV, NRBC %&#, HPC#, IG%, IG#  none  Plt clumps, PIt ABN distribution, WBC ABN scattergram, blast, left shift, atyp. lymph., ABN lymph./blasts, RBC ABN distribution, RBC lyse resistance, RBC agglut., turbidity  none none none P-LCR, PCT, PDW HPC#, NRBC, IG%, IG#
Differential method(s) used Linearity:  Precision:  Accuracy of automated diff. compared with manual diff. (per NCCLS H-20A), regression equation  Interfering substances:•WBC  •RBC  •MCV or Hct  •Platelet •Hb Interfering substances: differential	fluorescent flow cytometry, RF/DC detecting method 0–170/0–8 0–25/0–5,000 0–60 (Hct) <3%/<1.5% <1.0%/<4.0% <1.0% (Hct)  neut% r=0.95, y=0.92x+5.46; lymph% r=0.95, y=0.88x+2.46; mono% r=0.79, y=0.77x+1.88; eos% r=0.92, y=0.97x+0.29; baso% r=0.82, y=1.01x+0.01 ; NRBC% r=0.96, y=1.12x+0.11 ; IG% r=0.83, y=0.9332x+0.0922 cold agglut., PIt aggreg., nucl. RBCs, cryoglob., lyse-resistant RBCs cold agglut., severe microcytosis, frag. RBCs, large No. giant PIts, in vitro hemolysis Hct: cold agglutinins, leukocytosis (>100,000/μL), ABN red cell fragility, spherocytosis  pseudothrombocytopenia, PIt aggreg., incr. microcytosis, megalocytic PIts lipemia, ABN proteins in blood plasma, severe leukocytosis (>100,000/μL) lyse-resistant RBCs	fluorescent flow cytometry, RF/DC detecting method 0–170/0–8 0–25/0–5,000 0–60 (Hct) 3%/1.5% 1.0%/4.0% 1 .0% (Hct)  neut% r=0.95, y=0.92x+5.46; lymph% r=0.95, y=0.88x+2.46; mono% r=0.79, y=0.77x+1.88; eos% r=0.92, y=0.97x+0.29; baso% r=0.82, y=1.01x+0.01 ; NRBC% r=0.96, y=1.12x+0.11; IG% r=0.83, y=0.9332x+0.0922 cold agglut., PIt aggreg., cryoglob., lyse-resistant RBCs, NRBCs cold agglut., severe microcytosis, frag. RBCs, leukocytosis (>100,000/μL)  Hct: cold agglut., ABN red cell fragility, spherocytosis, leukocytosis (>100,000/μL)  pseudothrombocytopenia, PIt aggreg., incr. microcytosis, megaloblasts lipemia, ABN proteins, leukocytosis (>100,000/μL) lyse-resistant RBCs
Age- and sex-specific reference ranges Max. CBCs per hr/max. CBCs & diffs. per hr Recommended average frequency of calib. •Modes calibrated/parameters calibrated Frequency of blood/latex controls Min. specimen vol. open/closed/sample dead vol. closed Tube sampling supported Veterinary capability Microsample capability Prepares microscopic slides automatically or flags problems for slide prep If auto. slidemaker available, No. installed/list price	yes 150/150 twice per year by FSR open, closed, capillary/WBC, RBC, Hb, Hct, PIt per CLIA requirements/not required 130 μL/200 μL/1 mL yes no yes yes with Alpha or HST upgrade  >1,000	yes 150/150 twice per year by FSR open, closed, capillary/WBC, RBC, Hb, Hct, PIt per CLIA requirements/not required 130 μL/200 μL/1 mL yes no yes yes with Alpha or HST upgrade  >1,000
Archives patient data for later comparison Patient-specific archiving Max. archived data accessible when system online Memory capacity—numeric results—No. specimens Memory capacity—histo/cytograms—No. specimens •Stored in conjunction with CBC data •Histo/cytogram images & CBC data printed as 1 report Saved results can be recalled and retransmitted Saved data can be sorted for reprocessing or report transmission Performs delta checks Tags and holds results for followup, confirm. testing, or rerun Parameters for flags for holding samples are defined by Some results can be transmitted to LIS while others held Scattergram display: cell-specific color Histogram display: color with threshold Choice of desired specimen &/or result info. displayed	yes yes 10,000 samples 10,000 samples 10,000 samples yes yes yes yes yes yes yes yes yes yes yes yes yes	yes yes 10,000 samples 10,000 samples 10,000 samples yes yes yes yes yes yes yes yes yes yes yes yes yes
LIS interface formats supported Information transferred on LIS interface  LOINC codes transmitted with results How labs get LOINC codes for reagent kits Optional data mgmt. or collation system • Software features  Interface avail. or planned to auto. specimen-handling system  Bar-code symbologies read on tube Accommodates bar-code placement per NCCLS standard Auto2A	RS-232C/TCP IP numeric & flag results, histograms & scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast; host query for patient demographics & orders — n/a yes, proprietary enhanced QC, data archiving, data collation from multiple instruments, online QC Roche, Labotix, IDS, A&T  Codabar, codes 39 & 128, interl. 2 of 5, ITF, NW7, EAN 8 & 13 yes	RS-232C, TCP IP numeric & flag results, histograms & scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast; host query for patient demographics & orders — n/a yes, proprietary enhanced QC, data archiving, data collation from multiple instruments, online QC Roche, Labotix, A&T, IDS  Codabar, codes 39 & 128, interl. 2 of 5, ITF, NW7, EAN 8 & 13 yes
Time required for maintenance by lab personnel Onboard maintenance records Time from communication of problem to engineer on site Onboard diagnostics/limited to software problems Mftr. can perform diagnostics via modem	daily: 15 min walkaway with autoready yes territory dependent yes/no yes	daily: 15 min walkaway with autoready yes territory dependent yes/no yes
Acquisition program based on cost-per-reportable result	yes	yes
Distinguishing features	enumeration of NRBCs; throughput of 150 CBCs per hour; random access; discrete testing; HPC testing; online QC; remote diagnostics, IG enumeration, body fluid analysis; platelet linearity to 5 million, IPF, and RET He	remote diagnostics; online QC; random access; HPC testing; 150 CBC per hour throughput; discrete testing; NRBC enumeration, IG enumeration, body fluid analysis

Tabulation does not represent an endorsement by the College of American Pathologists

High-volume hematology analyzers

Part 10 of 11  See related article, page 33	Sysmex America Inc. Peggy Barranco 1 Nelson C. White Pkwy. Mundelein, IL 60060 800-379-7639 www.sysmex.com/usa	Sysmex America Inc. Brian Verne 1 Nelson C. White Pkwy. Mundelein, IL 60060 800-379-7639 www.sysmex.com/usa
Name of instrument First year sold—installed in U.S./outside U.S. No. units installed in U.S./outside U.S./list price	Sysmex XE-2100D 2004/2004 —/—/\$200,000	Sysmex XE-Alpha N/HST-N 2000 >1,000 worldwide/\$360,000–\$1,000,000
Test menu:  All instruments have: WBC, RBC, Hb, Hct, MCV, MCH, MCHC, Plt, %&# neut, mono, lymph, eos, baso FDA-cleared tests but not clinically released Tests not available but submitted for clearance Tests in development For research use only Tests unique to analyzer	•Chartable  •Laboratory  •Flags  standard menu (left) plus: RDW-SD, RDW-CV, IG%, IG#  none  Plt clumps, Plt ABN distribution, WBC ABN scattergram, blast, left shift, atyp. lymph., ABN lymph./blast, RBC ABN distribution, RBC lyse resistance, RBC agglut., turbidity n/a n/a n/a P-LCR, PCT, PDW IG% & IG#	standard menu (left) plus: RDW-SE, RDW-CV, IG%, IG#, NRBG%, NRBC#, retic%&#, IRG, Plt-O, HPC#, MPV  none  Plt clumps, RBC agglut., turbidity, WBC ABN scattergram, RBC ABN distrib., Plt ABN distrib., RBC lyse resistance, blasts, left shift, atyp. lymph., ABN lymph./blast, ret. ABN scattergram new release IPF & RET He none RET-He, IPF P-LCR, PCT, PDW NRBC, HPC#, IG%, IG#
Differential method(s) used Linearity:  Precision:  Accuracy of automated diff. compared with manual diff. (per NCCLS H-20A), regression equation  Interfering substances:•WBC •RBC  •MCV or Hct  •Platelet  •Hb Interfering substances: differential	fluorescent flow cytometry 0–170/0–8 0–25/0–5,000 0–60 (Hct) 3%/ 1.5% 1.0%/ 4.0% 1 .0% (Hct)  neut% r=0.95, y=0.92x+5.46; lymph% r=0.95, y=0.88x+2.46; mono% r=0.79, y=0.77x+1.88; eos% r=0.92, y=0.97x+0.29; baso% r=0.82, y=1.01x+0.01; NRBC% r=0.96, y=1.12x+0.11; IG% r=0.83, y=0.9332x+0.0922 cold agglut., Plt aggreg., cryoglob., lyse-resistant RBCs, NRBCs cold agglut., severe microcytosis, frag. RBCs, leukocytosis (>100,000/μL)  Hct: cold agglut., ABN red cell fragility, spherocytosis, leukocytosis (>100,000/μL)  pseudothrombocytopenia, Plt aggreg., incr. microcytosis, megaloblasts  lipemia, ABN proteins, leukocytosis (>100,000/μL) lyse-resistant RBCs	fluorescent flow cytometry, RF/DC detecting method 0–170/0–8 0–25/0–5,000 0–60 (Hct) <3%/<1.5% <1.0%/<4.0% <1.0% (Hct)  neut% r=0.95, y=0.92x+5.46; lymph% r=0.95, y=0.88x+2.46; mono% r=0.79, y=0.77x+1.88; eos% r=0.92, y=0.97x+0.29; baso% r=0.82, y=1.01x+0.01; NRBC% r=0.96, y=1.12x+0.11; IG% r=0.83, y=0.9332x+0.0922 cold agglut., Plt aggreg., nucl. RBCs, cryoglob., lyse-resistant RBCs cold agglut., severe microcytosis, frag. RBCs, large No. giant Plts, in vitro hemolysis Hct: cold agglut., leukocytosis (>100,000/μL), ABN red cell fragility, spherocytosis  pseudothrombocytopenia, Plt aggreg., incr. microcytosis, megalocytic Plts  lipemia, ABN proteins in blood plasma, severe leukocytosis (>100,000/μL) lyse-resistant RBCs
Age- and sex-specific reference ranges Max. CBCs per hr/max. CBCs & diffs. per hr Recommended average frequency of calib. •Modes calibrated/parameters calibrated Frequency of blood/latex controls Min. specimen vol. open/closed/sample dead vol. closed Tube sampling supported Veterinary capability Microsample capability Prepares microscopic slides automatically or flags problems for slide prep If auto. slidemaker available, No. installed/list price	yes 150/150 twice per year by FSR open, closed, capillary/WBC, RBC, Hb, Hct, Plt per CLIA requirements/not required 130 μL/200 μL/1 mL yes no yes yes, with Alpha or HST upgrade  >1,000/—	yes 150/150 per analyzer on automation system twice per year by FSR open, closed, capillary/WBC, RBC, Hb, Hct, Plt per CLIA requirements/not required 130 μL/200 μL/1 mL yes no yes yes  >1,000/\$250,000
Archives patient data for later comparison Patient-specific archiving Max. archived data accessible when system online Memory capacity—numeric results—No. specimens Memory capacity—histo/cytograms—No. specimens •Stored in conjunction with CBC data •Histo/cytogram images & CBC data printed as 1 report Saved results can be recalled and retransmitted Saved data can be sorted for reprocessing or report transmission Performs delta checks Tags and holds results for followup, confirm. testing, or rerun Parameters for flags for holding samples are defined by Some results can be transmitted to LIS while others held Scattergram display: cell-specific color Histogram display: color with threshold Choice of desired specimen &/or result info. displayed	yes yes 10,000 samples 10,000 samples 10,000 yes yes yes yes yes yes yes yes yes yes yes yes yes yes	yes yes 10,000 samples 10,000 10,000 yes yes yes yes yes yes yes yes yes yes yes yes yes yes yes
LIS interface formats supported Information transferred on LIS interface  LOINC codes transmitted with results How labs get LOINC codes for reagent kits Optional data mgmt. or collation system • Software features  Interface avail. or planned to auto. specimen-handling system Bar-code symbologies read on tube Accommodates bar-code placement per NCCLS standard Auto2A	RS-232C, TCP IP numeric & flag results, histograms & scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast; host query for patient demographics & orders — n/a yes, proprietary enhanced QC, data archiving, data collation from multiple instruments, online QC Lab InterLink, MDS/AutoLab, Beckman Coulter, Roche, Labotix, A&T Codabar, codes 39 & 128, ASTM, interl. 2 of 5, ITF, NW7, EAN 8 & 13 yes	RS-232C, TCP IP numeric & flag results, histograms & scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast; host query for patient demographics & orders — n/a yes, proprietary enhanced QC, data archiving, data collation from multiple instruments, online QC Roche, Labotix, IDS, A&T Codabar, codes 39 & 128, interl. 2 of 5, ITF, NW7, EAN 8 & 13 yes
Time required for maintenance by lab personnel Onboard maintenance records Time from communication of problem to engineer on site Onboard diagnostics/limited to software problems Mftr. can perform diagnostics via modem	daily: 15 min walkaway with autoready yes contract and territory dependent yes/no yes	daily: 15 min walkaway with autoready yes territory dependent yes/no yes
Acquisition program based on cost-per-reportable result	yes	yes
Distinguishing features	provides high throughput sample analysis; small footprint; configurable & scalable; platelet linearity—5 million	multiple configurations available as are all distinguishing features of the XE-2100; platelet linearity—5 million; new parameters for platelet monitoring—IPF & retic Hb measurement & RET He

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High-volume hematology analyzers

Part 11 of 11	Sysmex America Inc. Peggy Barranco 1 Nelson C. White Pkwy. Mundelein, IL 60060 800-379-7639 www.sysmex.com/usa	Sysmex America Inc. Peggy Barranco 1 Nelson C. White Pkwy. Mundelein, IL 60060 800-379-7639 www.sysmex.com/usa
See related article, page 33		
Name of instrument First year sold—installed in U.S./outside U.S. No. units installed in U.S./outside U.S./list price	Sysmex XT-2000i 2002 400/3,500/\$145,000	Sysmex XT-1800i 2002 400/3,500/\$125,000
Test menu:  All instruments have: WBC, RBC, Hb, Hct, MCV, MCH, MCHC, Plt, %&# neut, mono, lymph, eos, baso  FDA-cleared tests but not clinically released Tests not available but submitted for clearance Tests in development For research use only Tests unique to analyzer	•Chartable  •Laboratory  •Flags  standard menu (left) plus: retic %&#, IRF, Plt-O, MPV, RDW-SD, RDW-CV  none  Plt clumps, Plt ABN distribution, WBC ABN scattergram, blast imm. gran., left shift, atyp lymph., ABN lymph./blasts, RBC ABN distribution, RBC lyse resistance, RBC agglut., turbidity, ret ABN scattergram, NRBC  none none body fluids, immature gran. %&# IG%&# Plt-O	standard menu (left) plus: MPV, RDW-SD, RDW-CV  none  Plt clumps, Plt ABN distribution, WBC ABN scattergram, blast imm. gran., left shift, atyp. lymph., ABN lymph./blasts, RBC ABN distribution, RBC lyse resistance, RBC agglut., turbidity, NRBC  none none body fluids, immature gran. %&# IG%&# —
Differential method(s) used Linearity:  Precision:  Accuracy of automated diff. compared with manual diff. (per NCCLS H-20A), regression equation Interfering substances:•WBC  •RBC  •MCV or Hct  •Platelet  •Hb Interfering substances: differential	fluorescent flow cytometry 0–310/0–8 0–25/0–2,000 0–60 (Hct) 3.0%/ 1.5% 1.5%/ 4.0% 1.5% (Hct)  neut% r=0.95, y=0.95x+3.38; lymph% r=0.96, y=0.85x+1.67; mono% r=0.90, y=11.37x+1.89; eos% r=0.94, y=0.87x+0.04; baso% r=0.76, y=0.48x+0.24 cold agglut., Plt aggreg., cryoglob., lyse-resistant RBCs, NRBCs  cold agglut., severe microcytosis, frag. RBCs, leukocytosis (>100,000/μL)  Hct: cold agglut., ABN red cell fragility, spherocytosis, leukocytosis (>100,000/μL)  pseudothrombocytopenia, Plt aggreg., incr. microcytosis, megaloblasts  lipemia, ABN proteins, leukocytosis (>100,000/μL) lyse-resistant RBCs	fluorescent flow cytometry 0–310/0–8 0–25/0–2,000 0–60 (Hct) 3.0%/ 1.5% 1.5%/ 4.0% 1 .5% (Hct)  neut% r=0.95, y=0.95x+3.38; lymph% r=0.96, y=0.85x+1.67; mono% r=0.90, y=11.37x+1.89; eos% r=0.94, y=0.87x+0.04; baso% r=0.76, y=0.48x+0.24 cold agglut., Plt aggreg., cryoglob., lyse-resistant RBCs, NRBCs  cold agglut., severe microcytosis, frag. RBCs, leukocytosis (>100,000/μL)  Hct: cold agglut., ABN red cell fragility, spherocytosis, leukocytosis (>100,000/μL)  pseudothrombocytopenia, Plt aggreg., incr. microcytosis, megaloblasts  lipemia, ABN proteins, leukocytosis (>100,000/μL) lyse-resistant RBCs
Age- and sex-specific reference ranges Max. CBCs per hr/max. CBCs & diffs. per hr Recommended average frequency of calib. •Modes calibrated/parameters calibrated Frequency of blood/latex controls Min. specimen vol. open/closed/sample dead vol. closed Tube sampling supported Veterinary capability Microsample capability Prepares microscopic slides automatically or flags problems for slide prep If auto. slidemaker available, No. installed/list price	yes 80/80 every 6 months by FSR open, closed, capillary/WBC, RBC, Hb, Hct, Plt per CLIA requirements/not required 85 μL/150 μL/1 mL yes yes, XT-V product yes no —	yes 80/80 every 6 months by FSR open, closed, capillary/WBC, RBC, Hb, Hct, Plt per CLIA requirements/not required 85 μL/150 μL/1 mL yes yes, XT-V product yes no —
Archives patient data for later comparison Patient-specific archiving Max. archived data accessible when system online Memory capacity—numeric results—No. specimens Memory capacity—histo/cytograms—No. specimens •Stored in conjunction with CBC data •Histo/cytogram images & CBC data printed as 1 report Saved results can be recalled and retransmitted Saved data can be sorted for reprocessing or report transmission Performs delta checks Tags and holds results for followup, confirm. testing, or rerun Parameters for flags for holding samples are defined by Some results can be transmitted to LIS while others held Scattergram display: cell-specific color Histogram display: color with threshold Choice of desired specimen &/or result info. displayed	yes yes 10,000 samples 10,000 samples 10,000 yes yes yes yes yes yes yes yes yes yes yes yes yes	yes yes 10,000 samples 10,000 samples 10,000 yes yes yes yes yes yes yes yes yes yes yes yes yes
LIS interface formats supported Information transferred on LIS interface  LOINC codes transmitted with results How labs get LOINC codes for reagent kits Optional data mgmt. or collation system • Software features  Interface avail. or planned to auto. specimen-handling system Bar-code symbologies read on tube Accommodates bar-code placement per NCCLS standard Auto2A	RS-232C, TCP IP, ASTM numeric & flag results, histograms & scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast; host query for patient demographics & orders — n/a yes, proprietary enhanced QC, data archiving, data collation from multiple instruments, online QC n/a Codabar, codes 39 & 128, interl. 2 of 5, ITF, NW7, EAN 8 & 13 yes	RS-232C, TCP IP, ASTM numeric & flag results, histograms & scatterplots, instrument to LIS; patient demographics, orders, LIS to instrument—broadcast; host query for patient demographics & orders — n/a yes, proprietary enhanced QC, data archiving, data collation from multiple instruments, online QC n/a Codabar, codes 39 & 128, interl. 2 of 5, ITF, NW7, EAN 8 & 13 yes
Time required for maintenance by lab personnel Onboard maintenance records Time from communication of problem to engineer on site Onboard diagnostics/limited to software problems Mftr. can perform diagnostics via modem	daily: 15 min walkaway with autoready yes contract and territory dependent yes/no yes	daily: 15 min walkaway with autoready yes contract and territory dependent yes/no yes
Acquisition program based on cost-per-reportable result	yes	yes
Distinguishing features	remote diagnostics; online QC; random access; fluorescent optical platelets; discrete testing; reagent monitoring; customized chartable report formats; XT-V unit for use in toxicology & research	remote diagnostics; online QC; random access; discrete testing; reagent monitoring; chartable report formats; XT-V for use in toxicology & research; unique specimen-gating SW is FDA Part II compliant

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