

History of Varian, Bruker and Scion Gas Chromatographs

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Time Line

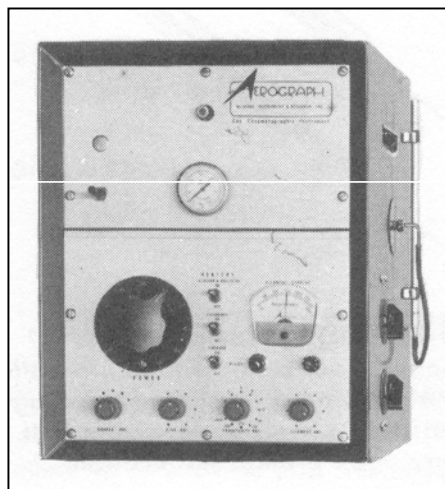
- 1952** Nobel Prize “The Development of Partition Chromatography” Archer John Porter Martin and Richard Laurence Millington Synge
- 1956** Founding of Wilkins Instruments, based in Walnut Creek, California
- 1966** Purchase by Varian Associates
- 1999** Spin off of Varian Instruments
- 2000** Relocation of GC Production to Middelburg Netherlands
- 2010** Purchase by Bruker
- 2014** Creation of Scion Instruments, and relocation of GC production to Goes Netherlands

Have you ever wondered where the number 3800 in Varian 3800 Gas Chromatograph comes from? The Varian 3800 is based on the developments of over 81 distinct gas chromatograph models produced by Varian, Inc., and its predecessors Varian Associates and Wilkens Instruments. The Varian 3800 is the latest in a sequence of 3300, 3400, 3500, 3600, and 3700 Chromatographs, and has a significant heritage from the Varian Models 1800 and 2800.

It all started with efforts by Keene Dimick, a USDA chemist in Albany, California, to capture the essence of strawberries by constructing a newfangled analytical tool inspired by the 1952 Nobel Prize recipients Archer Martin and Richard Synge. After Dimick published his novel treatises in 1956^{1,2}, the world came knocking to duplicate his efforts. With so much clamor, Dimick saw a business opportunity and, to avoid governmental restrictions, set up his brother-in-law, Ken Wilkins, to manufacture the new devices. The first was the Model A90, introducing the brand of Aerograph. As technology rapidly expanded in the 1960s and 1970s³, and even through the 1980s and 1990s, Wilkins Instruments and Varian both made significant changes in the instrument design and introduced multiple instruments reflecting the enhancements with solid-state electronics, microelectronics, microprocessors, new detector technologies, and new column advancements. The culmination of that effort is evident in the performance, flexibility and adaptability of the Varian Model 3800. This history goes something like this:

ANALYTICAL GC VERSIONS

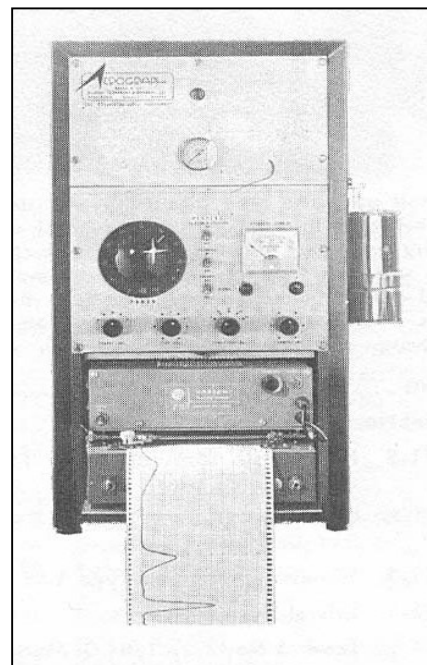
These instruments were typically set up for single dedicated applications and were designed for simple operations and ruggedness. Often they were implemented into smaller chassis, but could frequently match the performance of their “research” cousins.



A-90-C

1957 – **A-90-C**

- 4-filament TCD
- oven temperature: ambient to 300 °C
- heated stainless steel injector block
- TCD cell volume: 150 µl
- filaments - tungsten



A-100-C

1957 – **A-100-C**

- same as A-90-C, but with built-in Varian A-115 - 5" recorder with two chart speeds

¹ Dimick, K. P., and Makower, Benjamin, "Volatile Flavor of Strawberry Essence," *Food Technol.*, **10**, 73 (1956).

² Dimick, K. P., and Corse, J., "Gas Chromatography, A New Method for the Separation and Identification of Volatile Materials in Foods," *Food Technol.*, **10**, 360 (1956).

³ Varian Associates purchased Wilkins Instruments in 1966.

1957 – A-110-C

- same as A-90-C, but with built-in A-120 Brown-Honeywell 11" recorder, with four chart speeds

1961 – A-90P

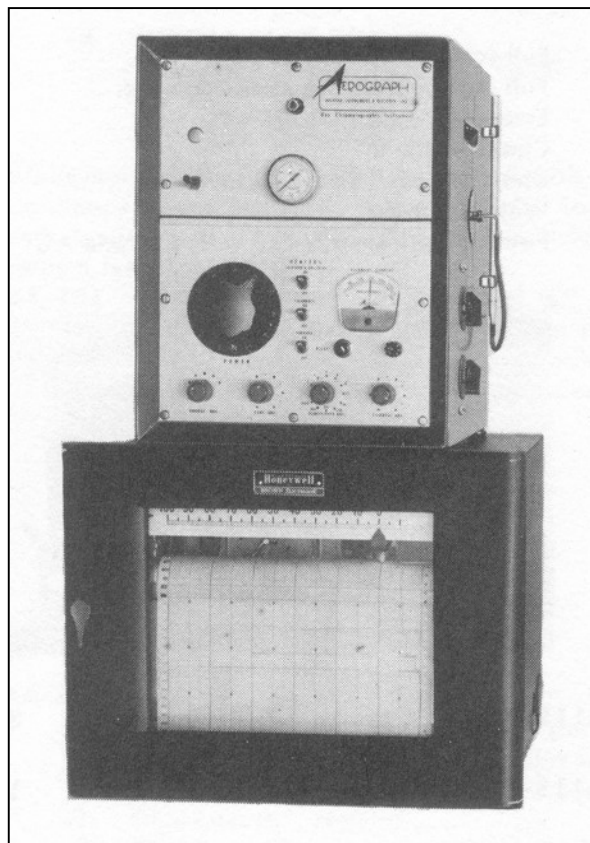
- TCD Only
- dial thermometer
- built-in 12VDC transistorized power supply
- manual column temperature programmer
- separate heaters for column oven, detector, and injector
- air circulating fan in column oven
- built-in 12 VDC transistorized power supply



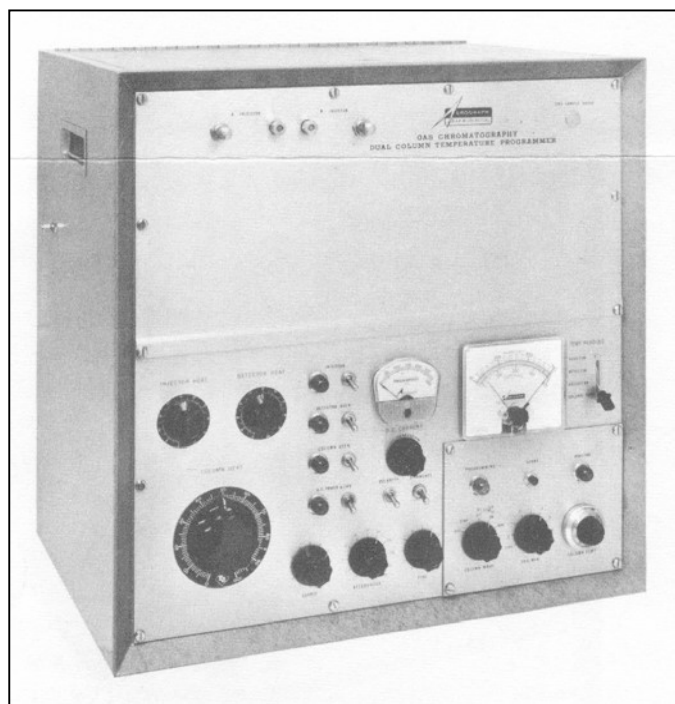
A-90P

1961 – A350B Dual-Column System

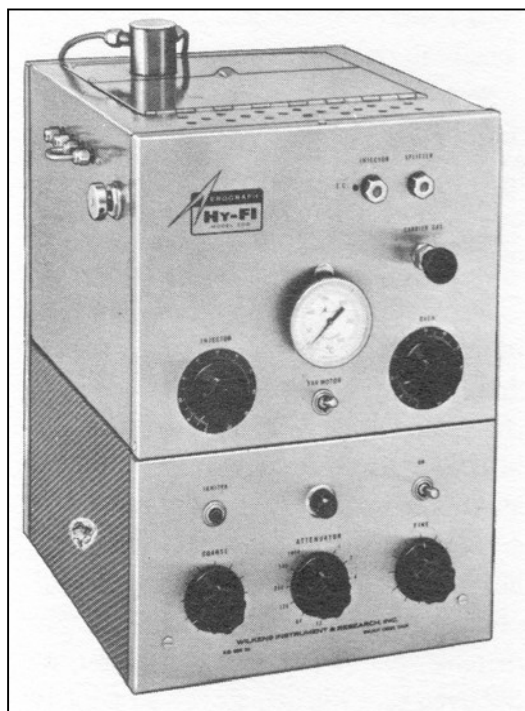
- balance column bleed
- linear temperature programmable column oven - 9 rates
- TCD only
- differential flow controllers



A-110-C



A-350-B



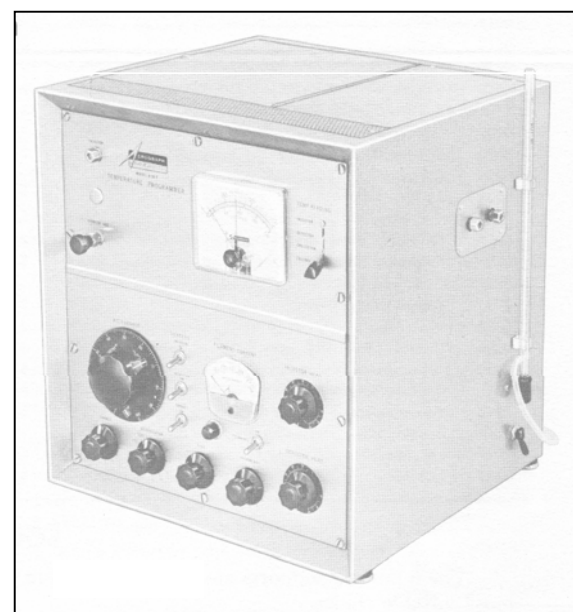
A-600-HyFI

1961 – A-600 - HyFI⁴

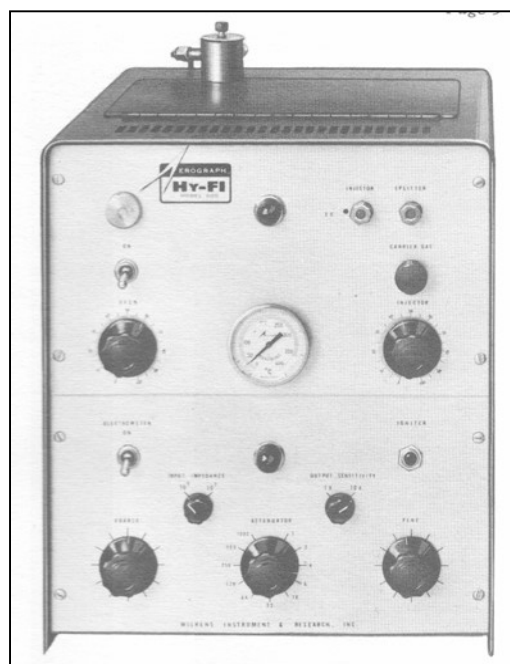
- A90P modified to accept FID
- new cabinet
- column and detector in same oven –
- new selected thermally stable vacuum tube power supply for long term trouble-free operation
- isothermal; manual programming at non-linear rates
- column temperature range: ambient to +400 °C
- separate H₂ and air connections for flame ionization detector
- dial thermometer
- detectors: flame ionization, electron capture (tritium), cross-section, phosphorus

1962 – A-90-P2

- pyrometer readout for injector, column, detector and collector temperatures
- manual column temperature programmer
- air circulating fan in column oven
- separate temperature settings for injector and detector
- built-in 12 VDC transistorized power supply



A-90-P2



A-600-B-HyFI

1962 – A-600-B HyFI

- similar to A-600
- gold-plated FID flame head
- interchangeable FID or electron capture detectors
- rapid heating, low mass column oven

⁴ Wilkins Instruments used the acronym "HyFI" for early Hydrogen Elame Ionization gas chromatographs.

1962 – Autoprep 700

- based on A-90-P2
- TCD only
- fully automatic preparative scale
- injection size – 0.1 ml to 2 ml
- automatic column temperature programmer
- motorized 8-bottle automatic collector
- automatic injector
- waste position



Autoprep 700



660 HyFI Moduline

1963 – 660 - HyFI₂ - Moduline

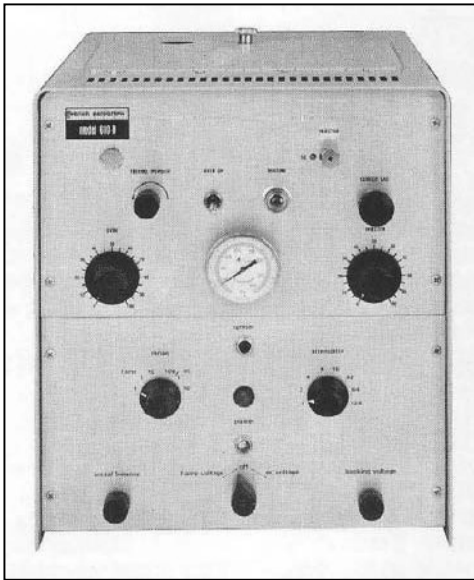
- interchangeable functional components
- field upgradeable modules
- separate detector oven, heats to 400 °C
- stainless steel column oven, heats 40 °C/min
- dual channel FID/ECD with effluent splitter
- dual channel electrometer
- manual or linear temperature programmer
- cross-section detector
- air-cooled electronic cabinet



A-600-C HyFI

1963– A-600-C HyFI

- similar to A-600-B
- electrometer with feedback circuit
- measure down to 10⁻¹² amperes
- improved attenuation controls

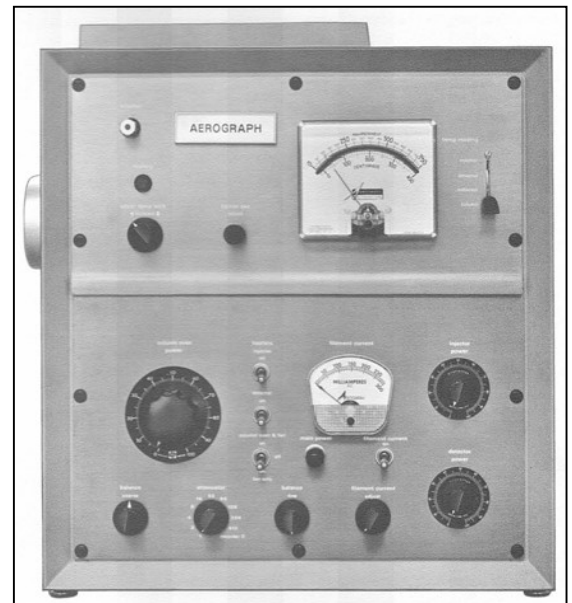


1964 – A-600-D - HyFI

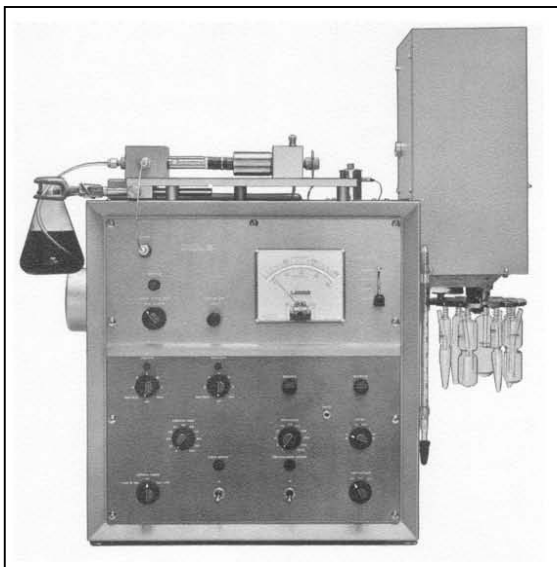
- similar to A-600-C
- electrometer sensitivity to 3×10^{-12} amps/mv

1964 – 90P3

- compact single-column instrument
- check valve in carrier to prevent sample flash-back
- column oven - 6,390 cm³
- expanded stainless steel column oven
- column oven to 400 °C
- cooling rate 300 °C to 100 °C in 8 minutes
- temperature monitor – thermocouple pyrometer with parallax correction
- adjustable column oven limit
- thermal conductivity detector only
- four-filament tungsten, constant current
- isothermal column oven
- differential flow controller with needle valve
- four tungsten/rhenium TCD filaments
- constant TCD filament current



90P3



Autoprep 705

1964 – 705 AutoPrep

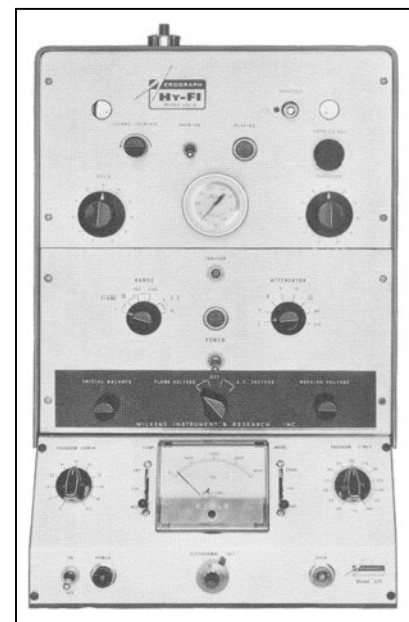
- FID
- fully automatic preparative GC
- post-column variable splitter to collect most of the sample but divert a small amount to the FID
- low cost nitrogen, instead of helium carrier

1964 – Autoprep 711

- large scale preparative and analytical GC with FID
- column oven - 33,300 cm³
- column oven - proportionally controlled isothermally or linear temperature programmable at 0.5 °C/min to 20 °C/min
- post column splitter

1964 – Option 328

- temperature controller with platinum probe
- isothermal or temperature programming
- oven control to 0.2 °C
- adaptable to any HyFI column oven



Option 328 with 600 HyFI



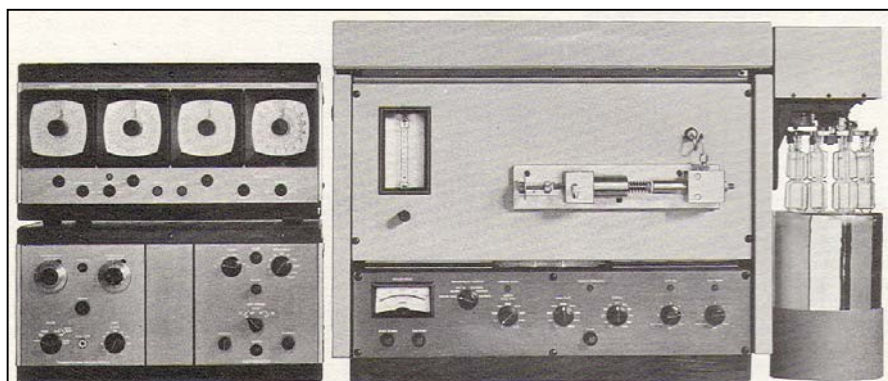
680 Pestilyzer

1965 – 680 Pestilyzer

- specifically designed for analysis of chlorinated pesticide and herbicide residues
- all glass column system
- removable Pyrex injector insert
- single channel electrometer
- built-in 2" chart recorder with pressure-sensitive paper
- concentric tube electron capture detector
- feedback stabilized electrometer
- thermostatic cast aluminum oven
- plug-in jack for external recorder

1965 – Autoprep 712

- automatic pneumatic injector - 0.1 ml to 5 ml
- automatic repetitive injection and collection of samples
- full proportional oven temperature control
- FID with built-in splitter
- 15-position automatic collector
- four-unit timer module



Autoprep 712



900

1965 – **900 Simulated Distillation**

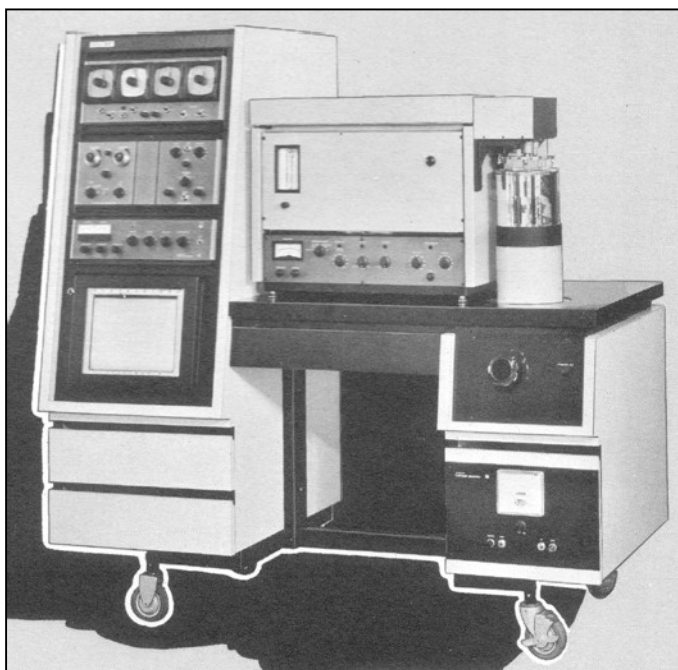
- completely self-contained
- linear column temperature programmer
- low mass column heater assembly
- flame ionization detector and electrometer
- integrator, printer and recorder included
- column oven to -60°C with LCO_2

1966 – **Autoprep 713**

- automatic time pressure injector and control module for reproducible injections of wide volume ranges
- sample capacity - 500 ml
- injection volume - 0.1 to 30 ml
- sample preheater for viscous samples



Autoprep 713



715 Autoprep Mark II

1966 – **715 Autoprep Mark II**

- similar to 713
- baseline drift corrector
- refrigeration unit and dewar to -60°C
- dewar elevator
- hydrogen and air generator included
- wheeled cart

1966 – 1200 – HyFI3

- low-cost, compact size, and versatile
- single channel FID or ECD
- whole new cabinet
- all transistor electronics
- solid-state operational amplifiers
- isolation of critical high impedance input circuits
- separate injector and detector ovens
- linear temperature programmable column oven
- column oven – 7,964 cm³
- cooling rate from 400 °C to 100 °C in 5 minutes
- universal base for ionization detectors

1966 – 1210

- electron capture version

1966 – 1220

- specifically designed for capillary
- independently heated capillary injector splitter
- linear reproducible splitter
- make-up gas plumbing
- reproducible retention times with programming
- FID



1200 – HyFI III

1967 – 1400

- FID or ECD only
- single column
- column oven – 6,614 cm³
- column temperature range - ambient to +400C
 - injectors - on-column or flash vaporization
- column cooling from 400 °C to 40 °C in 6 minutes
- thermocouple pyrometer
- linear temperature programming or isothermal
- automatic cooldown and reset to initial temperature
- electrometer completely solid-state with JFET input for minimum drift and unsurpassed reliability
- 220 volts only, even in US

1967 – 1420

- TCD
- dual column
- all thermal zones thermally isolated with individual temperature controls
- differential flow controllers for constant flow through both flow systems



1420

1968 – 1440

- 120 volt version for US
- single column
- universal detector base
- column oven - 6,614cm³

1968 – 1450 – ECD H³

1968 – 1475 – ECD Ni⁶³

1968 – 1485 – Alkali FID

1968 – 2440

- dual channel FID
- dual heated injector ports
- linear temperature programmer
- dual/differential electrometer



1440



920

1974 – 920

- TCD Only
- compact multipurpose instrument
- column oven - 5,390 cm³
- solid-state isothermal proportional controller for column oven
- thermal conductivity detector only
- solid-state detector electronics
- individual proportional controls for injector, detector and column ovens
- differential flow controller and fine metering valve for carrier
- fine metering valves for reference flow

1974 - 940

- FID Only
- compact multipurpose instrument
- 5390 cm³ column oven
- solid-state isothermal proportional controller for column oven
- flame ionization detector only
- solid-state electrometer, ranges 10⁻¹¹, 10⁻¹⁰, 10⁻⁹ amp/mv
- individual proportional controls for injector, detector and column ovens
- fine metering valves for carrier, hydrogen and air



940



**3400 (shown with
8100 AutoSampler)**

1984 – 3400

- microprocessor controlled
- inboard data handling (IBDH) and printer
- AutoSampler™ control through keyboard
- column oven: -99 °C to 400 °C
- column oven - 10,100 cm³
- 4 step column temperature programmer
- two detectors and electrometers
- two injector spaces
- subambient temperature programmable capillary injector
- on-column packed, flash packed and split/splitless capillary
- universal ionization detector base
- FID, TCD, ECD, TSD, FPD, PID, ELCD, and Saturn MS detectors
- heated pneumatics compartment
- 4 external events
- 4 heated zones

1985 – 3300

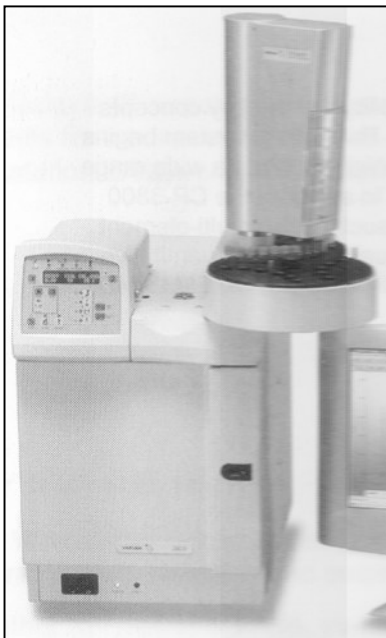
- low cost version of 3400
- single method
 - no IBHD
 - no AutoSampler™ control
 - 1 external event

1988 - 3410

- high temperature version of 3400
- column and detector temperatures: -99 °C to 420 °C

1995 – 3350

- single channel only version of 3400



3900

1998 – 3380

- dual channel version of 3800
- manual pneumatics for injector
- manual detector flow controllers
- column oven - 15,568 cm³
- seven external events
- 5 heated zones



3380

2002 – 3900

- FID/TCD only
- detector electronic flow controllers
- split/splitless capillary injector only
- column oven - 5,637 cm³
- 7" diameter column
- electronic flow control for injector
- AutoSampler™ control through keyboard

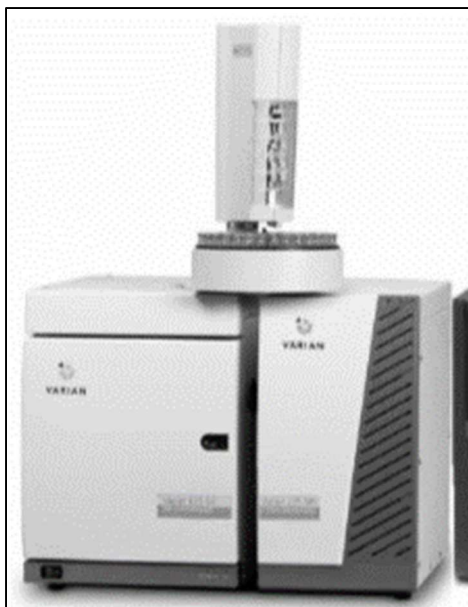
2003 4900

- micro-machining and computing technologies
- one to four plug-and-play GC channels.
- Each channel is a separate GC with pneumatics, injector, column, and detector.
- Low power consumption



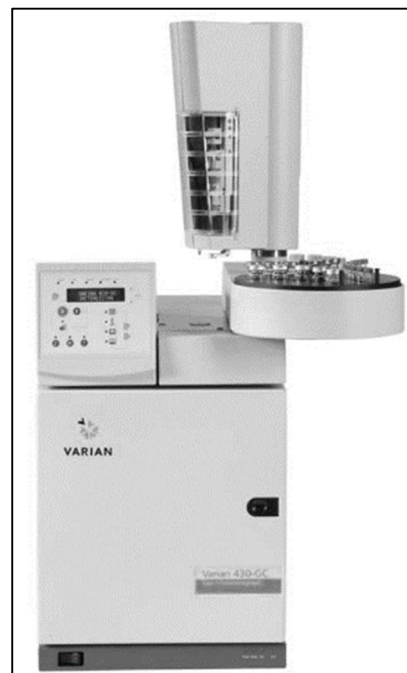
2007 431

For use with Varian Mass Spectrometers
status and control through GC Remote Control app
split/splitless capillary/packed-megabore injectors only
column oven - 5,637 cm³
electronic flow control for injector
AutoSampler™ control through Workstation



2008 430

- Heated zones: 3 (including column oven).
- single electrometer range - 100μV to 1 kV
- Local display and control display: VFD display: 2 lines, 20 characters per line.
- Maximum stored methods: 5,
- 7" diameter column split/splitless capillary/packed-megabore injectors only
- column oven - 5,637 cm³
- electronic flow control for injector
- AutoSampler™ control through Workstation



2012 436

- With just a width of 32cm;
- large color touch screen – easy operation and status overview
- packed, S/SL, PTV, COC injector
- high pressure injection ports for applications from 0 – 10 Bar
- compact oven with fast heating and cooling speed up to a maximum of 170°C/min; the oven cools from 400°C to 50°C within 4.5 minutes
- up to 24 temperature programs
- Temperature set-point resolution: 0.1°C
- Maximum stored internal methods: 50
- Local Display: • TFT full color screen • WVGA resolution (800 x 480) • Size 23 cm (9")
- One detector - FID, TCD, ECD, NPD/TSD, PFPD, PDHID, plus SQ- and TQ-MS detectors
- Languages: • English, German, French, Spanish, Italian, Portuguese, Cyrillic, Kanji, Chinese (standard and traditional), Thai, Korean and Dutch.
- Communication Ethernet: Protocol: TCP/IP Data rate: 100 Mbps Control: GC control and method parameters
- Up to 3 EFC modules total, injector, detector and auxiliary
- Heated zones: – Standard 5
- time-programmable External events (digital output): – 8 standard – 8 optional, total 16
- single electrometer range - 100µV to 1 kV



2021 8300

- 10" Compact footprint of only 32 cm (12.6") wide
- Fast ramping oven (170°C/minute)
- Two channel architecture, with up to 2 injection ports and 2 detectors (including MS), o=
- 10" High resolution full-color touchscreen, 16 languages supported
- Electronic flow control (EFC), 3 channels 0.001psi resolution
- Ethernet: Protocol: TCP/IP Data rate: 100 Mbps
- Time-programmable External events (digital output): – 8 standard – 8 optional, total 16
- Heated zones: 5
- single electrometer range - 100µV to 1 kV

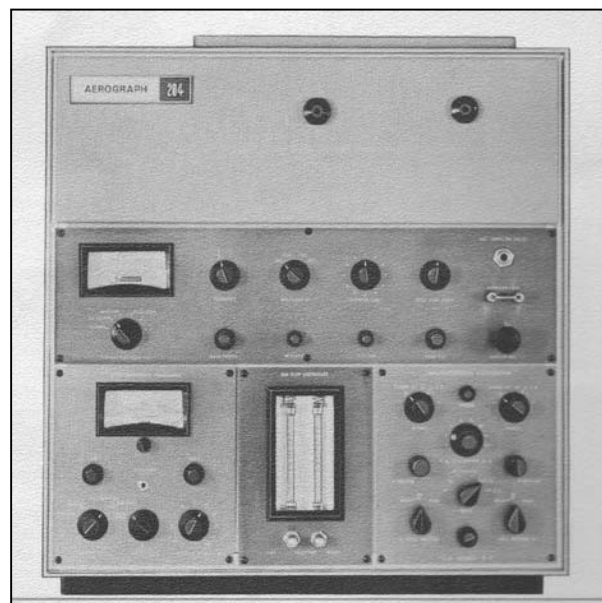


RESEARCH GC VERSIONS

These systems are set for the maximum performance available and readily adaptable in the field for new applications or hardware. Construction is generally modular for easy field-upgrading. Injectors and detectors are frequently interchangeable due to universal bases and ovens.

1963 – 202 – Moduline

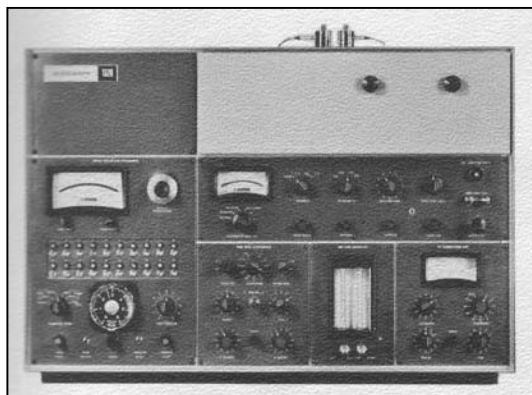
- TCD version
- two on-column or flash vaporized injectors
- dual columns
- linear column temperature programmer
- rapid cool-down from 400 °C to 100 °C in 4 minutes
- dual/differential flow controllers with two independent needle valves
- column oven: ~9,000 cm³
- fan for electronics cabinet cooling
- on-column or flash vaporization packed injectors
- separately heated detector oven
- adjustable temperature limiting device for column oven



204 Moduline

1963 – 204 – Moduline

- dual flame ionization detectors
- dual/differential electrometer
- optional ECD, micro cross-section, and sodium thermionic detectors



1520

1963 – 1520

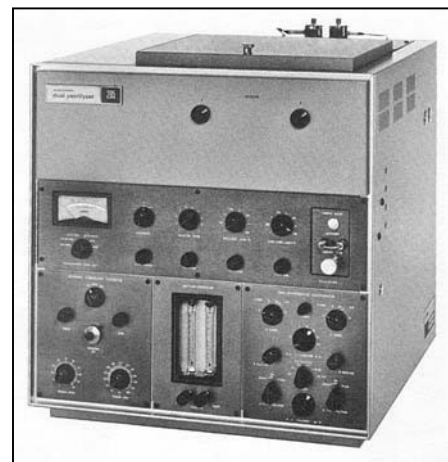
- dual columns, dual flame ionization and thermal conductivity
- column oven - 17,900 cm³
- matrix multi-level temperature programmer
- automatic oven cool-down and reset to start temperature
- on-column or flash vaporized injection
- dual injectors with separate temperature controls
- dual/differential electrometer and TCD electronics
- separate detector and column ovens with proportional temperature control of detector oven
- two-position manual sample collector

1963 – **1521** - TCD only, but upgradeable to add FID

1963 – **1522** - FID only, but upgradeable to add TCD

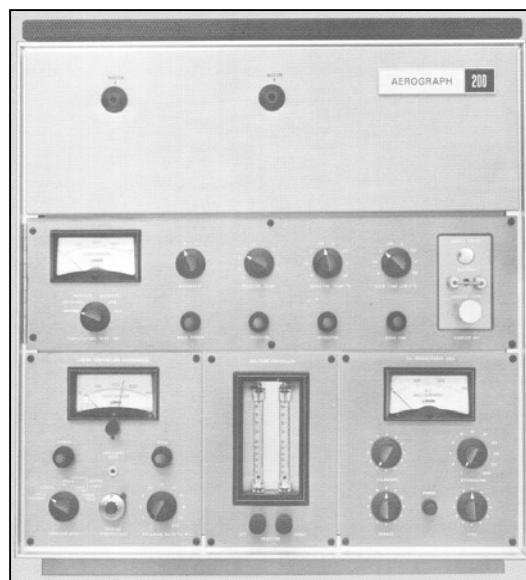
1963 – 205 Pestilyzer

- dual columns
- dual flow controllers
- Pyrex injector inserts and columns
- dual ECD
- two-channel electrometer
- dual rotometers for carrier gas
- dual electron capture detectors



1965 – **202-1B – Moduline B**

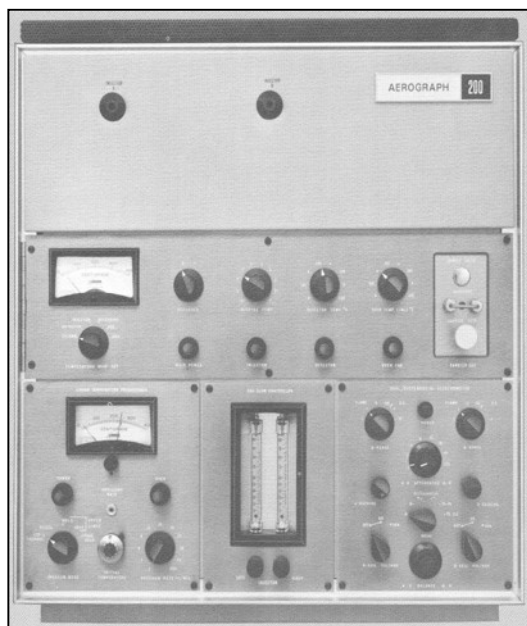
- dual columns
- TCD with WX filaments
- solid-state Wheatstone bridge
- column oven - 17,500 cm³



202-1B

1965 – **204-1B – Moduline B**

- dual columns
- dual FIDs
- two independent electrometers



204-1B

1965 – **1520B**

- larger oven and cabinet
- dual columns, dual FIDs, dual TCD
- matrix temperature programmer for multi-level programming
- automatic column oven door opener for cooldown
- dual/differential electrometer for two independent electrometers or differential mode for compensation for column bleed
- column oven - 17,500 cm³
- interchangeable injectors
- cooling rate – 400 °C to 100 °C in 3 minutes
- adjustable temperature limiting device for column oven



1520B

1965 – 1525B Preparative

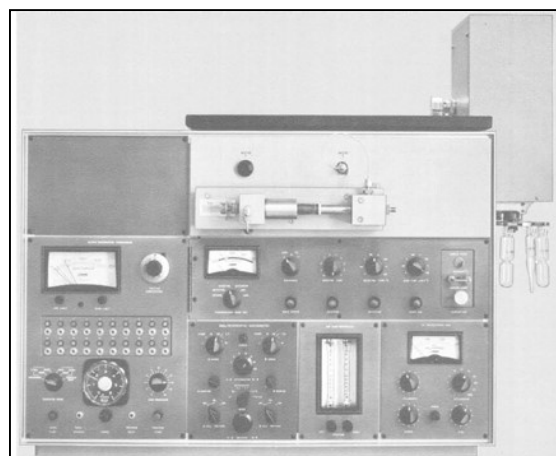
- automatic injection and collection of samples (collects 15 samples)
- can be used as analytical or preparative GC
- automatic sample injection – 0.025 ml to 1.5 ml



1532

1965 – 1532 – Trace Gas Analyzer

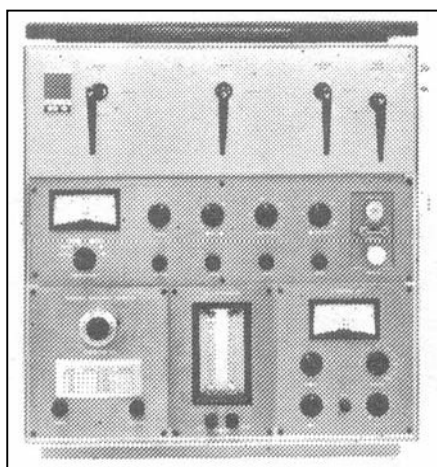
- dual helium ionization detectors
- tritium ionization source
- isothermal proportional controller for column oven
- liquid nitrogen trap for helium carrier
- detection to low ppb V/V for many gases



1525B

1966 – 2100 – “4 columns for U”

- specifically designed for biomedical field and pesticide work
- four injectors/four detectors
- common detector base for interchangeability
- floor mounted column oven
- U-columns to avoid “race track” effect
- column oven - 47,950 cm³
- total glass system
- two solid-state dual/differential electrometers for four detector operation



202B Natural Gas Analyzer

1967 – 202-B Natural Gas Analyzer

- dual TCD
- gas sampling valve
- two backflush valves



2100

1967 – 1520C

- hybrid electrometer - solid state + tube input

1967 – 204-1C

- hybrid electrometer - solid state + tube input

1968 – 1720 - Moduline D

- TCD only
- column oven - 17,500 cm³
- platinum resistance temperature probes (RTD)
- four filament tungsten-rhenium hot wire
- isothermal proportional control or ballistic temperature programming



1720

1968 – 1732 Trace Gas Analyzer

- no injectors
- helium ionization detector

1968 – 1740 - Moduline D

- FID or ECD only
- column oven - 17,500 cm³
- new JFET solid state dual differential electrometer
- single or dual capillary capability
- solid-state temperature programmer: 0.5 °C/min to 20 °C/min
- total glass system
- detector temperature limit for ³H ECD detector



1740

1968 - 1800 (1520D)

- TCD and FID
- new temperature controller with Pt Probe
- completely solid-state electrometer with JFET
- optional 4-digit digital display of temperature setpoint in 0.1 °C
- computer compatible, with remote start and ready signals
- program rates – 0 to 31.75 °C/min in 0.25 °C/min increments
- new matrix MLTP (solid state electronics)
- automatic oven cool-down and reset to start temperature
- 20 step column temperature programmer
- two memory circuits for temperature programs
- column temperature range: -100 °C to +400 °C
- column oven - 17,500 cm³

1970 – 1828 Preparative

- dual column, dual TCD

1970 – 1848 Preparative

- dual ionization detectors

1970 – 1868 Preparative

- dual TCD and dual FID



1800

1970 – 2720

- TCD only
- all thermal zones thermally isolated with individual temperature controls
- dual, separately heated injector ports
- automatic linear temperature programmer
- column oven - 17,500 cm³
- column oven temperature range: ambient to +400 °C
- cooling rate: +400 °C to +100 °C in 3 minutes
- temperature limit adjustable from +150 °C to +400°C

1970 – 2740

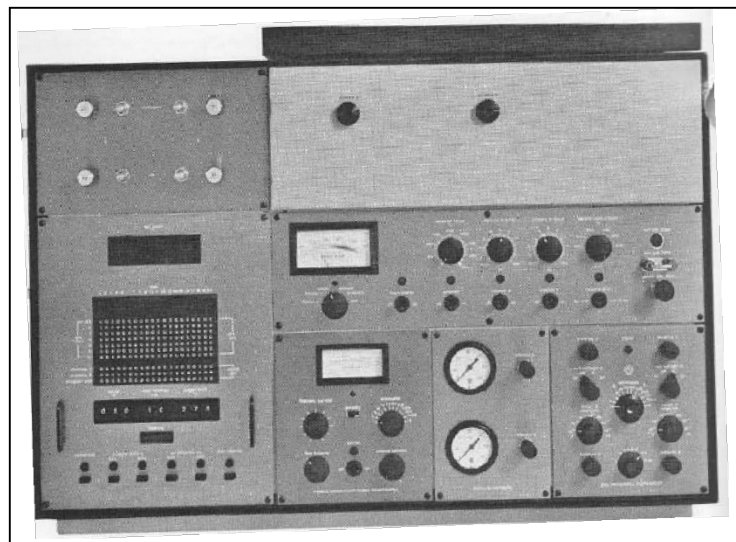
- ionization detectors only
- detector temperature limit for ³H ECD detector
- hydrogen and air individually controlled with needle valves
- thermocouple pyrometers with parallax correction
- dual/differential electrometer for ionization detectors
- dual, separately heated injector ports
- automatic linear temperature programmer
- column oven - 17,500 cm³
- column oven temperature range: ambient to +400 °C
- cooling rate: +400 °C to +100 °C in 3 minutes
- temperature limit adjustable from +150 °C to +400°C
- alkali FID for phosphorus, ECD scandium, later ECD nickel 63



2720

1970 – 2800

- FID and TCD
- new JFET solid-state dual electrometer
- dual, separately heated injector ports
- automatic multi-linear temperature programmer
- automatic oven cool-down and reset to start temperature
- dual, separately heated injector ports
- column oven temperature range: ambient to +400 °C
- column oven - 17,500 cm³
- cooling rate: +400 °C to +100 °C in 3 minutes
- temperature limit adjustable from +150 °C to +400°C
- optional alkali FID for phosphorus, ECD scandium, later ECD Ni⁶³



2800

1970 – 2828 Preparative

- dual column, dual TCD

1970 – 2848 Preparative

- dual ionization detectors

1970 – 2868 Preparative

- dual TCD and dual FID

1975 – 3700 Series

- single chassis, fresh redesign, completely new injectors and injectors, designed to later accept capillary (when restrictive patent expired in 1979)
- modular flexibility
- Self-Monitoring Electro-Sensor Panel (ESP)
- large oven - 22,122 cm³
- big pneumatics compartment
- 5 independent temperature zones
- versatile, adaptable injector system
- column temperature range: -99 °C to 420 °C
- two digital flow controllers with on/off valves in heated oven, with pressure gauges
- universal ionization detector base for easy interchange of detectors
- digital automatic linear temperature programmer, also externally controllable from data system
- rapid column heat up/ cool down: 50 °C to 250 °C in 5 min. and 250 °C to 50 °C in 9 min., including 2 min. stabilization
- subambient column oven: LN₂ to -99 °C, or CO₂ to -60 °C
- temperature-controlled pneumatics compartment
- two independent electronic bays for separate electrometers, or electrometer and TCD electronics



3760

1975 – 3720

- TCD version, field upgradeable to 3760
- constant mean temperature filament operation
- carrier loss protection with He and H₂
- TC cell – 140 µl 4 tungsten/rhenium filaments
- linear range - > 10⁵ butane

1975 – 3740

- ionization detector version, field upgradeable to 3760
- FID noise: 2X 10⁻¹² amperes; FID linearity - >10⁷
- general radioactive license for ECD; no site licensing required
- ECD - constant current, pulsed mode; cell geometry - asymmetric cylinder, 300 µl
- ECD carrier gas - N₂
- ECD linear range - >10⁴ for lindane
- TSD linearity: N - 10⁵; P - 10⁴

- TSD Selectivity N/C > 5X10⁴, N/P >0.5
- FPD - dual flame optical emission
- FPD dynamic range – P 10⁵; S 10³
- FPD selectivity:P/C >10⁵ gC/gP; S/C 10³ to 10⁶ gC/gS

1975 – 3760

- TCD/ionization version of 3700

1976 - 3711

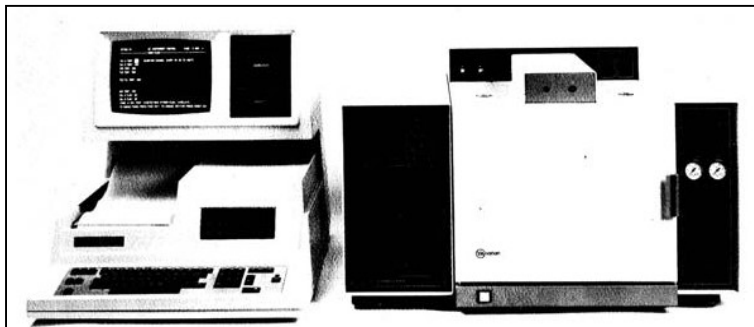
- automatic gas chromatograph
- includes CDS111 Chromatography Data System
- computer control of temperature programming, detector settings and AutoSampler™



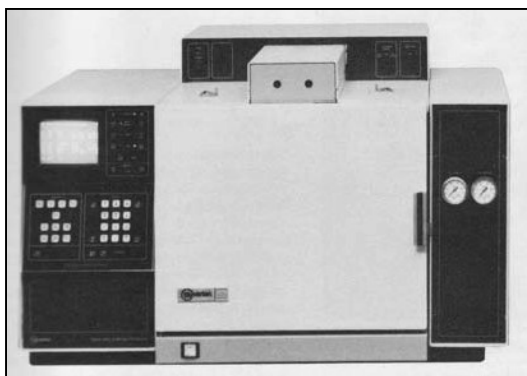
3711

1978 – Vista 4600

- full microprocessor control of all operating parameters
- large column oven - 22,122 cm³
- TCD plus ionization detectors
- injectors/detectors same as 3700
- control of two AutoSampler™ through instrument
- faceless; control only through with Vista 401
- 6 independent temperature zones; 8 external



Vista 46 with Vista 401



6000

1979 - Vista 6000

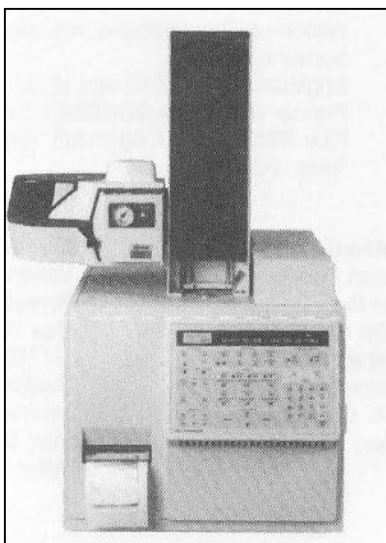
- Vista 4600 with CRT
- display/keyboard
- standalone GC

1979 – Vista 64

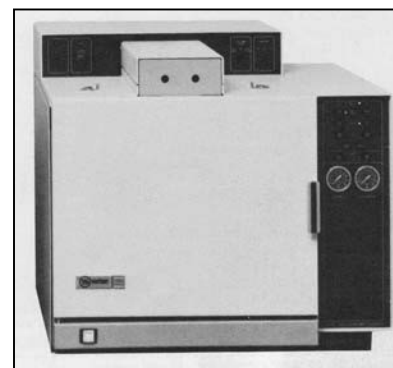
- Vista 6000 with Vista 401

1980 – Vista 6500

- satellite GC
- controlled through 6000
- adds two more injectors, detectors and Auto-Samplers™ to system



3500



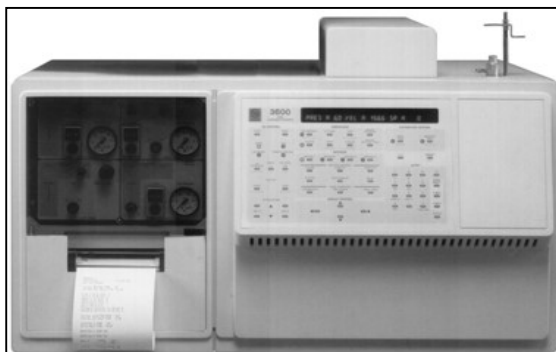
6500

1986 – 3500

- 3400 box for capillary only
- miniaturized detectors; 0.01" flame tip
- on-column capillary injector (1090)
- column oven – 10,100 cm³
- electronic readout of split flow
- electronic pressure readout of column headpressure

1986 – 3600

- large box version of 3400
- large column oven - 19,600 cm³
- spatially separated injectors
- 6 independent thermal zones
- 4 external events
- “twin towers” dual AutoSamplers™



3600

1997 – 3800



3800

- three injectors, three detectors
 - large column oven - 15,568 cm³
 - Ethernet communications with Workstation
 - 7 independent temperature zones
 - 7 external events
 - electronic flow controllers
 - single electrometer range - 100μV to 1 kV
 - detector electronic flow controllers
- automatic flame-out/reignition for**

2007 451

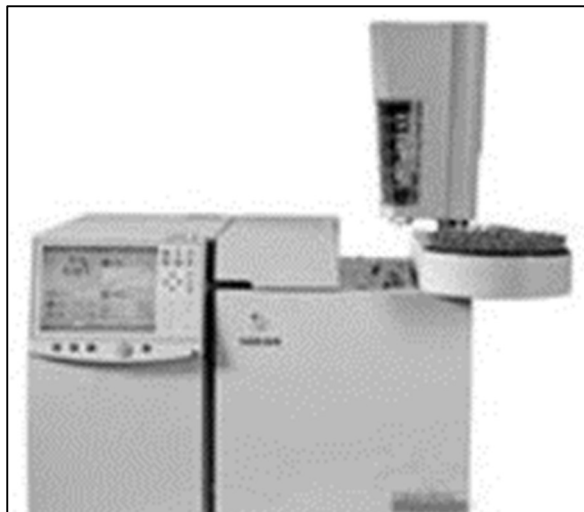
- for use with Varian Mass Spectrometers
- status and control through GC Remote Control app
- split/splitless capillary/packed-megabore injectors only
- large column oven - 15,568 cm³
- electronic flow control for injector



451

2008 450

- Heated zones: 7 (including column oven).
- large column oven - 15,568 cm³
- Local display and control: Display; TFT full color screen.
- VGA resolution (640 x 480); 8.4 " (20 cm).
- Control: • Touch screen. Plus Hard keys.
- Data Acquisition Rate : 100Hz for all detectors, except PFPD
- single electrometer range - 100μV to 1 kV
- Max number of timed events: 15



450

2012 456

- packed, S/SL, PTV, COC injectors
- high pressure injection ports for applications from 0 – 150 psiG
- up to 24 temperature program steps
- Column temperature set-point resolution: 0.1 °C
- Maximum stored internal methods: 50;30 alphanumeric characters with build-in keyboard)
- Local Display: • TFT full color screen • WVGA resolution (800 x 480) • Size 23 cm (9")
- Up to four detectors - FID, TCD, ECD, NPD/TSD, PFPD, PDHID, plus SQ- and TQ-MS detectors
- Languages: • English, German, French, Spanish, Italian, Portuguese, Cyrillic, Kanji, Chinese (standard and traditional), Thai, Korean and Dutch.
- Communication Ethernet: Protocol: TCP/IP Data rate: 100 Mbps Control: GC control and method parameters
- Up to 9 EFC modules total: injector, detector and auxiliary
- Heated zones: – Standard 5, option 4; total 9
- Maximum injector/detector temperature: 450 °C
- Time-programmable External events (digital output): – 8 standard – 8 optional, total 16
- Data Acquisition Rate: 600Hz for all detectors, except PFPD
- Large column oven - 15,568 cm³
- Single electrometer range - 100µV to 1 kV



456

2021 8500

- Fast ramping oven (170°C/minute)
- Three channel architecture, with up to 3 injection ports and 4 detectors (including MS)
- 10" High resolution full-color touchscreen, 16 languages supported
- Electronic flow control (EFC), 9 channels, 21 channels; 0.001psi resolution
- Ethernet: Protocol: TCP/IP
- Time-programmable External events (digital output): – 8 standard – 8 optional, total 16
- Heated zones: – Standard 5, 4 optional total -9
- S/SL Split/Splitless injector • PTV Programmable Temperature Vaporizing • COC Cold On-Column injector • Flash injector • PWOC Packed/ Wide bore On-Column injector
- Maximum stored internal methods: 50 (max. 30 alphanumeric characters)
- Maximum column oven/injector/detector temperature: 450 °C
- Data Acquisition Rate: 600 Hz for all detectors, except PFPD
- Large column oven - 15,568 cm³
- Single electrometer range - 100µV to 1 kV
- Electronic Flow Control (EFC), up to 21 channels at 0.001psi resolution.
- Communication Ethernet: Protocol: TCP/IP Data rate: 100 Mbps Control: GC control and method parameters

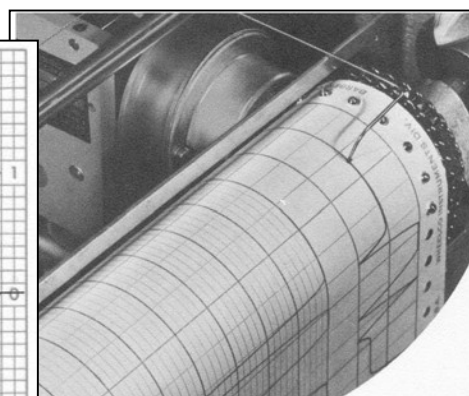
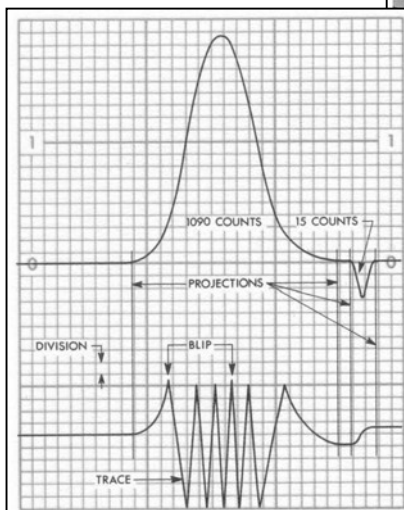


8500

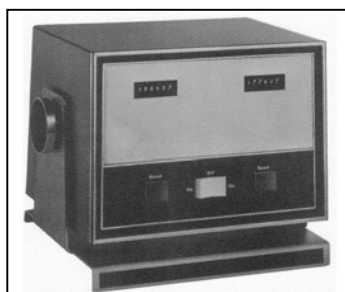
DATA HANDLING DEVICES

1960 - Disc Integrator

- area measurement on same paper as peak tracing
- inexpensive area computation
- manual computation by counting excursions



Disk Integrator



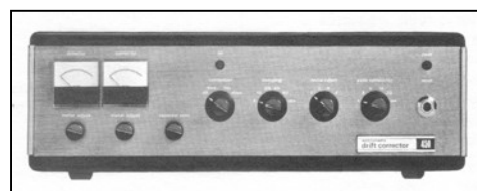
Duo-counter

1960 - Duo-Counter

- digital readout for disc integrator
- mechanical accumulator
- manual recording of areas
- no printer

1965 – 450 Baseline Drift Corrector

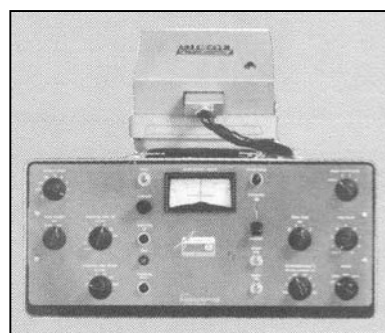
- miniature computer with memory, logic and integrating circuits to automatically correct baseline drift



450

1965 – 470

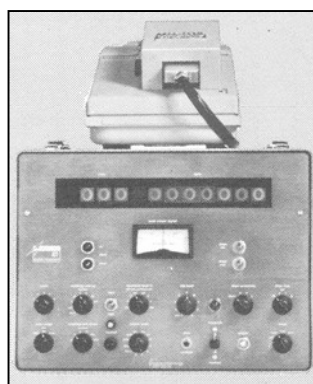
- built-in automatic baseline corrector
- peak sensor meter
- automatic peak area printout
- automatic retention time printout



470

1965 - 471

- similar to 470
- auto-extended input range
- visual data display



1966 – 475

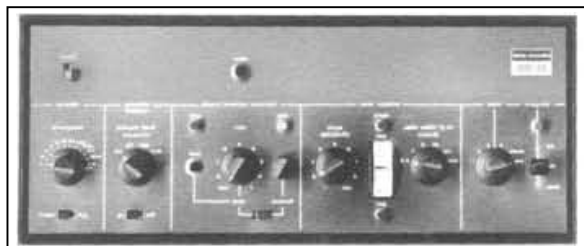
- automatic digital baseline drift corrector
- integrated microcircuitry
- automatic peak detection and filtering
- wide dynamic range (0-1400 mv)
- unattended operation



475

1966 – 476

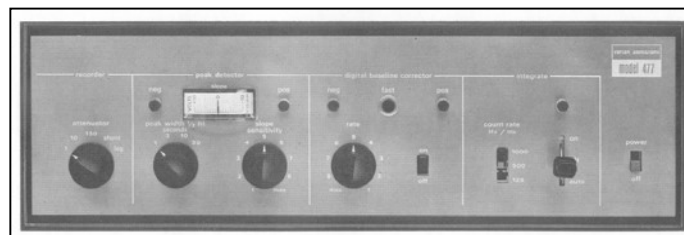
- similar to 475, but without digital display



476

1967 – 477

- low cost electronic integrator
- simple operation
- dynamic range – 0 to 140 mv
- digital printout peak area



477

1968 – 200 GC Data System

- on-line computer dedicated to GC data handling
- process data from 10 GC simultaneously
- linear range of 1,000,000
- autoranging preamplifier
- Varian Data Machine 620i minicomputer, 16 bit word, 8 K RAM
- teletype and paper tape input/output



200 GCDS

1974- 485

- built-in printer
- separate slope sensitivity and filtering controls
- automatic peak detection, peak integration and baseline correction
- automatic mode for unattended operation
- store data on punched tape
- optional display of retention time and peak area

1974 – CDS101

- first microprocessor chromatography data system
- automatically quantitates most chromatograms entirely on its own
- accurately measures areas of all peaks, both simple and complex
- automatically calculates results to any of 6 different methods – internal standard, external standard, calibration factor, relative response factor, area % and normalized %.
- stores up to 9 complete method files for immediate use



CDS101

1976 – CDS111C

- similar to CDS101
- control of Model 3700 temperature programming, detector settings and Model 8000 AutoSampler™

1978 – Vista 401

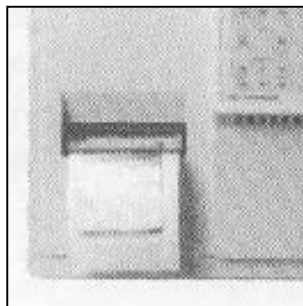
- floppy disk storage of raw data chromatograms and methods (first implementation in any chromatography data system)
- two optional independent floppy disk drives
- 16K RAM (80K RAM optional)
- full multi-tasking memory **AND** multi-tasking floppy disk
- full independent control of 4 Vista GCs and Vista LCs
- full QWERTY alpha-numeric keyboard plus number pad
- built-in dual plot printer with plots of dual live runs, stored versus live and dual stored runs
- high speed line printer (120 characters per sec.)
- optional remote dual plot printer
- 12" CRT display (16 lines of 64 characters) for method entry and report review
- input data range: -400 mV to +1 volt
- printer: 120 characters per second; 90 lines per min.
- independent control of two 8000 AutoSampler™
- replot of chromatograms with assigned baselines
- point-by-point blank baseline subtraction, stored with method
- RS 485 single cable connection from instrument module to mainframe



Vista 401

1981 – Vista 402

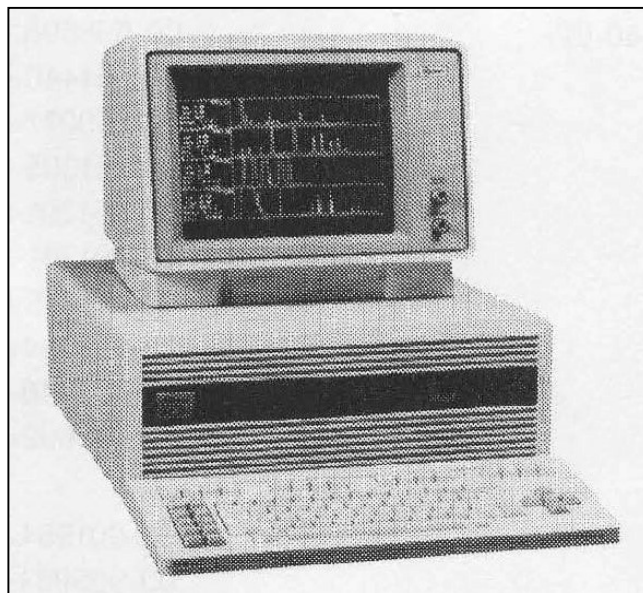
- similar to Vista 401
- RAM memory increase to 144K
- optional multi-tasking double-sided, dual density floppy drives



IBDH

1984- Inboard Data Handling (IBDH)

- built-in printer/plotter
- computes area%, Norm%, external; standard and internal standard
- alpha-numeric characters for peak labels



1985 – DS601

- single channel data system
- automatic call up of any of 8 methods on 3400 and 3600
- multi-tasking hard drive
- Thinkjet printer/plotter with dual plots
- built-in BASIC programming

1985 – DS604

- four channel data system
- similar to DS601

1987 – DS651

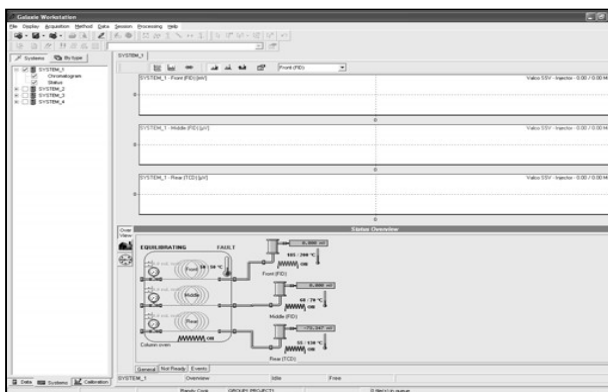
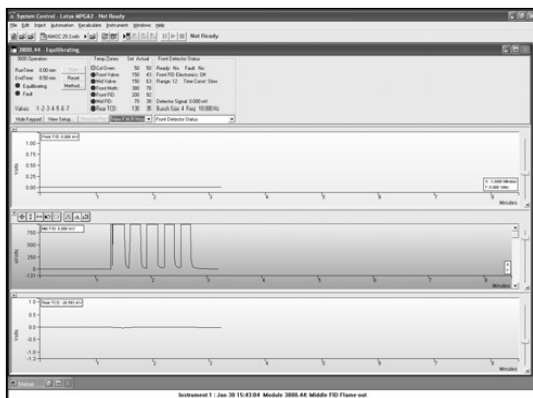
- similar to DS601
- new color monitor
- interactive graphics

1987 – DS654

- similar to DS604
- new color monitor
- interactive graphics

1989 – Star Workstation

- chromatography workstation based on PC and Windows operating system.
- full control of Varian 3400, 3600, 3800 and 3900 GCs
- control of four simultaneous GCs and LCs
- 10 Base 2 Ethernet communications with 3800



2002 – Galaxie/Compass Workstation

- client-server or workstation protocol
- full control of 3800, 3900, 430, 431, 450, 451, 436, 456, 4900, 8300, 8500
- control of other manufacturers' GCs

AUTOMATED SAMPLERS

1972 - 8000

- First commercial sampler
- AutoSampler™ trademarked by Varian
- 60 vial capacity
- Side-loading syringe



8000



Dual Automated Sampler – Twin Towers

1974 - Dual Automated Sampler

- Twin Towers
- Model 3700/ with two 8000s
- 120 vial capacity

1982 – LC-GC Interface

- Automatically injects LC column portion into GC for GC separation and detection.
- Utilizes side-loading syringe of 8000

1985 - 8035

- Dedicated capillary on-column
- Special sheathed needle to inject sample inside capillary column
- 60 vial capacity



9035

1989 - 8100

- Side-loading syringe
- Syringe washed with two solvents
- 48 vial capacity

1992 – 8200

- Similar to 8100
- Redesigned pneumatics
- Five preset sampling modes
- Optional Solid phase microextraction mode



8100/8200



CP-8400

2003 - **CP-8400**

- 100 vial capacity
- dual and duplicate sample injections
- inject into up to two injectors.
- injection modes (Standard On-Column, Standard Split/Splitless, Viscous, Volatile, and Neat)

2003 – **CP-8410**

- Manually positioned tray
- Accommodates up to 10, 6, and 5 each of 2 mL, 5 mL and 10 mL vials,
- Dual and duplicate sample injections
- Inject into up to two injectors.
- Injection modes Standard On-Column, Standard Split/Splitless, Viscous, Volatile, and Neat, plus user selections



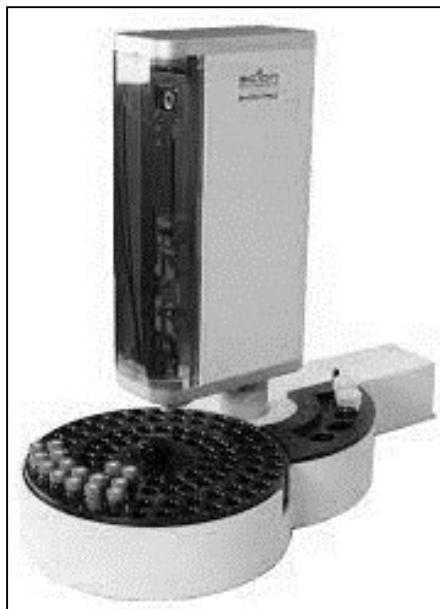
CP-8410



PAL3

2009 **PAL 3**

- Sample trays: two standard and expandable to four
- Tray types: • 96 x 2 mL vials • 200 x 1 mL vials • 32 x 10 mL/20 mL vials • 96-well plates
- Dual and duplicate mode
- Internal standard addition
- Modes of operation: liquid
- optional heated headspace
- optional Solid phase microextraction SPME
- optional extraction trap - ITEX
- Optional sample heating and cooling
- Additional optional modules: additional sample trays, microwell plate holders, wash station, SPME fiber bake-out station, dilutor, barcode readers, and flow cell



8400 Pro

2021 - 8400 Pro

- Sample capacity: 100 x 2 mL vials
- Large solvent wash vial: 2 x 120 mL optional
- Dual and duplicate mode
- Internal standard addition
- Injection modes Standard On-Column, Standard Split/Splitless, Viscous, Volatile, and Neat; plus user selections
- Optional ambient headspace,
- Optional solid phase microextraction
- Optional sample heating and cooling
- Syringes: 1 μ L, 2 μ L, 5 μ L, 10 μ L, 100 μ L, 250 μ L for liquid injection

2021 - 8410 Pro

- Sample capacity: 10 x 2 mL vials 6 x 5 mL vials 5 x 10 mL vials
- Optional large solvent wash vials: 2 x 120 mL
- Dual and duplicate mode
- Internal standard addition
- Syringes: 1 μ L, 2 μ L, 5 μ L, 10 μ L, 100 μ L, 250 μ for liquid injection



8410 Pro

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