IonQuest™

COMPLETE ION CHROMATOGRAPHY

CECIL

Superb Performance Ion Chromatography

The completely new Ion Chromatography system from Cecil Instruments – IonQuest – is a top performance modular system.

The conductivity cell is enclosed with a heat exchanger in a precisely thermostatted enclosure. The temperature of the enclosure is controlled to better than ±0.01°C.

The working temperature may be set by the operator to be between 25°C and 50°C and set with a default value of 35°C during production testing.

Modular Flexibility

The system is easy to use by control panel operation, or by using the sophisticated Cecil PowerStream software for data acquisition, processing and reporting. Full system control is also provided by the workstation equipped with PowerStream.

The modularity of the system enables its configuration to be changed with ease, for instance to use a UV/Visible detector.

Modules may readily be replaced, to reduce down-time, should the need arise.

Precision Temperature Control

The eluent background conductivity changes by about 2% for a 1°C change in temperature. The cell temperature controlled enclosure temperature may be set by the operator to avoid ambient changes causing drift. The default value is set at 35°C and controlled to better than ±0.01°C. Temperature compensation is not therefore required.

Pulse Free Pump

Mobile phase pumping is provided by a dual piston, digitally controlled, pump. Electronic feedback control virtually eliminates pulsing without using mechanical damping.

Column Oven

The very precisely temperature controlled oven accommodates Anion and Cation columns and pre-columns, as well as a background suppressor cartridge with its over pressure protection valve.

Close coupling to the detector provides high stability, low noise and low dispersion.

Leak Detector

A specially designed leak detection system is accommodated within the cell oven enclosure.

The detection system may be used to shutdown the system if a leak is detected in the enclosure.

PowerStream Software

This software, developed by Cecil Instruments, provides system control and superb data processing, manipulation and reporting with truly unrivalled ease.

Detector – Advanced Design

The CE4710 Conductivity Detector is an entirely new design from Cecil Instruments providing performance of the very highest order due to its exceptionally low noise and unrivalled baseline stability.

To achieve this standard of performance a very low volume, 0.5µL, conductivity cell has been designed and is operated in a precisely thermostatted aluminium oven enclosure.

A specially designed, low dispersion, heat exchanger, is also mounted in the cell enclosure preceding the detector cell. The exchanger stabilises the temperature of the mobile phase entering the cell. With the enclosed system controlled to better than ±0.01°C superb performance is always available.

Autozero and auto-range facilities are provided to ensure convenience of operation. Built-in diagnostics aids instrument evaluation and fault finding.

The temperature controlled cell and heat exchanger enclosure is conveniently accessed from the side of the detector module, as shown in the photograph.

Detector Features

- Full control by PowerStream software workstation
- Keypad and LCD interface, for local operation, when required
- Large memory for analytical methods
- Autozero for operator convenience
- Operator selectable cell temperature; default 35°C
- Leak detection system shutdown. Important for unattended operation.
- Self diagnostics to confirm instrument function
- Mounting facility for Rheodyne injection valve
- Calculation of detector cell constant not required
- Polarity switching

Chemically Suppressed Solvent Background

Sensitivity for the measurement of anions is greatly improved by reducing the conductivity of the eluent, post column.

An optional Anion Membrane Suppressor - SAMS ™ - is available which is mounted in the column oven, in series with and after the analytical column.

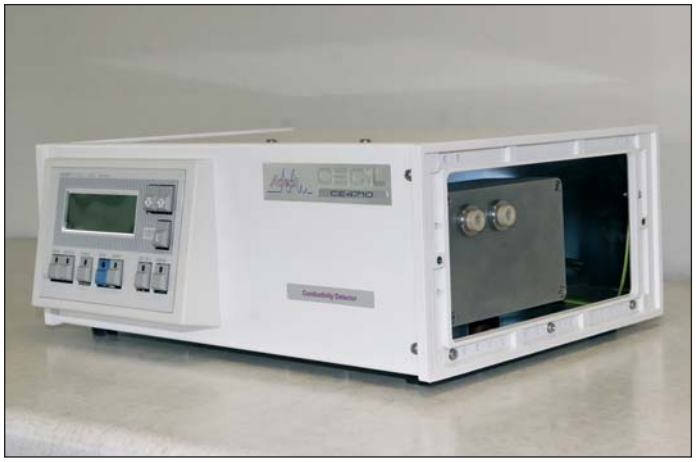
The suppressor may be used continuously and is regenerated by a Continuous Anion Regeneration System - CARS ™ - , which pumps the regeneration fluid through the post column suppressor cartridge.

The suppressed solvent background conductivity leads to reduced drift and noise and therefore higher sensitivity for measurements is available.

Close Coupling to Oven

Close coupling of the detector to the oven is important in eliminating the effects of ambient temperature fluctuation on results. The couplers can be seen on the side of the detector.

The cell compartment thermostatted enclosure is shown in the lower photograph, with the side cover removed for easy access.



Pump-Proven Performance

The Cecil CE4100 dual piston solvent delivery pump is well established as very reliable, convenient to use, with a very high performance specification.

The microprocessor controlled pump uses a precise stepping motor drive for the dual overlapping pistons which deliver solvent with very little pulsing.

Electronic feedback is used to control the pump speed during its cycle to reduce pulsing to a negligible level. No further mechanical pulse damping is required.

Delivery of mobile phase in the range 0.2 – 2.5mL per minute, the usually used range, is well within the ability of the pump, which delivers in the range 0.001mL/min to 10mL/min.

The wetted components of the pump are, sapphire, ruby and ceramic inserts.

The Total I C Concept

- Dual overlapping piston pump
- Microprocessor control for low pulsing
- Chemically inert flow-path
- Precisely thermostatted cell
- Low dispersion heat exchanger
- Dual column oven
- Leak detection
- PowerStream data processing
- PowerStream system control
- In line vacuum degassing
- Regenerative chemical suppression
- IC using UV detector
- Suppressor cartridge in oven
- Modular flexibility

Convenient Column Oven

It is important that the separation columns should operate at a constant temperature, matching the temperature of the measuring cell.

The CE4601C column oven module is a very convenient front opening design accommodating two analytical columns and pre-columns and also, when needed, a mobile phase background conductivity suppressor cartridge and its over-pressure protection valve.

The oven operates over the range from ambient temperature +5°C to 85°C.

The default temperature is set at 35°C.

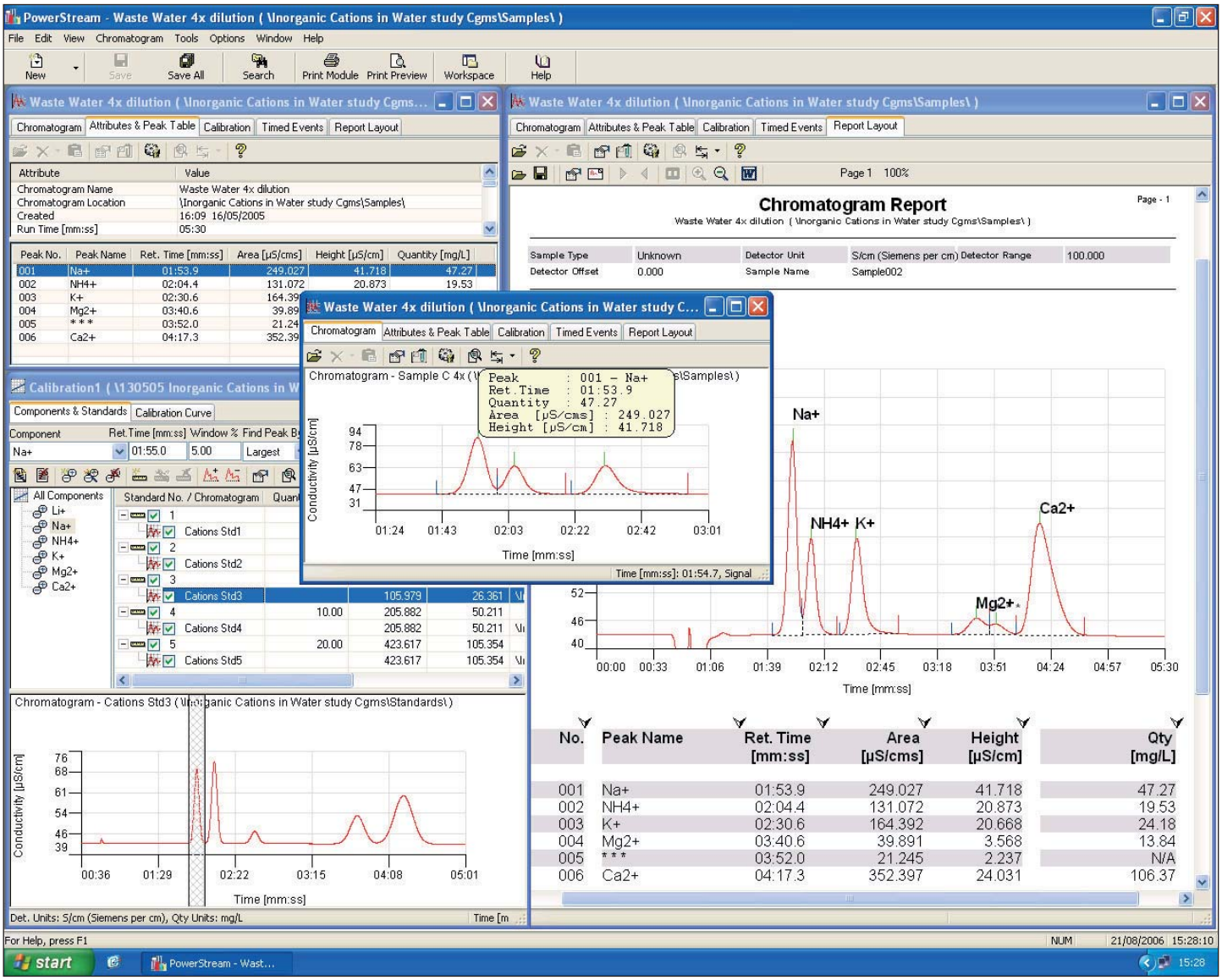
The actual and set temperatures are displayed by a bright LCD display and may be controlled by the adjacent keypad, or set by the PowerStream software. Temperature stability is better than ±0.01°C.

The flow tubes from the columns and suppressor cartridge enter and leave the oven enclosure through convenient self-sealing ports. The output port to the cell thermostatted enclosure lines up with the input connector of the enclosure, when the modular system is arranged as shown in the photographs of the system.

The very close coupling to the detector cell leaves only about 2 centimetres of tube between the oven and the cell. With the cell and oven operated at the same temperature, say 35°C, drift or noise due to ambient fluctuations is eliminated.

A column switching valve may be fitted to the oven offering convenient operation.

BY POWERSTREAM SOFTWARE



PowerStream – The Powerful Software

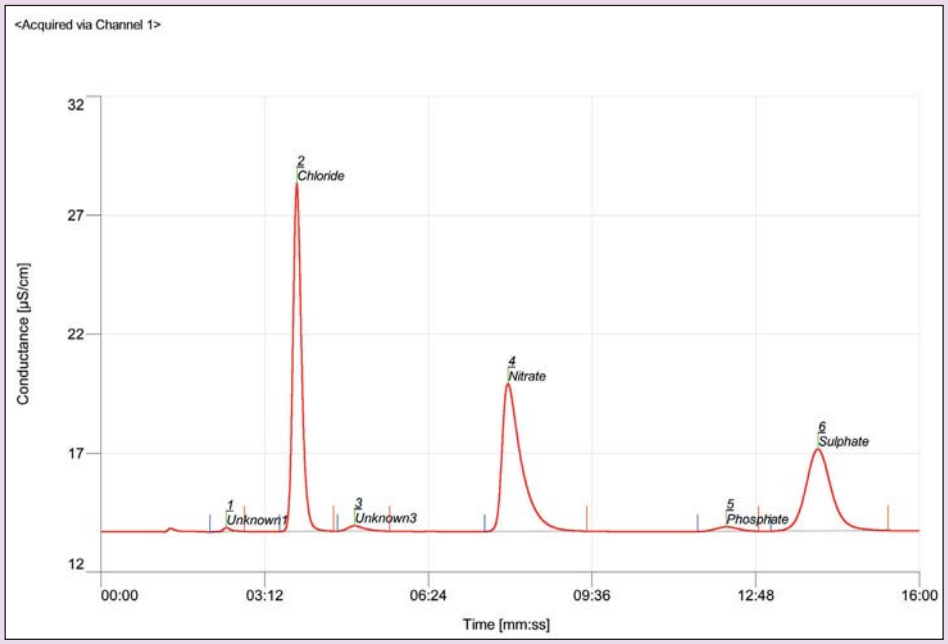
All the data processing procedures and power you need are elegantly available in PowerStream software. Digital system control is also available.

A typical display is shown here of a waste water cation analysis with a superimposed portion of the chromatogram highlighting sodium.
Detail and clarity are excellent and the software is truly both easy to use and sophisticated.

A fully interactive graphical interface provides for full method development, data capture and display of chromatograms for live screen display during a run. Developed to operate with Windows XP and VISTA, it may also be used with Windows 2000.

PowerStream Features

- Digital and analogue outputs
- Process signals from multiple detectors
- Comprehensive integration parameters
- Calibration curves with unlimited number of standards
- Linear, Quadratic and Cubic calibration curves
- Chromatogram overlays
- Bracketing of samples
- Digital control of a range of peripherals



Anions in Drinking Water

The Anion Suppressor was used

Column:-	Allsep Anion 100 x 4.6mm
Mobile Phase:-	0.85 mmol/L $NaHCO_3$ 0.90 mmol/L Na_2CO_3
Flow Rate:-	1.2mL/min
Injection Volume:-	20 µL
Column Temperature:-	35°C
Detector Temperature:-	35°C

Retention Time (mm : ss)	Anion	Measured concentration (ppm)
02:27	Unknown	-
03:49	Chloride	-
04:57	Unknown	-
07:57	Nitrate	37
12:13	Phosphate	-
14:01	Sulphate	-

Some Applications

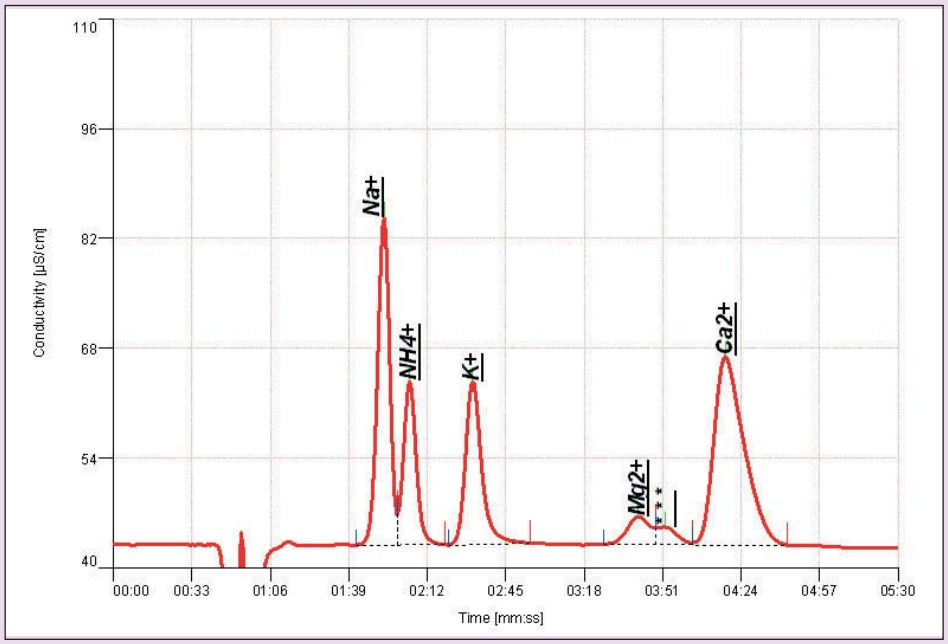
Drinking, surface and waste water

Sulphites in wine

Phosphoric and citric acids in soft drinks

Organic acids in water

Bromide in water



Inorganic Cations in Effluent Water

Column:-	Universal Cation 7 µm 100 x 4.6mm
Mobile Phase:-	5mmol Methanesulfonic acid
Flow Rate:-	1.5 mL/min
Injection Volume:-	20 µL
Column and Detector Temperatures:-	35°C

Nucleic acids

Fatty acids and hydroxy fatty acids

Amino acids

Dicarboxylic acids

Amino acids

Weak organic acids

Sodium in foods

Metals in soil

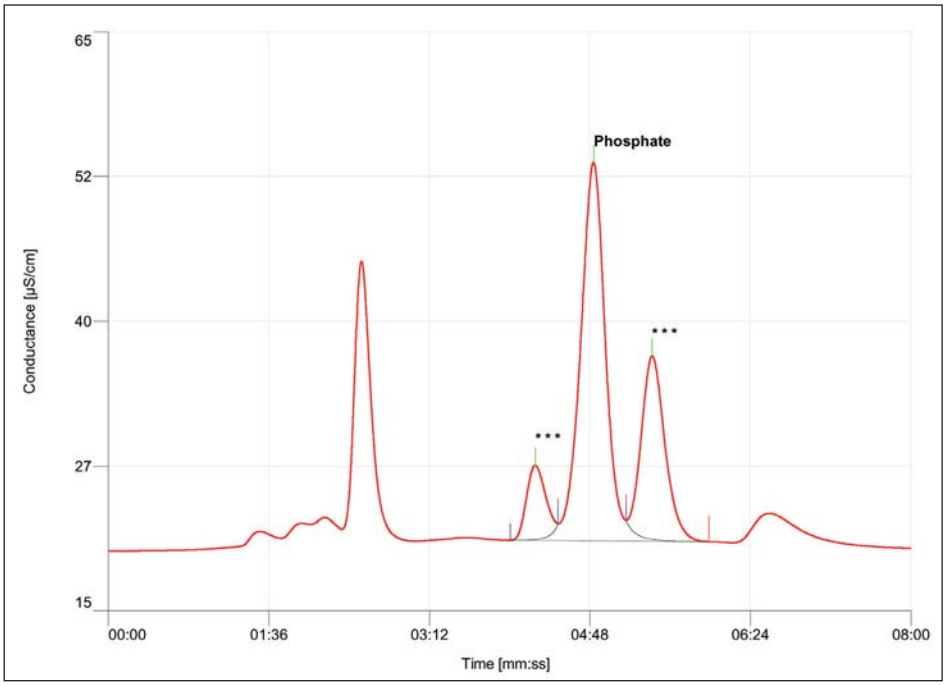
Azide and cyanate in explosives

Alkali metals and alkaline earths in grain

Chromate and sulphate in electro plating

Retention Time (mm : ss)	Cation	Measured concentration (ppm)
01:54	Na^+	72.03
02:04	NH_4^+	29.39
02:34	K^+	36.30
03:38	Mg^{2+}	6.47
4:17	Ca^{2+}	106.56

WITH HIGH SENSITIVITY



The determination of Phosphoric acid in a cola drink, as shown here, required under 5 minutes using a flow rate of 1.3mL/min.

Phosphoric Acid in Soft Drinks

The established method for determination of Phosphoric Acid in cola beverages uses the "molybdenum blue" analysis. This spectrophotometric method is not however rapid.

An Ion Chromatography method was developed, in our applications laboratory, which is both rapid and accurate. The Cecil CE4715 suppressor was used to reduce background conductivity. This improved sensitivity with reduced noise and drift. The reduction was from about 500µS/cm to 20µS/cm.

The flow rate of the eluent: 2 mM Na_2CO_3 / $NaHCO_3$ buffer, was 1.3mL/min with a 7 micron anion column.

The column oven and cell were both at 45°C.

Versatility

The modular design of the system leads to complete versatility through interchange of modules.

For methods requiring the use of a UV/Visible detector, the conductivity detector is easily replaced by the CE4300 variable wavelength detector, or the fast scanning DAD WaveQuest detector as shown in the photograph.

SPECIFICATIONS

Conductivity Detector CE4710	
Conductance Display Range	0.01 – 5000µS/cm
Output Signal	Selectable for anions or cations
Time Constant	0.1, 0.2, 0.5, 1, 1.5, 2, 5s
Autozero Range	Typically up to 10,000µS/cm
Synchronous Detection Frequency	5kHz
Noise	Less than ±1nS/cm, DI water, 1mL/min, 2s
Drift	Less than 20nS/cm/h, DI water, 1mL/min,
Cell Volume	0.5µL
Cell Body	PEEK P1000 grade
Electrodes	316 stainless steel
Cell Pressure Rating	200psi
Cell Enclosure Heater	20 watt
Operating Temperature	25 – 50°C; 35°C standard
Temperature Precision	± 0.01°C
Warm-up Time	10 minutes typical
LCD Screen	4 lines, back lit, adjustable contrast
Method Storage	Up to 100 with password protection
Analogue Output	0-1V
Computer Interface	RS232
Remote Autozero	By contact closure
Digital Control	By PowerStream software
Keypad Control	For entry of values, commands and programmes
Pump CE4100	
Pump Type	Dual piston design
Flow Rate	0.001 to 10mL/min in 0.001 steps
Flow Reproducibility	Better than 0.1%
Maximum Pressure	40MPa – 400 bar
User Interface	4 line back-lit display and full range of keys
Pressure Cut-outs	Adjustable for over and low pressures
Pulsation	Better than ±0.5% at 2mL/min
Flow Path Materials	Ceramic, ruby, sapphire, PEEK
Column Oven	
Number of Columns	2 plus suppressor cartridge
Pressure Cut-out Valve	Accommodated – Option
Temperature range	Ambient +5°C to 85°C
Temperature Stability	±0.01°C
Temperature Display	3 digit LCD display
Injection Valve	
Rheodyne Valve	PEEK flowpath, 100mL loop
Solvent Degasser	
Degasser – Optional	In-line degasser
Number of Flow Paths	Two, up to 3 mL/min each
Flow Path Material	PTFE, PEEK
System Details	
Power Requirements Total	110V or 240V, 50/60Hz, 200VA
Stack Size	365 x 290 x 470mm (WDH)

ORDERING

IonQuest System 1:

CE 4100 pump, CE 4710 conductivity detector, conductivity flow cell, CE 4601c column oven, CE 4033 solvent bottle and flow pipe co-ordinator, rheodyne injector valve with 100µL loop and mounting bracket, CE 4900 PowerStream software and system controller, 4150 05 00 installation kit, interconnecting leads, power cable and operators manual.

IonQuest System 2

As System 1 plus CE 4020 inline degasser and tubing with connectors.

Optional Items

CE 4715 Suppressor system for Anion background suppression

4720 01 01 Overpressure valve to protect suppressor cartridge

CE 4020 Solvent degasser 2 channel

CE 4800 Auto-sampler with valve

Analytical Columns

4100 60 06 Strong Anions 7µm

4100 60 09 Strong Cations 7µm

4100 60 10 Weak Anions 3µm

4100 60 11 Weak Cations 3µm

Guard Columns

4100 59 06 Strong Anions 7µm

4100 59 09 Strong Cations 7µm

4100 59 10 Weak Anions 3µm

4100 59 11 Weak Cations 3µm

Workstation Computer System

PowerStream
Chromatography System Manager

- PC with Pentium class processor
- Pentium 1 GHz or higher
- Microsoft Windows XP or Vista
- RAM 512 MB or higher
- Hard disk space 150 MB
- CD-ROM drive
- XGA or higher resolution monitor monitor resolution 1024 x 768 or better
- Mouse or compatible pointing device
- Free RS232 serial connection or serial to USB convertor

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