In vit	ro blood gas analyzel	rs
Part 1 of 12	Abbott Diagnostics	Abbatt Diagnostics
	Eric Perreault eric.perreault@abbott.com	Eric Perreault eric.perreault@abbott.com
	4A Grosby Dr. Bedford, MA 01730	4A Grosby Dr. Bedford, MA 01730
See accompanying	781-276-4797	781-276-4797
Name of device/first year sold No. of devices sold in U.S./outside U.S./list price	i-Stat 1/2001 500/250/\$8,500	i-Stat System/1992 11,000 worldwide/\$5,000
Dimensions (H x W x D)/weight	23.48 cm x 7.68 cm x 7.24 cm/22.4 oz	8.26 x 2.52 x 2.05 in/18.34 oz
Analytes measured on device	pH, pCO ₂ , pO ₂ , Hct, Hb, Na, K, Cl, iCa, lactate, glucose, creatinine, BUN	pH, pCO ₂ , pO ₂ , Hct, Na, K, Cl, iCa, glucose, creatinine, lactate
Parameters calculated on device	Hb, 0 ₂ SAT, BE, TCO ₂ , HCO ₃ -	Hb, O ₂ SAT, BE, TCO ₂ , HCO ₃ -
Rarometric prossure	masurad	measured
Analytical method(s)/technology(ies) employed	electrochemical for all analytes	electrochemical for all analytes
Device is work of a parise of valued workels		
User list/group available	no yes (through local sales representative)	no yes (through local sales representative)
Device warranty	1 yr replacement	1 yr replacement
Average expected life of device	n/a 8 yrs	n/a 8 yrs
Open or closed system/external gas tanks required	closed/no	closed/no
For FUC testing or laboratory	point-ot-care testing	point-ot-care testing
POC: Uses disposable prenackaged reagent/electrode system for analysis	reagent/electrode (single use)	reagent/electrode (single use)
No. of disposable reagent system units in basic shipment package	25 per box	25 per box
No. of samples analyzed per 1 disposable reagent/electrode system	1 \$3_\$7	1 ¢2_¢0
Reagent unit storage requirements	refrigerate, 2 weeks of shelf life at room temperature	refrigerate, 2 weeks shelf life at room temperature
	reag./electrode: 6–9 mos; 2 weeks at room temperature	reag./electrode: 6–9 mos retrig.; 2 weeks at room ter
Laboratory: No. of different disposable reagents required to maintain device	_	_
Max. No. specific analyte reagents that can reside in device at once Shelf life		_
Cost per test/reagent cost per test	_	—
Calibrations required	1 point (automatic)	1 point (automatic)
Calibration frequency	every test	every test
Calibrants traceable to NIST standards Internal QC program recommended	yes electronic OC. automated internal wet OC	yes electronic OC. automated internal wet OC
QC features	comparable plot, monthly cumulative reports (available with	monthly cumulative reports (available with external
Remote control of device from laboratory	external system)	can be fully automated, QC lockout
System can use LOINC to transmit results to LIS	yes	yes
Detects clots within analysis chamber	yes	yes
Specimen types suitable for device	whole blood, capillary, mixed venous, arterial, venous	whole blood, capillary, mixed venous, arterial, venou
Sampling technique	injection, capillary transfer and fill	injection, capillary transfer and fill
Suitable for samples from well/sick neonates	yes/yes	yes/yes
Sample size differs with No. of analytes selected	no	yes
Recommended collection device	syringe or capillary tube	syringe or capillary tube
Provides for patient temperature corrected results Time from sample introduction to result availability	yes about 2 min	yes about 2 min
Max. No. of patient samples per hr/max. No. of measured parameters per hr	20/160	20/160
Optimal throughput when calibrated and awaiting specimens Calibration can be interrupted to perform stat sample	n/a	— n/a
Contraindications		
Known interferences Restrictions based on Hot	_	_
Sampler has self-wiping probe		
Time required for maintenance by lab personnel	n/a	n/a
Diagnostics performed through modem	yes	yes
Training & certification program for user	yes, based on number to be trained	yes
Method of analyst ID in system Response for hardware & software failure/user ID & QC failure/	keypad/bar-code entry code no. error message/—/—	keypad entry (required) —/—/—
calibration & power failure		
Supports bar-code scanning of:	operator & patient identifier, reagent lot number, hospital specific information	no bar-code scanner
Supports bar-code scanning of: User can search for and review previous patient results on screen	operator & patient identifier, reagent lot number, hospital specific information yes	no bar-code scanner yes
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard coov report	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result_OC	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No. type, ventilator settings
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier data management system, which in turn connects to LIS/HIS	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No. type, ventilator settings data management system, which connects to LIS/HIS
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier data management system, which in turn connects to LIS/HIS ASTM 1394 & 1238, HL7, other	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No. type, ventilator settings data management system, which connects to LIS/HI ASTM 1394 & 1238, HL7, other
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier data management system, which in turn connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/900 hospitals installed; modem dial-in/25 hospitals	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No. type, ventilator settings data management system, which connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/700 hospitals installed; modem dial-in/2
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier data management system, which in turn connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/900 hospitals installed; modem dial-in/25 hospitals installed; hospital network/250 hospitals installed device unique indertifier accenter & exitent b contents	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No. type, ventilator settings data management system, which connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/700 hospitals installed; modem dial-in/2 hospital network/200 installed
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier data management system, which in turn connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/900 hospitals installed; modem dial-in/25 hospitals installed; hospital network/250 hospitals installed device unique identifier, operator & patient ID, result, QC identifier	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No. type, ventilator settings data management system, which connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/700 hospitals installed; modem dial-in/2 hospital network/200 installed device unique identifier, operator & patient ID, result identifier
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier data management system, which in turn connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/900 hospitals installed; modem dial-in/25 hospitals installed; hospital network/250 hospitals installed device unique identifier, operator & patient ID, result, QC identifier QC MGR 2.0/Precision Net/5x software/Central Data Station	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No. type, ventilator settings data management system, which connects to LIS/HE ASTM 1394 & 1238, HL7, other direct serial/700 hospitals installed; modem dial-in/7 hospital network/200 installed device unique identifier, operator & patient ID, result identifier QC MGR 2.0/Precision Net/Central Data Station 25.
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier data management system, which in turn connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/900 hospitals installed; modem dial-in/25 hospitals installed; hospital network/250 hospitals installed device unique identifier, operator & patient ID, result, QC identifier QC MGR 2.0/Precision Net/5x software/Central Data Station 35+ strip lot numbers, valid control values, valid operator IDs,	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No. type, ventilator settings data management system, which connects to LIS/HI ASTM 1394 & 1238, HL7, other direct serial/700 hospitals installed; modem dial-in/2 hospital network/200 installed device unique identifier, operator & patient ID, result identifier QC MGR 2.0/Precision Net/Central Data Station 35+
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier data management system, which in turn connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/900 hospitals installed; modem dial-in/25 hospitals installed; hospital network/250 hospitals installed device unique identifier, operator & patient ID, result, QC identifier QC MGR 2.0/Precision Net/5x software/Central Data Station 35+ strip lot numbers, valid control values, valid operator IDs, certification, analyzer location, lockouts, customized info	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No. type, ventilator settings data management system, which connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/700 hospitals installed; modem dial-in/2 hospital network/200 installed device unique identifier, operator & patient ID, result identifier QC MGR 2.0/Precision Net/Central Data Station 35+ —
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer System connected (live installations) to which LISs/HISs • using screen animation/screen scraping	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier data management system, which in turn connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/900 hospitals installed; modem dial-in/25 hospitals installed; hospital network/250 hospitals installed device unique identifier, operator & patient ID, result, QC identifier QC MGR 2.0/Precision Net/5x software/Central Data Station 35+ strip lot numbers, valid control values, valid operator IDs, certification, analyzer location, lockouts, customized info all major LIS vendors	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No. type, ventilator settings data management system, which connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/700 hospitals installed; modem dial-in/2 hospital network/200 installed device unique identifier, operator & patient ID, result identifier QC MGR 2.0/Precision Net/Central Data Station 35+ — all major LIS vendors
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer System connected (live installations) to which LISs/HISs • using screen animation/screen scraping • using standard HL7 interface • using proprietary protocol interface	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier data management system, which in turn connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/900 hospitals installed; modem dial-in/25 hospitals installed; hospital network/250 hospitals installed device unique identifier, operator & patient ID, result, QC identifier QC MGR 2.0/Precision Net/5x software/Central Data Station 35+ strip lot numbers, valid control values, valid operator IDs, certification, analyzer location, lockouts, customized info all major LIS vendors Cerner	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No. type, ventilator settings data management system, which connects to LIS/HI ASTM 1394 & 1238, HL7, other direct serial/700 hospitals installed; modem dial-in/2 hospital network/200 installed device unique identifier, operator & patient ID, result identifier QC MGR 2.0/Precision Net/Central Data Station 35+ — all major LIS vendors Cerner none
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer System connected (live installations) to which LISs/HISs • using screen animation/screen scraping • using standard HL7 interface • using proprietary protocol interface Use a third-party interfacing tool/engine for LIS/HIS interfaces	operator & patient identifier, reagent lot number, hospital specific information yes no/other device unique identifier, operator & patient ID, result, QC identifier data management system, which in turn connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/900 hospitals installed; modem dial-in/25 hospitals installed; hospital network/250 hospitals installed device unique identifier, operator & patient ID, result, QC identifier QC MGR 2.0/Precision Net/5x software/Central Data Station 35+ strip lot numbers, valid control values, valid operator IDs, certification, analyzer location, lockouts, customized info all major LIS vendors Cerner yes, Sybase	no bar-code scanner yes no/other patient data & results, date, time, analyzer serial No type, ventilator settings data management system, which connects to LIS/HIS ASTM 1394 & 1238, HL7, other direct serial/700 hospitals installed; modem dial-in/2 hospital network/200 installed device unique identifier, operator & patient ID, result identifier QC MGR 2.0/Precision Net/Central Data Station 35+ all major LIS vendors Cerner none none

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

Survey editor: Raymond D. Aller, MD

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In vitro blood gas analyzers		
Part 2 of 12		
	Bayer Corp., Diagnostics Division Kathleen Fallon kathleen.fallon.b@bayer.com	Instrumentation Laboratory Tim Lynch tlynch@ilww.com
2	Tarrytown, NY 10591	Lexington, MA 02421
See accompanying article on page 58	800-255-3232 www.bayerdiag.com	781-861-0/10 www.ilww.com
Name of device/first year sold No. of devices sold in U.S./outside U.S./list price	Rapidpoint 400/2001 n/a/n/a/\$38.000	Synthesis 10 & 15/1997 >100 worldwide/Synthesis 10: \$29.925. Synthesis
Dimensions (H x W x D)/weight	21.5 x 11.5 x 16 in/34 lbs	20 x 16 x 20 in/77 lbs
Analytes measured on device Parameters calculated on device	рн, рс0 ₂ , ро ₂ , нст, ма, к, ст, тса, giucose 0 ₂ SAT, BE, TCO ₂ , HCO ₃ -	pH, pU ₂ , pCU ₂ , Synthesis 15: 1Hb, U ₂ Hb, CUHb, Meth pH(T), pO ₂ (T), pCO ₂ (T), HCO ₃ -, SBC, TCO ₂ , Beb, BEec pAO ₂ , paO ₂ /pAO ₂ , RI, A-aDO ₂ , O ₂ cap, O ₂ ct, p50
Barometric pressure Analytical method(s)/technology(ies) employed	recorded pH, Na, Cl, iCa, K: potentiometry using ISE; pCO ₂ : potentiometry	tracking pH: potentiometry; pCO ₂ : Severinghaus electrode-v
	glucose: amperometric-glucose oxidase; Hct: conductivity	(Synthesis 15)
Device is part of a series of related models User list/group available	yes Yes	yes (Syntnesis family offering different analyte opt yes (through local sales representative)
Device warranty Loaner devices provided	1 yr yes	1 yr yes
Average expected life of device Open or closed system/external gas tanks required	5–7 yrs —/no	- 7–10 yrs closed/ves
For POC testing or laboratory	point-of-care testing	laboratory
POC: Uses disposable prepackaged reagent/electrode system for analysis	reagent/electrode (multiuse cartridge)	_
No. of disposable reagent system units in basic shipment package	1 measurement cartridge/3 waste/wash cartridges	Ξ
List price per disposable reagent system	\$3,500 safetoration	_
Shelf life of disposable units	reagent/electrode: 4 mos	_
Laboratory: No. of different disposable reagents required to maintain device	_	3
Max. No. specific analyte reagents that can reside in device at once Shelf life	_	reagent: 24 mos electrode: 4 mos_1 vr
Cost per test/reagent cost per test	_	\$.71/\$.73 @ 50 tests per day at list price/\$.24 @ 50 at list
Calibrations required	1 & 2 point (automatic) 1 point: 30 min: 2 point: 2 brs	1 & 2 point (automatic & manual) 1 point: after each sample, 2 point: every 2 hrs
Calibrants traceable to NIST standards	yes 1 lovel OC every 8 hrs testing, aqueous based	yes 1 lovel per 8 hrs. Il controls recommended
QC features	L-J plots, comparable plot, statistical calculations, monthly	L-J plots, QC tracking
Remote control of device from laboratory System can use LOINC to transmit results to LIS	cumulative reports (onboard & available with external system) yes ves	yes no
Detects clots within analysis chamber	yes	yes
Specimen types suitable for device Accentable anticoagulants	whole blood, capillary, mixed venous, arterial, venous benarin	w. blood, serum, plasma, capill., mixed ven., arterial, beparin
Sampling technique	aspiration	aspiration, injection, capillary
Sample size for complete panel of analyte results	100 μL	9es/yes 60 μL/100 μL
Sample size differs with No. of analytes selected Recommended collection device	no syringe or capillary tube	yes universal sampler accepts all devices
Provides for patient temperature corrected results Time from sample introduction to result availability	yes 60 sec	yes 60 sec
Max. No. of patient samples per hr/max. No. of measured parameters per hr	140/— 25	50/150–400
Calibration can be interrupted to perform stat sample	35 samples per hr yes	30 samples per hr yes
Contraindications	if calibration is interrupted repeatedly, it will force a mandatory calibration to be completed before sampling	none
Known interferences	benzalkonium	none
Sampler has self-wiping probe	yes	yes
Time required for maintenance by lab personnel Onboard diagnostics for troubleshooting/limited to software	maintenance free yes/no	monthly: 5 min yes/no
Diagnostics performed through modem Training & certification program for user	yes yes	yes yes (1 day on-site)
Method of analyst ID in system	password (customizable)	manual entry of ID & password (customizable)
Response for hardware & software failure/user ID & QC failure/ calibration & power failure	flag-prompt/user ID: customizable; QC: customizable-flag/cali- bration: flag–recalibration	operator warning, sampling lockout/user ID: no sys QC: channel flagged/calibration: no results for char automatic resultbration
Supports bar-code scanning of:	operator & patient ID, accession No., results, temperature, other information	operator & patient ID, QC values
User can search for and review previous patient results on screen Built-in printer/data port	yes ves/RS 232, ethernet	yes yes/4-RS 232, 1 parallel, standalone CO-ox port al
Information on hard copy report	operator & patient ID, accession No., results, temperature, other	keyboard port, bar-code reader port patient demographics, hospital name, results
Analyzar connects to	information	interfered direct with UIC/IIC on Immediate Orthog
Analyzer connects to	data management system, which connects to LIS/HIS; directly to LIS/HIS (both options) LIS 3	can be interfaced to HIS/LIS or Impact for Critical interfaced with LIS or Impact for Critical Corp. AST
To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system	direct serial, hospital network device unique identifier, operator & patient ID, result, OC	direct serial, modem dial-in, hospital network
Hardware/software for data management system	identifier HP platform/Windows NT_SOL server	Impact for Critical Care
No. of different management reports system produces		customizable
Contents downloaded from DMS to analyzer System connected (live installations) to which LISs/HISs	valid control values, valid operator IDs	patient ID, demographics
 using screen animation/screen scraping using standard HL7 interface 	 yes	none none
 using proprietary protocol interface Use a third-party interfacing tool/engine for LIS/HIS interfaces 	yes yes	none no
Distinguishing features	no maintenance, multiuse cartridge; fast time to patient results:	continuous calibration corrects every 3 seconds fo
	onboard audio-video training videos; auto QC	Clark & Severinghaus electrodes-ensures accurate before patient sampling; maintenance-free dispose trodes for convenience & system untime: integrate

INFER .			
In vit	In vitro blood gas analyzers		
Part 3 of 12	Instrumentation Laboratory Tim Lynch tlynch@ilww.com 101 Hartwell Ave. Lexington, MA 02421	Instrumentation Laboratory Tim Lynch tlynch@ilww.com 101 Hartwell Ave. Lexington. MA 02421	
See accompanying article on page 58	781-861-0710 www.ilww.com	781-861-0710 www.ilww.com	
Name of device/first year sold No. of devices sold in U.S./outside U.S./list price Dimensions (H x W x D)/weight	Synthesis 20 & 25/1997 >100 worldwide/Synthesis 20: \$38,325; Synthesis 25: \$48,300 20 x 16 x 20 in/77 lbs	Synthesis 30 & 35/1997 >100 worldwide/Synthesis 30: \$42,000; Synthesis 35: \$ 20 x 16 x 20 in/77 lbs	
Analytes measured on device Parameters calculated on device	pH, pO ₂ , pCO ₂ , Na+, K+, Ca++, Cl-; Synthesis 25: THb, O ₂ Hb, COHb, MetHb, RHb pH(T), pO ₂ (T), pCO ₂ (T), HCO ₃ -, SBC, TCO ₂ , Beb, BEecf, %sO ₂ c, pAO ₂ , paO ₂ /pAO ₂ , RI, A-aDO ₂ , anion gap, O ₂ cap, O ₂ ct, p50	pH, pO ₂ , pCO ₂ , Na, K+, Ca++, Cl-, glucose; Synthesis 35 O ₂ Hb, COHb, MetHb, RHb pH(T), pO ₂ (T), pCO ₂ (T), HCO ₃ -, SBC, TCO ₂ , Beb, BEecf, % pAO ₂ , paO ₂ /pAO ₂ , RI, A-aDO ₂ , anion gap, osmolality, O ₂ C p50	
Barometric pressure Analytical method(s)/technology(ies) employed	tracking pH: potentiometry; pCO ₂ : Severinghaus electrode-voltage; pO ₂ : Clark electrode-current; Hct: conductivity; Hb: nonhemolytic Hb	tracking pH: potentiometry; pCO ₂ : Severinghaus electrode-volta Clark electrode-current; Hct: conductivity; Hb: nonhem	
Device is part of a series of related models User list/group available Device warranty	absorption; Na, Cl, iCa, K: ISE yes (Synthesis family offering different analyte options) yes (through local sales representative) 1 yr	absorption; Na, Cl, iCa, K: ISE; glucose: enzymatic yes (Synthesis family offering different analyte options yes (through local sales representative) 1 yr	
Average expected life of device Open or closed system/external gas tanks required For POC testing or laboratory	yes 7–10 yrs closed/yes laboratory	yes 7–10 yrs closed/yes laboratory	
POC: Uses disposable prepackaged reagent/electrode system for analysis No. of disposable reagent system units in basic shipment package	Ξ	=	
List price per disposable reagent system Reagent unit storage requirements Shelf life of disposable units			
Laboratory: No. of different disposable reagents required to maintain device Max. No. specific analyte reagents that can reside in device at once	 12	<u></u> 12	
Cost per test/reagent cost per test	— \$.84/\$.86 @ 50 tests per day at list price/\$.24 @ 50 tests per day at list	— \$1.67/\$1.69 @ 50 tests per day at list price/\$.24 @ 50 t day at list price	
Calibrations required Calibration frequency Calibrants traceable to NIST standards Internal QC program recommended QC features	1 & 2 point (automatic & manual) 1 point: after each sample, 2 point: every 2 hrs yes 1 level per 8 hrs, IL controls recommended L-J plots, QC tracking	1 & 2 point (automatic & manual) 1 point: after each sample, 2 point: every 2 hrs yes 1 level per 8 hrs, IL controls recommended L-J plots, QC tracking	
Remote control of device from laboratory System can use LOINC to transmit results to LIS	yes no	yes no	
Detects clots within analysis chamber Specimen types suitable for device Acceptable anticoagulants Sampling technique Suitable for samples from well/sick neonates Sample size for complete panel of analyte results Sample size differs with No. of analytes selected Recommended collection device Provides for patient temperature corrected results Time from sample introduction to result availability Max. No. of patient samples per hr/max. No. of measured parameters per hr Optimal throughput when calibrated and awaiting specimens Calibration can be interrupted to perform stat sample Contraindications Known interferences	yes w. blood, serum, plasma, capill., mixed ven., arterial, ven., exp. gas heparin aspiration, injection, capillary yes/yes 80 μL/150 μL yes universal sampler accepts all devices yes 60 sec 50/350–600 30 samples per hr yes —	yes w. blood, serum, plasma, capill., mixed ven., arterial, ven heparin aspiration, injection, capillary yes/yes 80 μL/150 μL yes universal sampler accepts all devices yes 60 sec 40/280–480 30 samples per hr yes —	
Restrictions based on Hct Sampler has self-wiping probe	no yes	no yes	
Time required for maintenance by lab personnel Onboard diagnostics for troubleshooting/limited to software Diagnostics performed through modem Training & certification program for user	monthly: 5 min yes/no yes yes (1 day on-site)	monthly: 5 min yes/no yes yes (1 day on-site)	
Method of analyst ID in system Response for hardware & software failure/user ID & QC failure/ calibration & power failure	manual entry of ID & password (customizable) operator warning, sampling lockout/user ID: no system access, QC: channel flagged/calibration: no results for channel, power: automatic recalibration	manual entry of ID & password (customizable) operator warning, sampling lockout/user ID: no system QC: channel flagged/calibration: no results for channel automatic recalibration	
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report	operator & patient IDs, QC values yes yes/4-RS 232, 1 parallel, standalone co-ox port, alphanumeric keyboard port, bar-code reader port patient demographics, hospital name, results	operator & patient IDs, QC values yes yes/4-RS 232, 1 parallel, standalone co-ox port, alphan keyboard port, bar-code reader port patient demographics, hospital name, results	
Analyzer connects to Interface standards supported	interfaced direct with HIS/LIS or Impact for Critical Care, which can be interfaced to HIS/LIS interfaced with LIS or Impact for Critical Care, ASTM protocol	interfaced direct with HIS/LIS or Impact for Critical Car can be interfaced to HIS/LIS interfaced with LIS or Impact for Critical Care, ASTM p	
To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer System connected (live installations) to which LISs/HISs • using screen animation/screen scraning	direct serial, modem dial-in, hospital network device identifier, operator & patient ID, result, QC ID Impact for Critical Care customizable patient ID, demographics none	direct serial, modem dial-in, hospital network device identifier, operator & patient ID, result, QC ID Impact for Critical Care customizable patient ID, demographics none	
using standard HL7 interface using proprietary protocol interface Use a third-party interfacing tool/engine for LIS/HIS interfaces	none none no	none none no	
Distinguishing features	continuous calibration corrects every 3 seconds for drift seen in Clark & Severinghaus electrodes-ensures accurate results before patient sampling; maintenance-free disposable elec- trodes for convenience & system uptime; integrated co-oximeter uses no extra reagent & minimizes maintenance	continuous calibration corrects every 3 seconds for dri Clark & Severinghaus electrodes–ensures accurate res before patient sampling; maintenance-free disposable trodes for convenience & system uptime; integrated co uses no extra reagent & minimizes maintenance	

In vitro blood gas analyzers

INFE		
In vitro blood gas analyzers		
Part 4 of 12	.	
	Instrumentation Laboratory Tim Lynch tlynch@ilww.com	Instrumentation Laboratory Patti Eames peames@ilww.com
	101 Hartwell Ave. Lexington, MA 02421	101 Hartwell Ave. Lexington, MA 02421
See accompanying article on page 58	781-861-0710 www.ilww.com	781-861-0710 www.ilww.com
Name of device/first year sold No. of devices sold in U.S./outside U.S./list price	Synthesis 40 & 45/1999 n/a/Synthesis 40: \$48,300; Synthesis 45: \$60,375	Gem Premier 3000/2000 —/—/\$39,995
Dimensions (H x W x D)/weight	20 x 16 x 20 in/77 lbs	17 x 12 x 12 in/29.5 lbs
Analytes measured on device	pH, pO ₂ , pCO ₂ , Na+, K+, Ca++, Cl-, glucose, lactate; Synthesis 45: THb, O ₂ Hb, COHb, MetHb, RHb	pH, pO ₂ , pCO ₂ , Hct, Na+, K+, Ca++, glucose, lactate
Parameters calculated on device	pH(T), pO ₂ (T), pCO ₂ (T), HCO ₃ -, SBC, TCO ₂ , Beb, BEecf, %sO ₂ c, pAO ₂ , paO ₂ /pAO ₂ , RI, A-aDO ₂ , anion gap, osmolality, O ₂ cap, O ₂ ct, p50	0 ₂ SAT, BE, TCO ₂ , HCO ₃ -, Ca++ (7.4)
Barometric pressure	tracking	n/a
Analytical method(s)/technology(les) employed	pH: potentiometry; pCO_2 : Severinghaus electrode-voltage; pO_2 : Clark electrode-current; Hct: conductivity; Hb: nonhemolytic Hb	pH, pCO ₂ : potentiometry; pO ₂ , glucose, lactate: am Hct: conductivity; Na, iCa, K: ISE
Device is part of a series of related models	absorption; Na, Cl, ICa, K: ISE; glucose, lactate: enzymatic yes (Synthesis family offering different analyte options)	yes
User list/group available Device warranty	yes (through local sales representative) 1 yr	yes (through local sales representative) 5 yrs
Loaner devices provided Average expected life of device	yes 7–10 yrs	yes 7–10 yrs
Open or closed system/external gas tanks required For POC testing or laboratory	closed/yes laboratory	closed/no POC & laboratory
POC:		. 55 & laboratory
Uses disposable prepackaged reagent/electrode system for analysis	Ξ	reagent/electrode (multiuse cartridge) 2 per pack
No. of samples analyzed per 1 disposable reagent/electrode system	_	75-, 150-, 300-, & 450-test cartridge
List price per oisposable reagent system Reagent unit storage requirements	_	varies with size & menu room temperature
Shelf life of disposable units		6 mos
Laboratory: No. of different disposable reagents required to maintain device	_	0
Max. No. specific analyte reagents that can reside in device at once Shelf life	13	1 multiuse cartridge 6 mos
Cost per test/reagent cost per test	TBD/\$.24 @ 50 tests per day at list price	varies with size & menu
Calibrations required	1 & 2 point (automatic & manual)	1 & 2 point (automatic & manual)
Calibration frequency Calibrants traceable to NIST standards	1 point: after each sample, 2 point: every 2 hrs yes	 yes
Internal QC program recommended QC features	1 level per 8 hrs, IL controls recommended L-J plots. OC tracking	1 level per 8 hrs, IL controls recommended bar-code identification of OC material. QC statistics
Remote control of device from laboratory	ves	scheduling, QC lockout ves
System can use LOINC to transmit results to LIS	no	no
Detects clots within analysis chamber Specimen types suitable for device	yes w. blood, serum, plasma, capill., mixed ven., arterial, ven., exp. gas	yes whole blood, capill., arterial, venous with lithium h
Acceptable anticoagulants Sampling technique	heparin aspiration injection capillary	heparin aspiration
Suitable for samples from well/sick neonates	yes/yes	yes/yes
Sample size for complete panel of analyte results Sample size differs with No. of analytes selected	95 μL/165 μL yes	135–150 μL no
Recommended collection device Provides for patient temperature corrected results	universal sampler accepts all devices ves	
Time from sample introduction to result availability	60 sec 40/220 520	<100 sec
Optimal throughput when calibrated and awaiting specimens	40/320–520 30 samples per hr	15/135 15 samples
Calibration can be interrupted to perform stat sample Contraindications	yes —	yes —
Known interferences Restrictions based on Hct	no	no
Jampier has sen-wiphing prove	yes Monthly: 5 min	disposable cartridge/no maintenance required
Onboard diagnostics for troubleshooting/limited to software	Yes/no Yes	yes/no po
Training & certification program for user	Yes (1 day on-site)	yes
Method of analyst ID in system Response for hardware & software failure/user ID & QC failure/	manual entry of ID & password (customizable) operator warning, sampling lockout/user ID: no system access,	manual or bar-code wand entry of ID & password (operator warning, sampling lockout/user ID: no sys
calibration & power failure	UC: channel flagged/calibration: no results for channel, power: automatic recalibration	uc: channel flagged/calibration: no results for chan automatic recalibration
Supports bar-code scanning of: User can search for and review previous patient results on screen	operator & patient IDs, QC values yes	operator & patient IDs, QC values yes
Built-in printer/data port	yes/4-RS 232, 1 parallel, standalone co-ox port, alphanumeric keyboard nort, har-code reader port	yes/3-RS 232, 1 parallel, bar-code reader port, ethe
Information on hard copy report	patient demographics, hospital name, results	patient demographics, hospital name and address,
Analyzer connects to	interfaced direct with HIS/LIS or Impact for Critical Care, which can be interfaced to HIS/LIS	interfaced direct with LIS/HIS or Impact for Critical can be interfaced to HIS/LIS
Interrace standards supported	Interfaced with LIS or Impact for Critical Care, ASTM protocol	Interfaced with LIS or Impact for Critical Care, AST
IO UPIOAD PATIENT & UC results, how analyzer connects to external system Information included in transmission from analyzer to external system	airect seriai, modem dial-in, hospital network device identifier, operator & patient IDs, result, QC ID	airect serial, modem dial-in, hospital network device identifier, operator & patient IDs, result, QC
Hardware/software for data management system No. of different management reports system produces	Impact for Critical Care customizable	Impact for Critical Care customizable
Contents downloaded from DMS to analyzer	patient ID, demographics	patient ID, demographics
using screen animation/screen scraping	none	none
using standard HL/ Interface using proprietary protocol interface	none	none
Use a third-party interfacing tool/engine for LIS/HIS interfaces	no	no
Distinguishing features	continuous calibration corrects every 3 seconds for drift seen in Clark & Severinghaus electrodes_ensures accurate results	maintenance-free multiuse cartridge used through
	olark & Severinghaus electroues-clisures accurate results	cifical care rearing, proven dependance recimolog

lo vi	tro blood aas analyzo	ro
	li o bioou yas anaiyze	13
Part 5 of 12	Instrumentation Laboratory	Medica Corp.
	Patti Eames peames@ilww.com 101 Hartwell Ave	Leslie Boone Iboone@medicacorp.com 14 DeAngelo Dr.
	Lexington, MA 02421	Bedford, MA 01730
See accompanying article on page 58	781-861-0710 www.ilww.com	800-777-5983 www.medicacorp.com
Name of device/first year sold	Gem 3100/2000	EasyBloodGas/2000
No. of devices sold in U.S./outside U.S./list price	-/-/-	<500/>500/\$10,500
	22 X 12 X 12 III/31.3 IUS	14.5 X 12.5 X / 111/16 IUS
Analytes measured on device	pH, pO ₂ , pCO ₂ , Hct, Na+, K+, Ca++, glucose, lactate: PT, APTT, ACT. ACT-LR	рН, рО ₂ , рСО ₂
Parameters calculated on device	0 ₂ SAT, BE, TCO ₂ , HCO ₃ -, Ca++ (7.4)	0_2 SAT, BE, TC 0_2 , HC 0_3 -
Barometric pressure Analytical method(s)/technology(ies) employed	n/a pH, pCO ₂ ; potentiometry; pO ₂ , glucose, lactate; amperometry;	pH: ISE: pO ₂ : ISE: pCO ₂ : ISE
	Hct: conductivity; Na, iCa, K: ISE; PT, APTT, ACT, ACT-LR:	
Device is part of a series of related models	yes	yes (EasyElectrolytes)
User list/group available	yes (through local sales representative)	yes (through individual dealers)
Loaner devices provided	yes	yes
Average expected life of device Open or closed system/external gas tanks required	7–10 yrs closed/no	>5 yrs closed/no
For POC testing or laboratory	POC & laboratory	laboratory
POC:		
No. of disposable reagent system units in basic shipment package	reagent/electrode (multiuse cartridge); single-use coag. cartridge 2 per pack	_/_ _
No. of samples analyzed per 1 disposable reagent/electrode system	cartridges available: 75-, 150-, 300-, & 450-test cartridge, 1	—
List price per disposable reagent system	coagulation tests per cart.: PT: \$6, APTT: \$8, ACT: \$4, ACT-LR: \$4.50	_
Reagent unit storage requirements	room temperature	_
No. of different disposable reagents required to maintain device	0	1
Max. No. specific analyte reagents that can reside in device at once Shelf life	2:1 for blood gas/electrolytes, 1 for coagulation 6 mos	1 reagent & electrode: 1 vr: membrane kit: n/a, dispo
Cost nor tost/reasont cost nor tost	varias with many 9 sartridge size	electrodes; cartridge: n/a
Calibrations required Calibration frequency	1 & 2 point (automatic & manual) 	1 & 2 point (automatic) 1 point: during each sample analysis; 2 point: can b
Calibrante traccable to NICT standards	Voc	8 hr increments
Internal QC program recommended	yes 1 level per 8 hrs, IL controls recommended	— 1 level per 8 hrs, Medica controls recommended
QC features	bar-code identification of QC material, electronic & liquid QC	L-J plots; monthly cumulative reports
Remote control of device from laboratory	yes	no
System can use LOINC to transmit results to LIS	no	no
Detects clots within analysis chamber	yes	yes
Acceptable anticoagulants	heparin, fresh whole blood for coagulation tests	whole blood, capillary, mixed venous, arterial heparin
Sampling technique	aspiration	aspiration
Suitable for samples from well/sick neonates Sample size for complete namel of analyte results	yes/yes 135–150 ul _50 ul for coagulation	yes/yes 75 ul capillary, 100 ul svringe
Sample size differs with No. of analytes selected	no	no
Recommended collection device Provides for national temperature corrected results	 V95	syringe or capillary, heparinized
Time from sample introduction to result availability	<100 sec; under 5 min for coagulation	125 sec, includes 1-point calibration
Max. No. of patient samples per hr/max. No. of measured parameters per hr	15/135	25/75
Calibration can be interrupted to perform stat sample	ves	25 Ves
Contraindications	<u> </u>	no
Known interferences Restrictions based on Hct	 no	incorrect anticoagulant
Sampler has self-wiping probe	yes	yes
Time required for maintenance by lab personnel	no operator involvement	daily: 0.5 min; weekly: 3.5 min; monthly: 15 min
Onboard diagnostics for troubleshooting/limited to software	yes/no	yes/no
Diagnostics performed through modem	no	no (i)
Iraining & certification program for user	yes	yes (through distributors)
Method of analyst ID in system	manual or bar-code wand entry of ID & password (customizable)	manual or bar-code wand for ID entry
Response for hardware & software failure/user ID & QC failure/ calibration & power failure	operator warning, sampling lockout/user ID: no system access, OC: channel flagged/calibration: no results for channel, nower	SW displays error/prevents use until corrected/wat SW lockout, displays error, prevents use until corre
	automatic recalibration	tion: SW lockout, displays error, prevents use until
Sunnorts har-code scanning of	operator & nation ID_OC values	power: no data lost, auto reset, will need to be reca

operator & patient ID, reagent lot number, QC control, reagent pack automatically read when reagent module installed

User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report	yes yes/2-RS 232, 1 parallel, bar-code reader port, ethernet port patient demographics, hospital name, results	yes yes/RS 232 patient information; measured parameters: pH, pCO ₂ , pO ₂ ; 11 calculated parameters
Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer System connected (live installations) to which LISs/HISs • using screen animation/screen scraping • using standard HL7 interface	interfaced direct with HIS/LIS or IMPACT for Critical Care, which can be interfaced to HIS/LIS interfaced with LIS or IMPACT for Critical Care, ASTM protocol direct serial, modem dial-in, hospital network device identifier, operator & patient ID, result, QC ID Impact for Critical Care customizable patient ID, demographics none none	data management system, which in turn connects to LIS/HIS — direct serial patient ID, result internal QC, L-J, patient reports valid control values, valid operator IDs, ranges, patient IDs —
Use a third-party interfacing tool/engine for LIS/HIS interfaces	no	TBD
Distinguishing features	maintenance-free multiuse cartridges used in >100,000 open- heart surgery cases annually; dependability of being the pioneer in cartridge-based blood gas systems for >10 yrs; only system that provides consolidated workstation for blood gases, electrolytes, glucose, lactate, Hct, coagulation	all components are modular; the analyzer can be repaired and maintained by anyone; due to its modularity, replacement parts are easy to install; no need for a service contract

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In vit	tro blood gas analyze	rs
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Part 6 of 12	Nova Biomedical	Nova Biomedical
Con anomina	200 Prospect St.	200 Prospect St.
See accompanying article on page 58	Waltham, MA 02454-9141 800-458-5813	Waltham, MA 02454-9141 800-458-5813
Name of device/first year sold	Stat Profile M/1998	Stat Profile pH0x/1998
No. of devices sold in U.S./outside U.S./list price Dimensions (H x W x D)/weight	—/—/\$52,000 18.5 x 22.25 x 19 in/70 lbs	—/—/\$15,000 15 x 12 x 15 in/18 lbs
Analytes measured on device	nH, pCQ,, pQ,, Hot Hb, Na, K, Cl, iCa, iMg, lactate, glucose, BUN,	nH. nCO., nO., Het. Hb. O.SAT
	02SAT	PE TCO UCO
Barometric pressure	tracked	tracked
Analytical method(s)/technology(ies) employed	Na, Cl, iCa, iMg, pH, K: direct ISE; pCO ₂ : potentiometry; pO ₂ : amperometry, Hct: conductivity; Hb: optical–reflectance; lactate,	pH: direct ISE; pCO ₂ : potentiometry; pO ₂ : amperomet conductivity; Hb & SO ₂ %: optical–reflectance
Device is part of a series of related models	glucose: enzyme/amperometric; BUN: enzyme/ISE	Ves
User list/group available	yes (upon request)	yes (upon request)
Device warranty Loaner devices provided	1 yr, travel & labor, repair or replacement yes	1 yr, travel & labor, repair or replacement yes
Average expected life of device Onen or closed system/external gas tanks required	5–7 yrs closed/yes	5–7 yrs closed/no
For POC testing or laboratory	POC & laboratory	POC & laboratory
POC:		
Uses disposable prepackaged reagent/electrode system for analysis No. of disposable reagent system units in basic shipment package	reagent 200–500 analyses	reagent 200–500 analyses
No. of samples analyzed per 1 disposable reagent/electrode system List price per disposable reagent system	n/a \$148–\$221	n/a \$200–\$265
Reagent unit storage requirements	room temperature	room temperature
	reagents. To mos room temperature, electrodes, up to to mos	reagents. To mos room temperature, electrodes, up i
Laboratory: No. of different disposable reagents required to maintain device	1	1
Max. No. specific analyte reagents that can reside in device at once Shelf life	1 reagents & electrodes: 18 mos; membrane kits: 12–24 mos	1 reagents & electrodes: 18 mos; membrane kits: 12–2
Cost per test/reagent cost per test	<\$.07 at 35 analyses per day/<\$.03 at 35 analyses per day	<\$.11 at 35 analyses per day/<\$.08 at 35 analyses p
Calibrations required	1 & 2 point (automatic) 1 point: 30 or 45 min (user selectable), 2 point: 2, 4, or 6 br (user	1 & 2 point (automatic) 1 point: 30 or 45 min or with every sample (user sele
	defined)	2 point: 2, 4, or 6 hr (user defined)
Calibrants traceable to NIST standards Internal QC program recommended	yes min. CLIA recommendations	yes min. CLIA recommendations
QC features	L-J plots, statistical calcs., monthly cum. report (onboard, more extensive reporting avail. with Nova Patient Data Manager)	L-J plots, statistical calcs., monthly cum. report (onl extensive reporting avail, with Nova Patient Data Ma
Remote control of device from laboratory System can use LOINC to transmit results to LIS	no c , c , c , c , no , c , c , c , c , c , c , c , c , c ,	yes no
Datacte clots within analysis chamber	Vas	vee
Specimen types suitable for device	plasma, serum, whole blood, capill., mixed venous, arterial, venous	whole blood, capillary, mixed venous, arterial, venou
Acceptable anticoagulants Sampling technique	heparin aspiration & capillary	heparin aspiration & capillary
Suitable for samples from well/sick neonates Sample size for complete panel of analyte results	yes/yes 195 uL	yes/yes 70 uL
Sample size differs with No. of analytes selected	yes, Profile M offers micropanel; standard 12-test micropanel	yes, pHOx offers micropanel; standard 3-test micropanel
Recommended collection device	syringe, capill., microcollect. containers, standard vacuum cont.	syringe, capill., microcollect. containers, standard va
Provides for patient temperature corrected results Time from sample introduction to result availability	yes 1.2 min–2.5 min	yes 45 sec
Max. No. of patient samples per hr/max. No. of measured parameters per hr	35/490 tests	50/300 tests
Calibration can be interrupted to perform stat sample	yes	yes
Contraindications Known interferences	none not reported	none none
Restrictions based on Hct	no	no
	yes	ycs
Onboard diagnostics for troubleshooting/limited to software	weekly: <5 min, monthly: <15 min yes/no	weekiy: <5 min, montniy: <10 min yes/no
Diagnostics performed through modem Training & certification program for user	yes ves (on-site)	yes ves (on-site)
Mathod of analyst ID in system	nassword with unique user ID No. (ontional)	password with unique user ID No. (ontional)
Response for hardware & software failure/user ID & QC failure/	self-diag. SW informs & notifies oper. of HW failure; hotline & field	self-diag. SW informs & notifies oper. of HW failure; hot
calibration & power failure	support depending on problem/optional lockout w/o user ID; options for QC failure range from flagging to not reporting test that fails QC to	support depending on problem/optional lockout w/o u for QC failure range from flagging to not reporting test
	lockout for QC failure or exceeding scheduled QC interval/ any test that does not calibrate will not report results & instrument potifies	lockout for QC failure or exceeding scheduled QC interv that does not calibrate will not report results & instrum
	oper. of reason for failure; momentary power interrupts require no	oper. of reason for failure; momentary power interrupts
Supports bar-code scanning of:	patient identifier	patient identifier
User can search for and review previous patient results on screen Built-in printer/data port	yes ves/multiple RS 232	yes ves/multiple RS 232
Information on hard copy report	patient ID with access. No., entered settings, meas. & calc. results	patient ID w/ access. No., entered settings, meas. &
Analyzer connects to	data management system &/or directly to LIS/HIS	data management system &/or directly to LIS/HIS
To upload patient & QC results, how analyzer connects to external system	direct serial/>500 hospitals installed; hospital network/>100	direct serial/>500 hospitals installed; hospital netwo
Information included in transmission from analyzer to external system	installed device unique identifier, operator & patient IDs, result, OC	installed device unique identifier, operator & patient IDs, resu
Hardwara/aaftwara far data managament avatam	identifier, accession No. Bentium with Microsoft Windows 2000 Neve Patient Date Manager	identifier, accession No. Bentium with Microsoft Windows 2000/Neve Petient D
No. of different management reports system produces	>60	>60
Contents downloaded from DMS to analyzer System connected (live installations) to which LISs/HISs	n/a	yes, patient name, passwords
using screen animation/screen scraping using standard HI 7 interface	>20	>20
using proprietary protocol interface	>500	>500
Use a third-party interfacing tool/engine for LIS/HIS interfaces	yes	yes
Distinguishing features	broad critical care test menu—user can select up to 14 meas. tests on one system; only critical care analyzer offering these diagnostic tests.	onboard QC cartridge provides sufficient QC materi day auto QC analysis; no external gas tanks (suppli
	iMg-unique test offered; "remote review" of patient results prior to	calibrations incorporated into single reagent cartrid
	results reporting: lining automated test ordering accessioning a ma	CONECT. SISO INCORDORATED F. INFITTURE PRO AVAILABLE OF

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JTN .		
In vit	ro blood gas analyze	rs
Part 7 of 12	Nova Biomedical	Nova Biomedical
	200 Prospect St.	200 Prospect St.
See accompanying article on page 58	Waltham, MA 02454-9141 800-458-5813	Waltham, MA 02454-9141 800-458-5813
Name of device/first year sold	Stat Profile M7/1999	Stat Profile pH0x Plus/2000; Stat Profile pH0x Plus I
No. of devices sold in U.S./outside U.S./list price Dimensions (H x W x D)/weight	—/—/\$52,000 18.5 x 22.25 x 19 in/70 lbs	pHO Plus: —/—/\$29,000; pHOx Plus L: —/—/\$32,00 15 x 12 x 15 in/18 lbs
Analytes measured on device	pH, pCO ₂ , pO ₂ , Hct, Hb, Na, K, Cl, iCa, creatinine, lactate, glucose,	pH, pCO ₂ , pO ₂ , Hct, Hb, O ₂ SAT, Na, K, Cl or iCa, gluco
Parameters calculated on device	BON, 0_2 SAT BE, TCO ₂ , HCO ₃ -	BE, TCO ₂ , HCO ₃ -; pHOx Plus L: Hb, HCT, BE, TCO ₂ , HC
Barometric pressure Analytical method(s)/technology(ies) employed	tracked Na, CI, iCa, pH, K: direct ISE; pCO2: potentiometry; pO2: amper-	tracked pH: direct ISE; pCO ₂ : potentiometry; pO ₂ : amperome
	ometry, Hct: conductivity; Hb: optical-reflectance; lactate,	conductivity; Hb & SO ₂ %: optical-reflectance; Na, K
Device is part of a series of related models	yes, user configurable; max. tests: 14	yes
User list/group available Device warranty	yes (upon request) 1 yr, travel & labor, repair or replacement	yes (upon request) 1 yr, travel & labor, repair or replacement
Loaner devices provided Average expected life of device	yes 5–7 vrs	yes 5–7 vrs
Open or closed system/external gas tanks required	closed/yes	closed/no
For POC testing or laboratory	POC & laboratory	POC & laboratory
POC: Uses disposable prepackaged reagent/electrode system for analysis	reagent	reagent
No. of disposable reagent system units in basic shipment package No. of samples analyzed per 1 disposable reagent/electrode system	200–500 analyses n/a	200–500 analyses n/a
List price per disposable reagent system	\$185	\$210-\$275
Reagent unit storage requirements Shelf life of disposable units	room temperature reagents: 18 mos room temperature, electrodes: up to 18 mos	room temperature reagents: 18 mos room temperature, electrodes: up
Laboratory:	1	1
No. of different disposable reagents required to maintain device Max. No. specific analyte reagents that can reside in device at once	1 1	1
Shelf life Cost per test/reagent cost per test	reagents & electrodes: 18 mos; membrane kits: 12–24 mos <\$.07 at 35 analyses per day/<\$.03 at 35 analyses per day	reagents & electrodes: 18 mos; membrane kits: 12- <\$.11 at 35 analyses per day/<\$.08 at 35 analyses p
Calibrations required	1 & 2 point (automatic)	1 & 2 point (automatic)
Calibration frequency	1 point: 30 or 45 min (user selectable), 2 point: 2, 4, or 6 hr (user defined)	1 point: 30 or 45 min or with every sample (user sele 2 point: 2, 4, or 6 hr (user defined)
Calibrants traceable to NIST standards	yes	yes min CLIA recommendations
QC features	L-J plots, statistical calcs., monthly cum. report (onboard, more	L-J plots, statistical calcs., monthly cum. report (on
Remote control of device from laboratory	extensive reporting avail. with Nova Patient Data Manager) no	extensive reporting avail. with Nova Patient Data Ma no
System can use LOINC to transmit results to LIS	no	no
Detects clots within analysis chamber Specimen types suitable for device	yes plasma, serum, whole blood, capill., mixed venous, arterial, venous	yes whole blood, capillary, mixed venous, arterial, venous
Acceptable anticoagulants	heparin	can accommodate preceding specimens as well as se heparin
Sampling technique	aspiration & capillary	aspiration & capillary
Sample size for complete panel of analyte results	965/965 195 μL	yes/yes 110 μL
Sample size differs with No. of analytes selected Recommended collection device	yes, M7 offers micropanel; standard 14-test micropanel req., 150 µL svringe, capill., microcollect, containers, standard vacuum cont.	yes, pHOx offers micropanel; standard 3-test micropanel; standard 3-test micropanel; svringe, capill., microcollect, containers, standard y
Provides for patient temperature corrected results	yes	yes
Ime from sample introduction to result availability Max. No. of patient samples per hr/max. No. of measured parameters per hr	1.2 min–2.5 min 35/490 tests	45 sec 50/500 tests
Optimal throughput when calibrated and awaiting specimens Calibration can be interrupted to perform stat cample	490–552 tests per hr	300 tests per hr
Contraindications	none	none
Known interferences Restrictions based on Hct	not reported no	none no
Sampler has self-wiping probe	yes	yes
Time required for maintenance by lab personnel	weekly: <5 min, monthly: <15 min	weekly: <5 min, monthly: <10 min
Diagnostics performed through modem	yes/no yes	yes/no yes
Training & certification program for user	yes (on-site)	yes (on-site)
Method of analyst ID in system Response for hardware & software failure/user ID & OC failure/	password with unique user ID No. (optional) self-diag, softw. informs & patifies oper of bardw failure: boting ?	password with unique user ID No. (optional) self-diag, softw. informs & notifies oner of bardw. failu
calibration & power failure	field support depending on problem/optional lockout w/o user ID;	field support depending on problem/optional lockout v
	options for QC failure range from flagging to not reporting test that fails QC to lockout for QC failure or exceeding scheduled OC interval/	options for QC failure range from flagging to not report fails QC to lockout for QC failure or exceeding schedule
	any test that does not calibrate will not report results & instrument	any test that does not calibrate will not report results &
	require no recover-extended power failure results in automatic calib.	require no recover–extended power failure results in a
Sunnorts har-code scanning of	patient identifier	patient identifier ves
User can search for and review previous patient results on screen	100	/ U. I. DO 000
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report	yes/multiple RS 232 patient ID with access. No., entered settings. meas, & calc. results	patient ID w/ access. No., entered settings. meas. &
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report	yes/multiple RS 232 patient ID with access. No., entered settings, meas. & calc. results data management system &/or directly to LIS/HIS	yes/multiple RS 232 patient ID w/ access. No., entered settings, meas. & data management system &/or directly to LIS/HIS
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & OC results, how analyzer connects to external system	yes/multiple RS 232 patient ID with access. No., entered settings, meas. & calc. results data management system &/or directly to LIS/HIS ASTM E1381-91 (HL7 available with external device) direct serial/>500 hospitals installed: hospital network/>100 inst	yes/multiple KS 232 patient ID w/ access. No., entered settings, meas. 8 data management system &/or directly to LIS/HIS ASTM E1381-91 (HL7 available with external device direct serial/>500 hospitals inst - hospital network/
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system	yes/multiple RS 232 patient ID with access. No., entered settings, meas. & calc. results data management system &/or directly to LIS/HIS ASTM E1381-91 (HL7 available with external device) direct serial/>500 hospitals installed; hospital network/>100 inst. device unique identifier, operator & patient IDs, result, QC	data management system &/or directly to LIS/HIS ASTM E1381-91 (HL7 available with external device direct serial/>500 hospitals inst.; hospital network/ device unique identifier, operator & patient IDs, res
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Dimensional and a transmission of a structure statuse of a structure structure stru	Name of device/first year sold	IRMA Blood Analysis System/1994	ABL 5/1994	
Another measure of order pt of pt (pt) pt (t, t, t	Dimensions (H x W x D)/weight	//varies based on quantity 11.5 x 9.5 x 5 in/5 lbs, 4 oz		
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License operation of a decision increases of the sector of	User list/group available Device warranty	list of customers available 1 vr	yes (through local sales representative) 1 vr. narts. labor. & travel	
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For CD testing or theoretary page to be care testing PO or an iboxistry Dec. The origination of the set set in the set se	Open or closed system/external gas tanks required	/ yrs closed/no	20 yrs with tun support closed/yes (NIST traceable gases)	
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No. of alignment respect spectral properties within the state signal properties of spectral propertical properime properties of spectral properties of spectral	POC: Uses disposable prepackaged reagent/electrode system for analysis	reagent/electrode (single use and multiuse cartridge available)	_	
Both of analysis larged part indexide part indexi	No. of disposable reagent system units in basic shipment package	25	—	
Respect unit storage equipements	No. of samples analyzed per 1 disposable reagent/electrode system List price per disposable reagent system	1 varies based on quantity	_	
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In. or of different disposable respects required to maintain drives Max. Ms. specific lands in anyles appends that is a point (automatic) appendix appendix point of the appendix point appendix point of the appendix point of the	Laboratory:	-		
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Dot per test/segant cont per test	Max. No. specific analyte reagents that can reside in device at once Shelf life	-	4 reagent, electrode, membrane kit, cartridge: 2+ yrs	
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Collinates transable (not standards) Ves	Calibrations required	2 point (automatic)	1 & 2 point (automatic) 1 point: 1/2 br—CLIA setting, 4 brs—mftr.; 2 point;	
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OC features L-J plots, statisfied calculations, monthly cumulative reports statisfied calculations (available with extend is (willable with extend is press Renote cortic of device from laboratory System con use LOMC is transmit results to LS mo yes yes Detects close within analysis chamber System con use LOMC is transmit results to LS mo yes yes Acceptable anticogenization Samples from with/s consults mo mo yes yes System con use LOMC is transmit results to LS mo mo mo yes System con use LOMC is transmit results to LS mo mo mo yes System con use LOMC is transmit results to LS The form system con use LOMC is transmit results to LS yes yes System con use LOMC is transmit results to LS The form system con use LOMC is transmit results to LS yes yes yes System con use LOMC is transmit results to LS transmit LS yes yes yes System con use LOMC is transmit results to LS transmit RS yes yes yes System con use LOMC is transmit results to LS transmit RS yes yes yes yes	Internal QC program recommended	electronic QC per 8 hrs patient testing, 2 iiquid qu per cartridge shipment	depends on hospital management & inspection age	
Remote control of device from laboratory yes Detects click within analysis chamber Spectrum types suitable for device yes yes Detects click within analysis chamber Spectrum types suitable for device yes yes Acceptable attractions types suitable for device whole blood, capillary, mixed wnows, arbiral, venous yes Simple size for complete panel of analyte results types/se yes Simple size for complete panel of analyte results types/se Simple size for complete panel of analyte results Time from sample size for complete panel of analyte results types/se Simple size for complete panel of analyte results Time from sample size for complete panel of analyte results types/se Simple size for complete panel of analyte results types/se Time from sample size for complete panel of analyte results types/se Simple size for complete panel of analyte results types/se Dynant throught with cellstrated analyse size tor complete panel of analyte results types/se Simple size for complete panel of analyte results types/se 20120 3039 3049 3049 3049 3049 Time from sample hordical on analyte result washing spectre non non non <td>QC features</td> <td>L-J plots, statistical calculations, monthly cumulative reports (available with external system)</td> <td>statistical calculations (available with external sys</td>	QC features	L-J plots, statistical calculations, monthly cumulative reports (available with external system)	statistical calculations (available with external sys	
System Call Biol rec production System Call Biol momental Biological Biologicenestes and Biological Biological Biological Biological	Remote control of device from laboratory	yes	yes	
Speciment byte suitable for senseInterfaceProvidesAcceptable anticoagulantshepparin, EDTA (glucase strip only)hepparin, balanced hepparinSamples for complete pard of analyte resultshepparin, EDTA (glucase strip only)hepparin, balanced hepparinSuitable for samples for ongoing pard of analyte resultshepparin, EDTA (glucase strip only)hepparin, balanced hepparinSuitable for samples for complete pard of analyte resultsyesyesSomposition scienceyesyesProvides for particit temperature concreted resultsyesyesThe from sample introduction to result availabilityyesyesAcceptable anticoagulantiadvanture science30/90<	Detects clots within analysis chamber	no_eamnle nath visible	y65	
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Sampling technique approximate <	Acceptable anticoagulants	heparin, EDTA (glucose strip only)	heparin, balanced heparin	
Sample size for complete panel of analyte seatch125 µL capillary, 200 µL syringe85 µLSample size for complete panel of analyte seatch125 µL capillary, 200 µL syringe95 µLRecommended collection device94 standard blod gas syringe95 µLProvides for panel state temperature corrected results22 µL and 22 µL a	Sampling technique Suitable for samples from well/sick neonates	injection yes/yes	aspiration yes/yes	
Recommended collection device standard blood gas syringe syringe or capillary Provides for patient tamperature corrected results -2 min -1 min The form sample introduction to result valiability yes 30.90 Calibration corrected results -2 min -1 min Max. No. of patient samples profile -1 min -1 min Max. No. of patient samples profile -1 min -1 min Contraindications none -1 min Known interfreetice - - haldtane Contraindications - none - None interfreetice - - haldtane None interfreetice - - - None required for maintenance by lab personnel - no no Onboard dispositics for troubleshoritig/minite to software - - no Diaboard dispositics for troubleshoritig/minite to software - - no Contraindication sector - - - - Method of analyst ID in system LCD touchscreen, numeric (customizabil)	Sample size for complete panel of analyte results Sample size differs with No. of analytes selected	125 μL capillary, 200 μL syringe	85 µL ves. ontional 35 µL for nH only	
Provides tor patient inductions to result valiability provides torp patient inductions to result valiability provides torp patient inductions provides torp patient inductions Max. No. of patient samples per hr/max. No. of measured parameters per hr Datibuition to result valiability 22 min 2 30.90 hr Other torp patient inductions in the non control waliability parameters per hr Datibuition to result valiability 22 min 2 30.90 hr Contraindications none none none Contraindications non initianance pres/no no Sampler has self-wiping probe no maintenance pres/no no Time form samples per hrythas. no maintenance pres/no no Diagostics for trubuleshooting/limited to software no maintenance pres/no no Nethod of analyst ID in system LOB touchscreen, numeric (customizable) operator ID entry (optional) Response for daturey Supports har-code scanning of: LOB touchscreen, numeric (customizable) operator ID entry (optional) Supports har-code scanning of: patient ID & tong, result, sample allowed, press, software: screen prompti, software: screen pr	Recommended collection device	standard blood gas syringe	syringe or capillary	
Max. No. of patient samples per hr/max. No. of measured parameters per hr 20/120 30/90 Optimal troughout when ealibred and availing specimens 20 30 per hr Calination can be interrupted to perform stat sample	Time from sample introduction to result availability	yes <2 min	yes ~1 min	
Calibration can be interrupted to perform stat sample contraindications	Max. No. of patient samples per hr/max. No. of measured parameters per hr Optimal throughput when calibrated and awaiting specimens	20/120 20	30/90 30 per hr	
Contraining Contraining Control interfaces and review previous patient results on screen patient (Content for analyst D in results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content for analyst D in results) and review previous patient results on screen patient (Content Content for analyst D in results) and review previous patient results on screen patient (Content Content Content for analyst D in results) and review previous patient results on screen patient (Content Content Con	Calibration can be interrupted to perform stat sample		yes	
Restrictions based on htt Sampler has elf-wiping probe no no no to not needed Time required for maintenance by lab personnel Onboard diagnostics for troubleshooting/limited to software Diagnostics for troubleshooting/limited to software Training & certification program for user no maintenance yes/no no monthly: as needed; annually: 5 hrs yes/no no Method of analyst ID in system Training & certification program for user LCD touchscreen, numeric (customizable) ECC failure or screen prompt/if user ID required, no access to patient tisting mode/cailib: test ends-no injection of sample allowed, power: blank screen-resumpt, software: screen prompt/if user ID required, no access to patient ID required for and review previous patient results on screen pyer/NS 232, modem analyzer serial No, date, calib, successful, calib, code, Iot No, patient ID & fam, results, barometric press, softw. version optional: user ID, ref. ranges, O ₂ therapy, sample info. no bar-code scanner no scriptor H/Z data maagement system, which connects to LIS/HIS i or directly to LIS/HIS device unque identifier, operator & patient ND. results for work, direct bestranal system No. of different management system No. of different managemen	Known interferences		halothane	
Time required for maintenance by lab personnel Onboard diagnostics for troubleshooting/limited to software Diagnostics for troubleshooting/limited to software Disting/limited/limi	Restrictions based on Hct Sampler has self-wiping probe	no no, not needed	no (always use well-mixed sampies) no	
Chooserd diagnestics for trobbeshooting/limited to software Diagnostics performed through modem Training & certification program for useryes/no no no yesyes/no no no no no yesMethod of analyst ID in system Calibration & power failure/ calibration & power failureLCD louchscreen, numeric (customizable) EQG failure or screen prompt/if user ID required, no access to menu, 10 C required, no access to patient testing mode/calib: test ends-no injection of sample allowed, power iblank screen-resume testing with power opprator ID, patient ID, catridge information yesoperator ID entry (optional) system messagesSupports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy reportLCD louchscreen, numeric (customizable) EQG failure or screen prompt/if user ID, required, no access to menu, 10 C required, no access to patient testing mode/calib: test ends-no injection of sample allowed, power: laware screen resume testing with power opprator ID, patient ID, catridge information yesoperator ID entry (optional) system messagesAnalyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external systemdata management system, which connects to LIS/HIS; directly to LIS/HIS (cho poinos) script or HI-7Radiance Stat information management system, with connects on the spectra management system analyzer settingsRadiance Stat information management system, with US/HIS outpert direct serial/housand; modem dial-in/hundreds wireless future optionInformation included in transmission from analyzer to external system No of different management report system produces Contents downloaded from DMS to ana	Time required for maintenance by lab personnel	no maintenance	monthly: as needed; annually: 5 hrs	
Distinguistic performance unrough mound training & certification program for usernonoMethod of analyst ID in system Response for hardware & software failure/ calibration & power failureLCD touchscreen, numeric (customizable) ECD failure or screen prompt, software: screen prompt/ if user ID required, no access to permont/ if C required, no access to permot/ if user ID required, no access to permot/ if user ID required, no access to permot/ if C required, no access to permot/ if user ID required, no access to permot/ if C required, no access to permot/ testing mode/calib. ister ends-no injection of sample allowed, power blank screen-resume testing with power operator ID, patient ID, cartridge information yesoperator ID entry (optional) system messagesAnalyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Mardware/software for data management system No. of different management reports system Mardware/software for data management system No. of different management reports system No. of different management reports system wireless future option device unique identifier, operator & patient IDs, result, QC identifier, as per ASTM protocols external Radiance wireless future option device unique identifier, operator & patient IDs, result, QC identifier, as per ASTM protocols external Radiance user standards supported To upload patient & QC results, how analyzer system connected (We installations) to which LIS/HISS all analyzer settings	Onboard diagnostics for troubleshooting/limited to software	yes/no	yes/no	
Method of analyst ID in system Response for hardware & software failure/user ID & QC failure/ calibration & power failure LCD touchscreen, numeric (customizable) operator ID entry (optional) Supports bar-code scanning of: User can search for and review previous patient results on screen built-in printer/data port information on hard copy report LCD touchscreen, numeric (customizable) operator ID entry (optional) system messages Supports bar-code scanning of: User can search for and review previous patient results on screen built-in printer/data port information on hard copy report no bar-code scanner no yes/RS 232, modem analyzer serial No, date, calib. successful, calib. code, tol No., patient ID & temp, results, hormetric press., softw. version optional: user ID, ref. ranges, 0 ₂ therapy, sample info. no bar-code scanner no yes/RS 232 patient information management system, which comported to LIS/HIS; tol LS/HIS or directly to LIS/HIS script or HL7 Radiance Stat information management system, which contents downloaded from manalyzer to external system Radiance Stat information management system, which content downloaded from DMS to analyzer system conceled (live installations) to which LIS/HISs Radiance Stat information included in transmission from analyzer to external system IDMS 5.0.2 Radiance Stat information game and al-in/hundreds wireless future option device unique identifier, operator & patient IDs, result, QC identifier, apteral to 2 ₂ therapy information IDMS 5.0.2 Cerner, Meditech, Sunquest, others none Using sported submoched from DMS to analyzer using sported stallations (to which LIS/HIS) interface using proprietary protocol interface using proprie	Training & certification program for user	yes	yes (on-site as needed)	
Response for hardware & software failure/user ID & QC failure / calibration & power failureEQC failure or screen prompt, software: screen prompt/f user ID required, no access to menu, If QC required, If QC is accumption intrading If If If If QC is accumpting and	Method of analyst ID in system	LCD touchscreen, numeric (customizable)	operator ID entry (optional)	
Link and the section of sample allowed, power: blank screen-resume testing with power operator ID, patient ID, cartridge information yes yes/RS 232, modem analyzer secien analyzer secin	Response for hardware & software failure/user ID & QC failure/ calibration & power failure	EQC failure or screen prompt, software: screen prompt/if user ID required. no access to menu, if QC required, no access to patient	system messages	
Supports bar-code scanning of: User can search for and review previous patient results on screen Built-in printer/data portno bar-code scanner no yes/RS 232 analyzer serial No., date, calib. successful, calib. code, lot No., patient ID & temp., results, barometric press., softw. version optional: user ID, ref. ranges, 0,2 therapy, sample info.no bar-code scanner no yes/RS 232 patient lino, meas. & calc. results, system mess: patient lino, meas. & calc. results, system mess: printer/data portAnalyzer connects todata management system, which connects to LIS/HIS; directly to LIS/HIS (both options) script or HL7Radiance Stat information management system, w to LIS/HIS or directly to LIS/HIS ASTM 1394 & 1238, serial directly to LIS/HIS directly to LIS/HIS directly to LIS/HIS hospital network, direct serial, modem dial-in hospital network, direct serial, modem dial-in wireless future option device unique identifier, operator & patient ID, result, QC identifier, patient 0, therapy information lanalyzer settingsRadiance Stat information management system, w to LIS/HIS ASTM 1394 & 1238, serial directly to LIS/HIS directly to LIS/HIS directly to LIS/HIS asting a standard HL7 interfaceNo. of different management reports system produces using standard HL7 interfaceall major HIS/LIS vendors all major HIS/LIS vendors all major HIS/LIS vendors customizable EDI interfact to HIS/LIS vendors nonecerner, Meditech, Sunquest, others none noreDistinguishing featurescartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info.provides basic blood gases (pH, pC02, p02) test p use with minimal maintenance; low cost of operator		testing mode/calib.: test ends-no injection of sample allowed,		
User can search for and review previous patient results on screen yes no Built-in printer/data port yes/R5 232, modem yes/R5 232, modem Information on hard copy report analyzer serial No., date, calib. successful, calib. code, lot No., patient ID & temp., results, barometric press., softw. version optional: user ID, ref. ranges, O ₂ therapy, sample info. yes/R5 232 Analyzer connects to data management system, which connects to LIS/HIS; Radiance Stat information management system, withich connects to LIS/HIS; Interface standards supported script or HL7 ASTM 1394 & 1238, serial To upload patient & QC results, how analyzer connects to external system hospit or HL7 ASTM 1394 & 1238, serial Information included in transmission from analyzer to external system device unique identifier, operator & patient IDs, result, QC identifier, patient Q ₂ therapy information Information included from DMS to analyzer all major HIS/LIS vendors all major HIS/LIS vendors cerner, Meditech, Sunquest, others • using standard HL7 interface all major HIS/LIS vendors none none • using standard HL7 interface all major HIS/LIS vendors none none • using standard HL7 interface all major HIS/LIS vendors none none • using standard HL7 interface non	Supports bar-code scanning of:	operator ID, patient ID, cartridge information	no bar-code scanner	
Information on hard copy reportanalyzer serial No., date, calib. successful, calib. code, lot No., patient ID & temp., results, barometric press., softw. version optional: user ID, ref. ranges, 02 therapy, sample info.patient info., meas. & calc. results, system messAnalyzer connects todata management system, which connects to LIS/HIS; directly to LIS/HIS (both options) script or HL7Radiance Stat information management system, which connects to LIS/HIS or directly to LIS/HIS ASTM 1394 & 1238, serial direct serial/thousands; modem dial-in device unique identifier, operator & patient IDs, result, QC identifier, patient 02 therapy informationRadiance Stat information management system, w to LIS/HIS or directly to LIS/HIS ASTM 1394 & 1238, serial direct serial/thousands; modem dial-in, device unique identifier, operator & patient IDs, result, QC identifier, patient 02 therapy informationRadiance Stat information management system, w to LIS/HIS or directly to LIS/HIS ASTM 1394 & 1238, serial direct serial/thousands; modem dial-in/undreds wireless future option device unique identifier, operator & patient IDs, result, QC identifier, patient 02 therapy informationInformation included in transmission from analyzer to external system No. of different management reports system produces System connected (from DMS to analyzer System connected from DMS to analyzer system connected (ine installations) to which LISs/HISs • using standard HZ interface • usin	User can search for and review previous patient results on screen Built-in printer/data port	yes yes/RS 232, modem	no yes/RS 232	
Analyzer connects to Interface standards supporteddata management system, which connects to LIS/HIS; data management system, which connects to LIS/HIS; script or HL7Radiance Stat information management system, w to LIS/HIS or directly to LIS/HIS ASTM 1394 & 1238, serial direct serial/thousands; moder dial-in/hundreds wireless future optionInformation included in transmission from analyzer to external system No. of different management system No. of different management reports system produces System connected for momentations to which LIS/HIS and and the instantion of the installations) to which LIS/HIS script or HL7device unique identifier, operator & patient IDs, result, QC identifier, operator & patient 02 therapy information identifier, operator & patient 02 therapy information identifier, apper ASTM protocols external Radiance user-definableNo. of different management reports system suggest and different management reports system produces system connected (live installations) to which LIS/HISs • using screen animation/screen scraping • using standard HL7 interface • using proprietary protocol interface • using tradiand rHZ interfacesall major HIS/LIS vendors noneCerner, Meditech, Sunquest, others noneDistinguishing featurescartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info.provides basic blood gases (pH, pC02, p02) test p use with minimal maintenance; low cost of operator operator do priore	Information on hard copy report	analyzer serial No., date, calib. successful, calib. code, lot No.,	patient info., meas. & calc. results, system messag	
Analyzer connects to Interface standards supporteddata management system, which connects to LIS/HIS; directly to LIS/HIS (both options)Radiance Stat information management system, w to LIS/HIS or directly to LIS/HIS ASTM 1394 & 1238, serial direct serial/thousands; modem dial-inInformation included in transmission from analyzer to external systemdevice unique identifier, operator & patient IDs, result, QC identifier, patient 02, therapy information IDMS 50.2ASTM 1394 & 1238, serial direct serial/thousands; modem dial-in/hundreds wireless future option device unique identifier, operator & patient IDs, result, QC identifier, patient 02, therapy information IDMS 50.2ASTM 1394 & 1238, serial direct serial/thousands; modem dial-in/hundreds wireless future option device unique identifier, operator & patient IDs, result, QC identifier, patient 02, therapy information IDMS 50.2ASTM 1394 & 1238, serial direct serial/thousands; modem dial-in/hundreds wireless future option device unique identifier, operator & patient IDs, result, QC identifier, as per ASTM protocols external Radiance user definableNo. of different management reports system produces Contents downloaded from DMS to analyzer using stendard HZ interface using stendard HZ interfaceall major HIS/LIS vendors using stendard HZ interfaceCerner, Meditech, Sunquest, others none• using proprietary protocol interface use a third-party interfacing tool/engine for LIS/HIS interfacesall major HIS/LIS vendors nonenonenoneDistinguishing featurescartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info.provides basic blood gases (pH, pCO2, pO2) test p use with minimal main		optional: user ID, ref. ranges, 0 ₂ therapy, sample info.		
Interface standards supportedto Lis/HIS (both options)to Lis/HIS or directly to Lis/HISInterface standards supportedscript or HL7ASTM 1394 & 1238, serialTo upload patient & QC results, how analyzer connects to external systemhospital network, direct serial, modem dial-inASTM 1394 & 1238, serialInformation included in transmission from analyzer to external systemdevice unique identifier, operator & patient IDs, result, QCdevice unique identifier, operator & patient IDs, result, QCHardware/software for data management systemIDMS 5.0.2external RadianceNo. of different management reports system produces24user-definableContents downloaded from DMS to analyzerall major HIS/LIS vendorsSystem connected (live installations) to which LIS/HISsall major HIS/LIS vendorscerner, Meditech, Sunquest, others• using standard HL7 interfaceall major HIS/LIS vendorsnone• using proprietary protocol interfacecustomizable EDI interfact to HIS/LIS vendorsnone• using featurescartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info.provides basic blood gases (pH, pC02, p02) test pDistinguishing featurescartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info.use with minimal maintenance; low cost of operator	Analyzer connects to	data management system, which connects to LIS/HIS;	Radiance Stat information management system, wh	
To upload patient & QC results, how analyzer connects to external systemhospital network, direct serial, modem dial-indirect serial/thousands; modem dial-in/hundreds wireless future optionInformation included in transmission from analyzer to external systemdevice unique identifier, operator & patient IDs, result, QC identifier, patient 02 therapy informationdirect serial/thousands; modem dial-in/hundreds wireless future optionHardware/software for data management systemIDMS 5.0.2external Radiance user-definableNo. of different management reports system produces24user-definableContents downloaded from DMS to analyzerall analyzer settings	Interface standards supported	directly to LIS/HIS (both options) script or HL7	to LIS/HIS or directly to LIS/HIS ASTM 1394 & 1238, serial	
Information included in transmission from analyzer to external systemdevice unique identifier, operator & patient IDs, result, QC identifier, patient 02 therapy informationdevice unique identifier, operator & patient IDs, r identifier, as per ASTM protocols external Radiance user-definableHardware/software for data management systemIDMS 5.0.2external Radiance user-definableNo. of different management reports system produces24user-definableContents downloaded from DMS to analyzerall analyzer settingsSystem connected (live installations) to which LISs/HISsall major HIS/LIS vendors all major HIS/LIS vendorsCerner, Meditech, Sunquest, others none• using standard HL7 interfacecustomizable EDI interfact to HIS/LIS vendors nonenone• use a third-party interfacing tool/engine for LIS/HIS interfacescartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info.provides basic blood gases (pH, pC02, p02) test p use with minimal maintenance; low cost of operator	To upload patient & QC results, how analyzer connects to external system	hospital network, direct serial, modem dial-in	direct serial/thousands; modem dial-in/hundreds;	
Hardware/software for data management system IDMS 5.0.2 external Radiance No. of different management reports system produces 24 user-definable Contents downloaded from DMS to analyzer all analyzer settings — System connected (live installations) to which LISs/HISs all major HIS/LIS vendors Cerner, Meditech, Sunquest, others • using screen animation/screen scraping all major HIS/LIS vendors none • using standard HL7 interface customizable EDI interfact to HIS/LIS vendors none • using proprietary protocol interface customizable EDI interfact to HIS/LIS vendors none Use a third-party interfacing tool/engine for LIS/HIS interfaces cartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info. provides basic blood gases (pH, pC0 ₂ , p0 ₂) test p Distinguishing features cartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info. provides basic blood gases (pH, pC0 ₂ , p0 ₂) test p	Information included in transmission from analyzer to external system	device unique identifier, operator & patient IDs, result, QC	device unique identifier, operator & patient IDs, res	
No. of different management reports system produces 24 user-definable Contents downloaded from DMS to analyzer all analyzer settings System connected (live installations) to which LISs/HISs all major HIS/LIS vendors • using screen animation/screen scraping all major HIS/LIS vendors Cerner, Meditech, Sunquest, others • using standard HL7 interface all major HIS/LIS vendors none • using proprietary protocol interface customizable EDI interfact to HIS/LIS vendors none Use a third-party interfacing tool/engine for LIS/HIS interfaces cartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info. provides basic blood gases (pH, pC0 ₂ , p0 ₂) test p use with minimal maintenance; low cost of operational patient info.	Hardware/software for data management system	IDMS 5.0.2	external Radiance	
System connected (live installations) to which LISs/HISs all major HIS/LIS vendors Cerner, Meditech, Sunquest, others • using screen animation/screen scraping all major HIS/LIS vendors none • using standard HL7 interface all major HIS/LIS vendors none • using proprietary protocol interface customizable EDI interfact to HIS/LIS vendors none • using proprietary protocol interface customizable EDI interfact to HIS/LIS vendors none Use a third-party interfacing tool/engine for LIS/HIS interfaces cartridges do not require refrig. (room temp.); true QC lockout—lab provides basic blood gases (pH, pC0 ₂ , p0 ₂) test p Distinguishing features cartridges do not require refrig. (room temp.); true QC lockout—lab provides basic blood gases (pH, pC0 ₂ , p0 ₂) test p	No. of different management reports system produces Contents downloaded from DMS to analyzer	24 all analyzer settings	user-definable —	
• Using standard HL7 interface • Using standard HL7 interface • Using proprietary protocol interface • Use a third-party interfacing tool/engine for LIS/HIS interfaces Distinguishing features Cartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info. Use with minimal maintenance; low cost of operations	System connected (live installations) to which LISs/HISs	all maior HIS/I IS vondors	Corner Meditach Sunguest others	
• using proprietary protocol interface customizable EDI interfact to HIS/LIS vendors none none Use a third-party interfacing tool/engine for LIS/HIS interfaces customizable EDI interfact to HIS/LIS vendors none no (use interface templates) Distinguishing features cartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info. provides basic blood gases (pH, pCO ₂ , pO ₂) test p use with minimal maintenance; low cost of operation	using standard HL7 interface	all major HIS/LIS vendors	none	
Distinguishing features cartridges do not require refrig. (room temp.); true QC lockout—lab manager controls QC test requirements, user access, patient info. provides basic blood gases (pH, pCO ₂ , pO ₂) test p use with minimal maintenance; low cost of operation.	using proprietary protocol interface Use a third-party interfacing tool/engine for LIS/HIS interfaces	customizable EDI interfact to HIS/LIS vendors none	none no (use interface templates)	
manager controls QC test requirements, user access, patient info. use with minimal maintenance; low cost of opera	Distinguishing features	cartridges do not require refrig. (room temp.): true OC lockout—lab	provides basic blood gases (pH, pCO ₂ , pO ₂) test pro	
requiremente e a notient ID requiremente extridae design w/ luca — standby users test restart in 9 min out of stand		manager controls QC test requirements, user access, patient info.	use with minimal maintenance; low cost of operati	

IN VIT	ro blood gas analyze	rs
Part 9 of 12 See accompanying	Radiometer America Inc. Telesales Department info@radiometeramerica.com 810 Sharon Dr., Westlake, OH 44145 800-736-0600 ext. 333	Radiometer America Inc. Telesales Department info@radiometeramerica.com 810 Sharon Dr., Westlake, OH 44145 800-736-0600 ext. 333
article on page 58	www.radiometeramerica.com	www.radiometeramerica.com
Name of device/first year sold No. of devices sold in U.S./outside U.S./list price Dimensions (H x W x D)/weight	ABL 700 Series/1998 —/—/\$29,560-\$70,195 (depends on configuration options) 17 x 28 x 20 in/66 lbs	ABL 555/1998 —/—/\$31,615 depends on configuration options/82 lbs
Analytes measured on device Parameters calculated on device	pH, pCO ₂ , pO ₂ , Hb, Na, K, Cl, iCa, lactate, glucose, bilirubin, fetal Hb, O ₂ Hb, MetHb, RHb, COHb, O ₂ SAT Hct, BE, TCO ₂ , HCO ₃ -, plus 40 added parameters, upgradable for	pH, pCO ₂ , pO ₂ , Hct, Na, K, plus one of the following: lactate, glucose Hb, BE, TCO ₂ , HCO ₃ -, plus 40 added parameters (ca
Barometric pressure Analytical method(s)/technology(ies) employed	future options (call 800-736-0600 ext. 333 for list) measured pH: pH-sensitive glass (ISE); pCO ₂ , pO ₂ , Na, Cl, iCa, K: ISE; Hct: calc.	0600 ext. 333 for list) measured pH: pH-sensitive glass (ISE); pCO ₂ , pO ₂ , Na, CI, iCa,
Device is part of a series of related models	from meas. Hb, bilirubin; Hb: optical, multiwavelength anal., intra- cuvette ultrasonic hemolysis; lactate, gluc.: ISE w/enzyme yes, ABL 700 Series	conductivity; lactate, glucose: ISĒ witħ enzyme no
User list/group available Device warranty Loaner devices provided	yes (through local sales representative) 2 yrs, parts, labor, & travel yes	yes (through local sales representative) 1 yr, parts, labor, & travel yes
Average expected life of device Open or closed system/external gas tanks required For POC testing or laboratory	20 yrs with full support closed/yes (low-pressure, premixed) POC & laboratory (products on mobile carts for POCT/NPT)	20 yrs with full support closed/yes (one glass cylinder) POC & laboratory (products on mobile carts for POC
POC: Uses disposable prepackaged reagent/electrode system for analysis	_	_
No. of samples analyzed per 1 disposable reagent/electrode system List price per disposable reagent system		_ _ _
Reagent unit storage requirements Shelf life of disposable units		
Laboratory: No. of different disposable reagents required to maintain device	4	6
Shelf life Cost per test/reagent cost per test	reagent, electrode, membrane kit, cartridge: 2+ yrs depends on sample volume & any extra incl. items/same	reagent, electrode, membrane kit, cartridge: 2+ yea depends on sample volume & any extra incl. items/
Calibrations required Calibration frequency	1 & 2 point (automatic) 1 point: ¹ /2 hr–CLIA setting, 4 hrs—mftr.; 2 point: every 8 hrs	1 & 2 point (automatic) 1 point: ¹ /2 hr-CLIA setting, 4 hrs—mftr.; 2 point: e
Calibrants traceable to NIST standards Internal QC program recommended QC features	yes depends on hospital management & inspection agency L-J plots, comparable plot (via DMS), statistical calcs., auto QC, monthly cum. reports (onboard & avail. w/external system, PC	yes depends on hospital management & inspection age L-J plots, comparable plot (via DMS), statistical calcs cum. reports (on board & available with external syste
Remote control of device from laboratory System can use LOINC to transmit results to LIS	download to Excel) yes yes	download to Excel) yes yes
Detects clots within analysis chamber Specimen types suitable for device	yes plasma, serum, whole blood, capill., mixed venous, arterial, venous	yes plasma, serum, whole blood, capill., mixed ven., ar
Acceptable anticoagulants Sampling technique Suitable for samples from well/sick neonates	EDTA, heparin, electrolyte-balanced heparin aspiration, syringe &/or capillary tube &/or test tube yes/yes	EDTA, heparin, electrolyte-balanced heparin aspir., injec., syringe &/or capill. tube &/or aspir. fr yes/yes
Sample size for complete panel of analyte results Sample size differs with No. of analytes selected Recommended collection device	95 μL for 17 measured parameters yes, with fewer meas. params., smaller micro-modes avail. from 55 μL syringe or capillary	125 μL for 17 measured parameters yes, option to select smaller test profile with reduc volume from 35 μL syringe or capillary
Provides for patient temperature corrected results Time from sample introduction to result availability Max No. of patient samples par br/max. No. of massured parameters per br	yes ~1 min (depends on tests ordered) 25/425	yes ~1 min, depends on tests ordered 20/27
Optimal throughput when calibrated and awaiting specimens Calibration can be interrupted to perform stat sample	25 per hr yes	20 tests per hr yes
Contraindications Known interferences Restrictions based on Hct Sampler has self-wiping probe	none halothane, specif. anticoag., thiocyanic & glycolic acids, sod. fl. no (always use well-mixed samples) yes	none halothane, specif. anticoag., thiocyanic & glycolic a no (always use well-mixed samples) yes
Time required for maintenance by lab personnel Onboard diagnostics for troubleshooting/limited to software	monthly: as needed, annually: ~2 hrs yes/no	monthly: as needed, annually: 32 hrs yes/no
Diagnostics performed through modem Training & certification program for user	yes yes (on-site as needed)	no yes (on-site as needed)
Method of analyst ID in system Response for hardware & software failure/user ID & QC failure/ calibration & nower failure	password system (customizable) system message with customized ("traffic light") visual & audible signals	password system (customizable) system messages with visual & audible signals
Supports bar-code scanning of: User can search for and review previous patient results on screen	operator & patient identifiers, reag. & QC lot Nos., exp., soft. keys yes, multitask searches while analyzer performs other functions	operator & patient identifiers, accession No. ves
Built-in printer/data port Information on hard copy report	yes/RS 232, parallel, Ethernet, USB patient info./demographics, patient therapy settings, meas. & calc. results, system messages, reference & critical ranges	yes/RS 232 patient info./demographics, patient therapy setting & calculated results, system messages
Analyzer connects to	Radiance Stat information management system, which connects to LIS/HIS or directly to LIS/HIS	Radiance Stat information management system, whi to LIS/HIS or directly to LIS/HIS
To upload patient & QC results, how analyzer connects to external system	ASTM 1394 & 1238, HL7, Serial, network TCP/IP direct serial/thousands of hosp. installed; modem dial-in/hun- dreds; hospital network/hundreds; realtime wireless future option	direct serial/thousands of hospitals installed; mode in/hundreds; hospital network/hundreds; realtime
Information included in transmission from analyzer to external system Hardware/software for data management system	device unique identifier, operator & patient IDs, result, QC identifi- er, per ASTM/HL7 standards plus calib. & analyzer status info. internal system + optional external system. Radiance w/Windows	device unique identifier, operator & patient IDs, resul er, as per ASTM/HL7 standards & calib. and system r internet and external system options
No. of different management reports system produces Contents downloaded from DMS to analyzer	NT user-definable searches/reports valid control values, valid operator IDs	user definable valid control values, valid operator IDs
System connected (live installations) to which LISs/HISs • using screen animation/screen scraping • using standard HL7 interface	Cerner, Meditech, Sunquest, others available from analyzer—LIS/HIS vendors can use	Cerner, Meditech, Sunquest, others none
using proprietary protocol interface Use a third-party interfacing tool/engine for LIS/HIS interfaces	none no (use interface templates to fit into existing interfaces)	none no (use interface templates to fit into existing inter
Distinguishing features	market first—bilirubin & fetal Hb meas. on whole blood with no extra sample volume, low maintenance & cost of operation; interference-free accuracy; smallest automated microsample mode options with no loss in performance specs. (conserves blood); flexible/moduler platform running on Windows 05	interference-free accuracy; many options for micro modes (conserves blood); easy to use and highly c highest reliability on market

J. T.		
In vit	tro blood gas analyze	rs
Part 10 of 12	Radiometer America Inc.	Radiometer America Inc.
	Telesales Department info@radiometeramerica.com 810 Sharon Dr.	Telesales Department info@radiometeramerica.com 810 Sharon Dr.
See accompanying	Westlake, 0H 44145	Westlake, OH 44145
article on page 58	www.radiometeramerica.com	www.radiometeramerica.com
Name of device/first year sold	ABL 77/2000	NPT7/2001
Dimensions (H x W x D)/weight	—,—,— 13 x 8 x 9 in/16 lbs	10 x 13 x 16 in/25 lbs
Analytes measured on device	pH, pCO ₂ , pO ₂ , Hct, Na, K, iCa, CI-	pH, pCO ₂ , pO ₂ , tHb, SO ₂ , O ₂ Hb, COHb, MetHb, HHb
Parameters calculated on device	Hb, 0_2 SAT, BE, TC 0_2 , HC 0_3 -, ct 0_2 (a-v), ct 0_2 , anion gap (K+), cCa ²⁺ (7.40), cBase (B)	Hct, ABE, SBE, TCO $_2$, HCO $_3$ -, SBC, TO $_2$, p50
Barometric pressure Analytical method(s)/technology(ies) employed	n/a pH, pCO ₂ , pO ₂ , Na, iCa: thick film; Hct: conductivity; Hb: indirect-	n/a pH, pCO ₂ , pO ₂ , oximetry: patented dry optical techno
	ly amperometric, potentiometric, & conductometric	
Device is part of a series of related models User list/group available	yes ves (through local sales representative)	no ves (through local sales representative)
Device warranty	1 yr, with service plans available after yr 1 depending on customer requirements	1 yr, parts, labor & travel or depot loaner service
Loaner devices provided	yes analyzer 5, we dispendice 14, 20 d or 150 oction to the	yes
Open or closed system/external gas tanks required	anaryzer: 5+ yrs, disposables 14–30 d or 150 patient tests closed/no	closed/no
For POC testing or laboratory	POC & small laboratory	PUC testing & small laboratory, RT department
POC: Uses disposable prepackaged reagent/electrode system for analysis	electrode (multiuse cartridge)	dry optical system
No. of disposable reagent system units in basic shipment package No. of samples analyzed per 1 disposable reagent/electrode system	1 50/100/150	multiuse cartridge contains 30 single-use cuvettes 30
List price per disposable reagent system Beagent unit storage requirements	depends on configuration & GPO affiliation	depends on configuration & GPO affiliation
Shelf life of disposable units	reagents: 3 mos, electrodes: 3 mos	18 months
Laboratory:	1	1
Max. No. specific analyte reagents that can reside in device at once	2	1
Cost per test/reagent cost per test	reagent: 3 mos, cartridge: 3 mos depends on configuration & GPO affiliation	2 yrs
Calibrations required	1 & 2 point (manual & automatic)	two-level check is performed as part of QualityGuar
Calibration frequency	1 point: after each test; 2 point: 30 min–4 hrs (user definable)	(manual & automatic) 1 point: n/a; 2 point: n/a
Calibrants traceable to NIST standards	yes OC material according to CLIA	yes QualityGuard includes a two-level check, system ch
	L Inlate comparable plat (via DMS) statistical calco, monthly sum	measuring check
	(onboard-current mean, STD, CV%) reports (onboard & available with external system, PC download to Excel)	system
Remote control of device from laboratory System can use LOINC to transmit results to LIS	yes yes	no yes
Detects clots within analysis chamber	yes	yes
Acceptable anticoagulants	whole blood, mixed venous, arterial, venous heparin, heparinized whole blood	whole blood, capillary, mixed venous, arterial, veno heparin
Sampling technique Suitable for samples from well/sick neonates	aspiration ves/ves	aspiration ves/ves
Sample size for complete panel of analyte results	85 µL	90 µL
Recommended collection device	no heparinized syringe	no syringe or capillary tube
Provides for patient temperature corrected results	yes 70-00 sec	yes 60 sec
Max. No. of patient samples per hr/max. No. of measured parameters per hr	40/320	30/270
Optimal throughput when calibrated and awaiting specimens Calibration can be interrupted to perform stat sample	40 tests per hr ves	30 tests per hr n/a
Contraindications	must be heparinized whole blood	NO Intralinid (concentrations over 5 vol%), fluorescein
Restrictions based on Hct	no (always use well-mixed samples)	no no no seelo diagonal of other managements in the second statement of the se
Sampler has sen-wiping probe	nu manthiu 1/a ha	no, prope disposed of after measurement
Onboard diagnostics for troubleshooting/limited to software	montniy: '/2 nr yes/no	maintenance free yes/no
Diagnostics performed through modem Training & certification program for user	no yes	no yes (on-site as needed)
Method of analyst ID in system	bar-code or onboard keyboard (customizable)	operator ID entry (optional)
Response for hardware & software failure/user ID & QC failure/ calibration & power failure	error msg./error msg./calib.: error msg., power: blank screen & color indicator for batterv level	system messages with visual signals
Supports bar-code scanning of: User can search for and review previous patient results on series	operator & patient identifiers, reag. & sensor lot Nos., QC	operator & patient ID, QC lot No.
Built-in printer/data port	yes/RS 232, ethernet, RJ45	yes/RS 232, ethernet
Information on hard copy report	all meas. & calc. values, exp., test remaining info., QC & dispos. lot No., basic statistics, time & date, user & patient info., QC	patient into, patient therapy settings; measured and parameter results; system messages; reference ran
	statistics, temp. corrected at 37°G, QC ranges w/ QC results on each run, hemoglobin value-measured or default	iot & cartriage expiration date
Analyzer connects to	Radiance Stat information management system, which connects	directly to LIS/HIS
Interface standards supported	to LIS/HIS or directly to LIS/HIS ASTM, HL7, E1394-91 for serial communication	ASTM 1394 & 1238, serial, network
To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system	direct serial, hospital network device unique identifier, operator & patient ID. result. OC	direct serial, hospital network device unique identifier, operator & patient ID, resu
Hardware/software for data management system	identifier Badiance with Windows NT	identifier PCM/CIA—internal DM or external DM
No. of different management reports system produces	user definable	user definable
System connected (live installations) to which LISs/HISs	_	LIS vendors completing interface requirements
 using screen animation/screen scraping using standard HL7 interface 	Cerner, others available from analyzer—LIS/HIS vendors can use	
	none	
using proprietary protocol interface Use a third-party interfacing tool/engine for LIS/HIS interfaces	Badiance	Badiance
using proprietary protocol interface Use a third-party interfacing tool/engine for LIS/HIS interfaces Distinguishing factures	Radiance	Radiance

n vit	In vitro blood gas analyzers		
	ie bieed gae analyze		
Part 11 of 12	Roche Diagnostics Corp. Sales Department	Roche Diagnostics Corp. Sales Department	
	9115 Hague Rd. Indiananolis, IN 46250	9115 Hague Rd. Indiananolis IN 46250	
See accompanying	800-428-5074	800-428-5074	
arucie on page so	AVI Omni Modular Svetom/1006	Opti Critical Care Applyzer/1998	
No. of devices sold in U.S./outside U.S./list price	AVL Umini Modular System/1996 —/—/\$29,900-\$56,200 46 Ev (20 + 10 - 5 in (20 + 10 - 5))		
Dimensions (H x W x D)/weight	16.5 X 21 X 18.5 IN/88 Ibs	4.7 x 14.2 x 9 in/9 lbs without battery, 11 lbs with	
Analytes measured on device	pH, pCO ₂ , pO ₂ , Hct, Hb, Na, K, Cl, iCa, lactate, glucose, BUN, CO- ox values: O ₂ Hb, COHb, SulfHb, HHb, metHb	pH, pCO ₂ , pO ₂ , Na, K, Cl, iCa, tHb, sO _{2,} glucose, urea	
Parameters calculated on device	40+ parameters, including BE, BB, HCO ₃ -, TCO ₂ , SO ₂ , NiCa++, ctO ₂ , p50, shunt, AG, OSM (call Roche for list)	Hct, DE, TCO ₂ , HCO ₃ - (12 additional parameters; call l list)	
Barometric pressure Analytical method(s)/technology(ies) employed	meāsured pH: ion selective galvanometric; pCO ₂ , pO ₂ : ion selective	measured pH, pCO ₂ , pO ₂ , Na, CI, iCa, K, glucose, urea (BUN): or	
	membrane; Hct: conductivity; Hb: spectrophotometry; Na, Cl, iCa, K: ion selective potentiometry: lactate: lact. oxidase enzyme:	fluorescence; tHb, sO_2 : optical reflectance	
Davice is part of a series of related models	glucose: glucose oxidase enzyme; BUN: urease enzyme	vas Anti Sarias	
User list/group available	yes, inducts 1–5 yes (through Roche sales dept.)	yes, opri series yes (through Roche sales dept.)	
Loaner devices provided	1 yr (service contract available for subsequent years) yes	1 yr (service contract available for subsequent years yes	
Average expected life of device Open or closed system/external gas tanks required	>7 yrs closed/no	>7 yrs closed/no	
For POC testing or laboratory	POC & laboratory (transportable on cart system)	POC & laboratory	
POC: Uses disposable prepackaged reagent/electrode system for analysis	n/a	reagent/optode	
No. of disposable reagent system units in basic shipment package No. of samples analyzed per 1 disposable reagent/electrode system	n/a n/a	25 individual packaged cassettes	
List price per disposable reagent system Reagent unit storage requirements	n/a n/a	depends on cassette configuration-contact Roche	
Shelf life of disposable units	n/a	reagent/electrode: 6 mos	
Laboratory:	denende en model, contact Doobe		
Max. No. specific analyte reagents that can reside in device at once	1	1	
Cost per test/reagent cost per test	reagents: 1 yr depends on sample volume/same	cassette: 6 mos depends on volume—contact Roche/same	
Calibrations required	1 & 2 point (automatic)	1 point (automatic)	
Calibration frequency Calibrants traceable to NIST standards	1 point: 30 min and with each sample, 2 point: selectable 4–12 hrs yes	with each cassette yes	
Internal QC program recommended QC features	1 liquid QC sample per 8 hrs of operation AutoOC sampling. L-J plots, statistical calcs., monthly cum, reports	3 levels liquid with change of cassette lot No., 2 mo electronic QC-1 level per 8 hrs of operation, elec. &	
	(onboard & external with DataCare POC software), multirules, auto.	statistical calcs., L-J with external system (DataCare stores 1 mo-3 levels onboard of each (elec. & lig.)	
Remote control of device from laboratory System can use LOINC to transmit results to LIS	yes no	no no	
Dataste clote within analysis chamber	Ves	Vac	
Specimen types suitable for device	plasma, serum, w. blood, capillary, mixed venous, arterial, venous	plasma, serum, w. blood, capill., mixed ven., arteria	
Sampling technique	aspiration, injection	aspiration	
Sample size for complete panel of analyte results	yes/yes 160 μL for full panel, 40 μL per module	yes/yes 125 μL	
Sample size differs with No. of analytes selected Recommended collection device	yes, 40 µL per module; i.e.: pH/BG, electrolytes, CO-ox, metabolites syringe, capillary, AVL microsampler	no syringe, capillary, AVL microsampler	
Provides for patient temperature corrected results Time from sample introduction to result availability	yes ~ 1 min (depends on tests analyzed)	yes 1 min from sample aspiration	
Max. No. of patient samples per hr/max. No. of measured parameters per hr Optimal throughout when calibrated and awaiting specimens	40/490 tests per hr 40 samples per hr	24/192	
Calibration can be interrupted to perform stat sample	yes	no none	
Known interferences	none no (automation!!:: shocks !!:t A!!! ::-ti::)	none none	
Sampler has self-wiping probe	no (automatically checks het: the ratio) no	no (net calculated based on meas. hb) no	
Time required for maintenance by lab personnel	weekly: 5 min, quarterly: 5 min	weekly: 1 min, quarterly: 5 min	
Diagnostics performed through modem	yes/no yes, with Omni-Link via network can remotely control, realtime	yes/no no	
	continuously monitor, activate calib., QC sampling (with AutoQC module), and activate troubleshooting routines remotely		
Training & certification program for user	yes (on-site or at vendor office as needed)	yes (on-site as needed)	
Method of analyst ID in system Response for hardware & software failure/user ID & QC failure/	4-level password system for 200 operators identified on screen & w/ diagnostic routine/user ID: on screen w/ msg	oper. ID and/or secure 4-digit PIN No. for 150 oper. (c identified on display & w/ diagnostic routine/user ID: id	
calibration & power failure	QC: on screen-report w/ high-low flagging & multirule/calib.: identified on display w/ easy-to-read icons. auto. lockout of failed OC test power	display (missing or not valid), QC: on display (report fla high or low)/calib: on display prior to sample aspir_po	
Sunnorts har-code scanning of	recorded in activities log, automatic customizable QC lockout of tests	identified on display-warning; automatic customized (
	QC ranges, expiration ves (in to 50.000 apling ophoard applying)	no., expiration, factory calibration info. & cassette t	
liser can search for and review previous patient results on server	yes (ap to 50,000 online onboard analyzer) yes/RS 232, parallel, Ethernet	yes/RS 232, IR	
User can search for and review previous patient results on screen Built-in printer/data port	customizable, can incl. input values, meas. values, calc. values	customizable, can incl. input values, meas. values,	
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report		data management at the test	
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to	data management system, which connects to LIS/HIS; directly to LIS/HIS (both options)	data management system, which connects to LIS/H directly to LIS/HIS (both options)	
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system	data management system, which connects to LIS/HIS; directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 (DataCare available) direct serial, hospital network, realtime wireless (RF)	data management system, which connects to LIS/H directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 direct serial or IR	
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system	data management system, which connects to LIS/HIS; directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 (DataCare available) direct serial, hospital network, realtime wireless (RF) device unique identifier, operator & patient ID, result, QC identifier	data management system, which connects to LIS/H directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 direct serial or IR device unique identifier, oper. & patient ID, result, Q all info. pertinent to patient & QC data	
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system	data management system, which connects to LIS/HIS; directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 (DataCare available) direct serial, hospital network, realtime wireless (RF) device unique identifier, operator & patient ID, result, QC identifier AVL Omni has onboard DM capabilities; DataCare POC software is available as a client/server to connect Omni analyzers	data management system, which connects to LIS/H directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 direct serial or IR device unique identifier, oper. & patient ID, result, Q all info. pertinent to patient & QC data Opti has onboard data management capabilities, ad Boche DataCare software is available as a client/ce	
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer	data management system, which connects to LIS/HIS; directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 (DataCare available) direct serial, hospital network, realtime wireless (RF) device unique identifier, operator & patient ID, result, QC identifier AVL Omni has onboard DM capabilities; DataCare POC software is available as a client/server to connect Omni analyzers 40 valid control values, valid operator IDs, nationt demographics	data management system, which connects to LIS/H directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 direct serial or IR device unique identifier, oper. & patient ID, result, Q all info. pertinent to patient & QC data Opti has onboard data management capabilities, ad Roche DataCare software is available as a client/se 40 none	
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer System connected (live installations) to which LISs/HISs	data management system, which connects to LIS/HIS; directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 (DataCare available) direct serial, hospital network, realtime wireless (RF) device unique identifier, operator & patient ID, result, QC identifier AVL Omni has onboard DM capabilities; DataCare POC software is available as a client/server to connect Omni analyzers 40 valid control values, valid operator IDs, patient demographics	data management system, which connects to LIS/HI directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 direct serial or IR device unique identifier, oper. & patient ID, result, Q all info. pertinent to patient & QC data Opti has onboard data management capabilities, ad Roche DataCare software is available as a client/set 40 none	
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer System connected (live installations) to which LISs/HISs • using screen animation/screen scraping • using standard HL7 interface	data management system, which connects to LIS/HIS; directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 (DataCare available) direct serial, hospital network, realtime wireless (RF) device unique identifier, operator & patient ID, result, QC identifier AVL Omni has onboard DM capabilities; DataCare POC software is available as a client/server to connect Omni analyzers 40 valid control values, valid operator IDs, patient demographics none Meditech, HBOC, Cerner, SMS (call Roche for updated list)	data management system, which connects to LIS/H directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 direct serial or IR device unique identifier, oper. & patient ID, result, 0 all info. pertinent to patient & QC data Opti has onboard data management capabilities, ad Roche DataCare software is available as a client/se 40 none none	
User can search for and review previous patient results on screen Built-in printer/data port Information on hard copy report Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer System connected (live installations) to which LISs/HISs • using screen animation/screen scraping • using standard HL7 interface • using proprietary protocol interface Use a third-party interfacing tool/engine for LIS/HIS interfaces	data management system, which connects to LIS/HIS; directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 (DataCare available) direct serial, hospital network, realtime wireless (RF) device unique identifier, operator & patient ID, result, QC identifier AVL Omni has onboard DM capabilities; DataCare POC software is available as a client/server to connect Omni analyzers 40 valid control values, valid operator IDs, patient demographics none Meditech, HBOC, Cerner, SMS (call Roche for updated list) Kaiser Permanente Dawning, Cloverleaf, Data Innovations (not required but can use)	data management system, which connects to LIS/H directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 direct serial or IR device unique identifier, oper. & patient ID, result, Q all info. pertinent to patient & QC data Opti has onboard data management capabilities, ad Roche DataCare software is available as a client/se 40 none none Meditech, HBOC, Cerner, SMS, others (call Roche for Kaiser Permanente, others Dawning, Cloverleaf, Data Innovations (not required	

September 2001

OF INSTRUCT In vitro blood gas analyzers

Part 12 of 12	Danka Diamantina Gam
	Sales Department
	9115 Hague Rd.
See accompanying	Indianapolis, IN 46250
article on this page	www.roche.com
Name of device/first year sold	Opti R Critical Care Analyzer/2000
NO. OT DEVICES SOID IN U.S./OUTSIDE U.S./IIST PRICE	—/—/\$9,500 4 7 x 14 2 x 9 in/9 lbs without battery 11 lbs with
	4.7 × 14.2 × 5 m/5 b5 without battery, 11 b5 with
Analytes measured on device	pH, pCO ₂ , pO ₂ , Na, K, iCa, tHb, sO ₂
Parameters calculated on device	Hct RF TCO, HCO, - (11 additional narameters: call Roche for list)
Barometric pressure	measured
Analytical method(s)/technology(ies) employed	pH, pCO ₂ , pO ₂ , Na, iCa, K: optical fluorescence; tHb, sO ₂ : optical
	reflectance
Device is part of a series of related models	ves. Opti Series
User list/group available	yes (through Roche sales dept.)
Device warranty	1 yr (service contract available for subsequent years)
Loaner devices provided	yes
Open or closed system/external gas tanks required	closed/no
For POC testing or laboratory	POC & laboratory
PUC: Uses disposable prepackaged reagent/electrode system for analysis	reagent/ontode
No. of disposable reagent system units in basic shipment package	4 individually packaged cassettes per pkg
No. of samples analyzed per 1 disposable reagent/electrode system	up to 25 patient samples per cassette + QC
List price per disposable reagent system	depends on volume—contact Roche
Reagent unit storage requirements	room temperature
Laboratory:	
No. of different disposable reagents required to maintain device	2
Shelf life	cassette: 6 mos. reagent pack—1 vr
Cost per test/reagent cost per test	depends on volume—contact Roche/same
Calibrations required	1 point (automatic) with each sample or every 30 min
Calibrants traceable to NIST standards	Ves
Internal QC program recommended	2 levels QC/8 hrs
QC features	statistical calcs., L-J with external system (DataCare);
Remote control of device from laboratory	stores i mo—3 ieveis ondoard
System can use LOINC to transmit results to LIS	no
Detects clots within analysis chamber Specimen types suitable for device	yes nlasma serum w blood canill mixed ven arterial venous
Acceptable anticoagulants	heparin, lithium
Sampling technique	aspiration
Suitable for samples from well/sick neonates	yes/yes
Sample size for complete panel of analyte results	125 µL
Recommended collection device	syringe, capillary, AVL microsampler
Provides for patient temperature corrected results	yes
Time from sample introduction to result availability	1 min from sample aspiration
Optimal throughput when calibrated and awaiting specimens	18 samples/hr
Calibration can be interrupted to perform stat sample	no
Contraindications	none
KNOWN INTERTERENCES Restrictions based on Hct	none no (Het calculated based on meas Hb)
Sampler has self-wiping probe	No (not valoalatea basea on meast no)
Time required for maintenance by lab personnel	weekly: 1 min, quarterly: 5 min
Diagnostics performed through modem	yes/110 NO
Training & certification program for user	yes (on-site or at vendor office as needed)
Method of analyst ID in system Reanance for bordware & coffware foilure/wear ID & OC foilure/	oper. ID and/or secure 4-digit PIN No. for 150 oper. (customizable)
calibration & power failure	display (missing or not valid). QC: on display (report flagging
•	param. high or low)/calib: on display prior to sample aspir., power:
	low batt. identified on display-warning; automatic customized QC
	IUCKUUL
Supports bar-code scanning of:	operator & patient ID, accession No., QC ranges, cassette lot
•	No./exp., reagent pack lot No./exp., factory cal. info. & cassette type
User can search for and review previous nationt results on screen	no

yes/RS 232. IR

Moderating menu to lighten load

Raymond D. Aller, MD Vendors of commercially available blood gas analyzers have made steady, albeit sometimes slow, progress in adding analytes to the menus of such devices.

In the early '80s, these instruments were restricted to pO₂, pCO₂, and pH. Hemoglobin soon was added. Technologies were introduced in the early '90s that allowed vendors to add a steady stream of additional analytes.

Many vendors in this arena view themselves as being in the critical care field—if the analyte is not done stat on ICU patients, they don't add it to the menu. The need for rapid results is just as great in the emergency department, but this area requires a slightly different menu.

In the ER, the blood gases that serve as the genesis of these critical analyte instruments can often be replaced by a pulse oximeter. More important are potassium, calcium, creatinine, alanine aminotransferase, and lipase.

Two years ago, while observing the slow demise of the traditional "med-surg" nursing unit and the shift toward routinely discharging all but the sickest patients to home care, I began to wonder why we still do 24-hour turnaround time procedures in hospital laboratories. What procedures really need to be available in the hospital instead of being provided, with eighthour turnaround time, by a regional core lab?

This led me to propose, in the August 1999 issue of CAPTODAY (page 48), a minimum menu for a hospital lab. That menu, with a few additions, includes blood gases, glucose, potassium, sodium, total CO2, creatinine, ionized calcium, ALT, alkaline phosphatase, lipase, bilirubin, hemoglobin, WBC, absolute neutrophil count, platelets, PT, PTT, fibrinogen, blood smear, Gram stain, and CSF cell count. Immunoassays include quantitative hCG, troponin, digoxin, phenytoin, RSV, rotavirus, Ddimer, ABO Rh, and red cell antibody screening. Clinical staff in some hospitals also might include lactate, oncotic pressure, ionized magnesium, and TSH. (If you take exception to any of these items or believe that a critical analyte was overlooked, please convey your opinion by sending an e-mail to raller@mdslabsus.com.)

This list presumes that specimens can be transported to a regional core laboratory within a two-hour radius for other analyses. The regional core lab would handle such vital analytes as HIV antibody, HBsAg, therapeutic drug monitoring and toxicity, most microbiology, and the 85 or more other chemistries commonly performed.

We urge vendors to move toward critical chemistry instruments that could be teamed with one or perhaps two other devices to analytes. With such an

Information on hard copy report	customizable, can incl. input values, meas. values, calc. values	e	encompass this range of analytes. With such an
Analyzer connects to Interface standards supported To upload patient & QC results, how analyzer connects to external system Information included in transmission from analyzer to external system	data management system, which connects to LIS/HIS; directly to LIS/HIS (both options) ASTM 1394, ASTM 1238, HL7 (with DataCare) n direct serial or IR device unique identifier, operator & patient ID, result, QC identifier, all information pertinent to patient & QC data, accession No.	i a c I I I I I I	analyzer array, it would be feasible to close down the "big iron" laboratory instruments an provide essential services for a critical care hose pital/ER. Until such analyzers are available however, every hospital, no matter how small
Hardware/software for data management system No. of different management reports system produces Contents downloaded from DMS to analyzer System connected (live installations) to which LISs/HISs • using screen animation/screen scraping • using standard HL7 interface • using proprietary protocol interface Use a third-party interfacing tool/engine for LIS/HIS interfaces	Opti has onboard data management capabilities; additionally Roche DataCare software is available as a client/server 40 none none Meditech, HBOC, Cerner, SMS, others (call Roche for updated list) Kaiser Permanente, others Dawning, Cloverleaf, Data Innovations (not required but can use)		must continue to maintain comprehensive and expensive "big iron" instrumentation. Pages 36–58 profile 23 in vitro blood gas ana- yzers from eight vendors. Before purchasing an analyzer, talk to users of these instruments about vendors' performance claims, instrument relia- bility, and quality of customer support.
Distinguishing features	meas. tHb/s0 ₂ ; 6 mo shelf life of cassettes stored at room temp. simplifies logistics; automatic sample aspir. from syringe and capillaries; cassettes provide up to 25 patient samples + QC; operates in cool temps. ($10^{\circ}-30^{\circ}C/50^{\circ}-86^{\circ}F$); extensive list of input parameters; onboard printer	l f c	Dr. Aller is vice president for medical affairs and in- formatics at MDS Laboratory Services (U.S.). He can be reached at raller@mdslabsus.com.

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

Built-in printer/data port