



# F & M SCIENTIFIC CORPORATION

Starr Road and Route 41, Avandale, Pa., U.S.A.



215 COlony 8-2281 TWX 215-293-3634

SEALED SOURCE AND DEVICE FILES

Reviewed by CAND Date 9-32

Received Revised by\_\_\_\_

> Isotopes Branch Division of Licensing & Regulation United States Atomic Energy Commission Washington 25, D. C.

Attention: Mr. Bell:

Dear Mr. Bell:

August 30, 1963 RECEIVED SEP 3 1963 U.S. Alush Licensing & Rugulation

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Thank you for the help given us when Mr. J. Schmit and myself called on you recently to discuss our radioactive detector, as discussed in our phone conversation of August 29, 1963. There are several details which you require before giving formal permission to send in customer license applications.

I have enclosed several photographs of the various units both with and without covers in order for you to identify all versions of our electron capture and micro-cross section detectors, as mounted in three basic styles of instruments. Photographs are described below:

#### 700 Unit

1A. A picture of a complete "700 Model" as it is normally used with all panels in place. Carrier gas passes through the detector to outlet pipe "X" marked on the left side of the unit to be led to a fume hood or other gas disposal system.

1B. A view of the same unit when the top cover is removed. This shows the detector mounting in left corner marked "Y" and its position relative to the oven. This shot was taken from the same angle as 1A but from a shorter distance. Four extra holes are drilled in the aluminum heat sink (dwg. #2-2827-A).

#### 400 Unit

2A. Finished "400 Model" with cover in place. Note flame detector is also fitted to unit close to E. C. detector cover, but is not connected in any way. Carrier gas exit at rear of back plate (not visible in photo).

2B. Above unit when E. C. detector cover is removed.

810 Unit

SSD

PDR

3A. View from left side of "810 Model," showing detector aluminum 9504210010 950410 PDR RC \*





Isotopes Branch

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housing (D) as positioned in the unit.

3B & 3C. Show the re-designed heat sink for use only with Model 810 series units. It is similar to the one detailed in drawing #2-2827-A except the outside shape has been changed to suit the 810 unit. General dimensions have also been enclosed in a sketch.

-2-

Please note that radioactive caution sign (dwg. #1-2846-A will always be visible when the unit is assembled with all panels and covers over the detector. Upon removing covers from the detector, the detailed caution sign is visible on all units (dwg. #1-2842-B or 1-2841-B where applicable.

We have included two descriptive leaflets which detail all the above units for your further information - several additional photos are included in this leaflet. A cross has been placed beside units to be fitted with radioactive detectors.

If the information enclosed is insufficient for you to formally authorize customer license applications, I would appreciate it if you could contact me at your earliest convenience as we are now running short of time for our agreement states application.

Research Chemist

JP:md

Encl.



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institutions such as hospitals, the applicant will usually be the hospital, clinic, etc. A physician who owns a private therapy facility should be the applicant and place his name in Item 1(a). The name of the applicant must be entered in both Items 1(a) and 16 of Form AEC-313, and the application must be signed by the applicant, or, if the applicant is an institution, by an individual who is delegated this responsibility by the applicant. Where a hospital is the applicant, the hospital administrator is normally the individual who signs the application.

#### III. INFORMATION TO BE SUBMITTED.

The information contained in an application must be sufficient to allow the Commission to determine that the applicant's proposed equipment, facilities, procedures, and the training and experience of personnel are such that the therapy program will not constitute an unreasonable risk to the health and safety of employees and the public. Attached as Appendix B is a sample teletherapy application submitted on Form AEC-313 and supplementary pages.

The applicant may incorporate by reference information contained in applications, statements, and reports previously filed with the Commission's Division of Licensing and Regulation. (See Section 30.22(a) of 10 CFR 30.) The references should clearly indicate the date, page, paragraph, and name of the document to be referenced and how such information is applicable to the license application.

Items 1 through 7, and 16 of Form AEC-313 must be completed and are self-explanatory. The remaining items need not be completed if adequate

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- 3 -

(716) 265-1600

SEALED SOURCE AND DEVICE FILES Received 9-3-23 W/Letter Dated 8-30-63 Revised by 

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# ANALYTICAL INSTRUMENTS

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An advanced research gas chromatograph useful in applications in the chemical, petroleum, food processing, biomedical and other research areas where high sensitivity and precision under adverse conditions are required, this dual column instrument has dual flame ionization detectors that can be interchanged with optional electron capture and micro cross-section detectors. EALED SOURDEY AND ACCOUNT (ELES) insitivity electrometer. A completely automatic temperature programming sequence permits precisely reproducible analytical runs. **Received agentication** to re-equinity and linear programmed periods, with automatic opera exceptional qualitative and quantitative repeatability. The instrument has independent temperature control of detector, injection port and column oven to 500°C, including precise power proportioning control on the oven. Its versatile injection port permits direct injection control on the oven. Its versatile inaccommodate replaceable lines when required. The 810 achieves optimum column compensation to minimize the effects of high temperature substrate bleeding in highsensitivity flame ionization analyses.

Described in Bulletin 8100.

Basic Price: \$2995.\*



# MODEL 720 DUAL COMMN PROGRAMMED HIGH PEMPERATURE GC

Workhorse chromatograph for research and control analyses, the Model 720 is a dual column programmed high temperature instrument with a thermal conductivity detector and an optional flame ionization detector attachment.

Independent dual flow control permits five analytical uses for its two columns: single, compensating, series, parallel, or preparative operation. Its power proportioning temperature controllers are used to provide precise temperature control on the detector and columns. The instrument can be operated isothermally or it can be programmed at any one of 12 linear heating rates. Column oven, detector and injection port temperatures all are adjustable to 500°C and can be set independently to provide the exact conditions for sample vaporization, complete separation and maximum detector sensitivity. The Model 720 can be used for the separation and analysis of a wide range of compounds from inert gases through high molecular weight materials such a plastics, glycerides and others.

The instrument is described in detail including examples of various operational modes and applications in the 12-page Bulletin 7200

#### Basic Price: \$2495.\*

The F & M Model 700 Dual Column Thermal Conductivity Gas Chromatograph gives optimum performance at a moderate price. It is a quality instrument designed for applications that do not require the many convenience and versatility features of more elaborate F & M research instruments. The Model 700 is an isothermal gas chromatograph which is particularly adapted for routine analytical work FC Det

is particularly adapted for routine analytical work where the same kind of separations are frequently repeated at fixed temperatures. Column temperature can be manually increased during a run when required. These features make the 700 ideally suited for use as a teaching unit where some of the more advanced gas chromatographic techniques such as dual column compensation, temperature programming and high temperature operation can be demonstrated. As the Model 701, it is also available with proportional temper-

ature control for the column oven and with an integral DC bridge power supply. The modular design of the instrument permits the addition of the complete line of F & M facilities to extend its operational characteristics as the need arises or the budget permits. MODEL 700 DUAL COLUMN ISOTHERMAL GC



Described in Bulletin 7000 Basic Price for Model 700: \$ 995.\* Model 701: \$1395.\*

## MODEL 770 AUTOMATIC PREPARATIVE GC

A high-performance preparative gas chromatograph, the Model 770 is designed and built for the automatic collection of large quantities of high-purity components. Because all operations are automatic, the 770 will run completely unattended. The Model 770 automatically injects from 0.25 to 12 ml at each cycle from a 300 ml sample reservoir and can selectively collect any six components of a complex mixture in high-efficiency traps. Because the 770 is controlled by system parameters, there is no possibility of component contamination that is common to timed cycle instruments. Other important features: programmed or isothermal operation; independent temperature control of column oven, detector, injection port and manifold heaters each of which can be operated to 300°C; independent analytical system; integral strip chart recorder.



Described in Bulletin 770. Basic Price: \$6995.\* (including recorder)

# MODEL 180 CARBON YDROGEN NITROGEN ANALYZER

An instrument capable of the simultaneous micro-determination of carbon, hydrogen and nitrogen in organic materials, the Model 180 performs a complete analysis in ten minutes. Accuracy and precision of results match or exceed those obtained by classical methods. So sensitive is the instrument that less than I mg of sample is required for the complete analysis. A single weighing of a single sample on an environment-insensitive micro balance is all that is necessary. Heart of the 180 is a highly specialized gas chromatograph that directly detects the products of combustion as individual peaks on a permanent chart record. Quantitative readout by peak height yields accurate data with samples up to 3 mg.

Described in Bulletin 1800 Basic Price: \$1995.\* (with recorder and balance: \$4090.)



## MODEL 400 BIOMEDICAL ANALYZER

The Model 400 is a gas chromatograph that is particularly suited for the analysis of materials which decompose, rearrange or react in a more customary unit, such as natural products and samples of interest in biological, medical and agricultural research. The standard instrument has both hydrogen fiame and electron capture detectors. An optional micro cross-section detector is also available. Samples can be injected directly onto the chromatographic column minimizing adsorption, decomposition and the attendant loss of efficiency. The unit features an extra-large oven capable of accepting U-bend glass or metal columns as well as coiled columns. The Model 400 can be operated isothermally or at any one of 12 programmed heating rates to 350°C.

# Described in Bulletin 4000

Basic Price: \$2995.\* SEALED SOURCE AND DEVICE FILES

Revised by Superseded by

#### Date 9-7-57 Reviewed by MODEL 450 BLOOD GAS ANALYZER

A semi-automated chaical instrument, the Model 450 performs a complete blood analysis for O2, N2 and CO2 within 4 minutes. The Model 450 produces results that are accurate and reproducible within  $\pm 1$  volume % relative, with diract peak height readout on the integral chart recorder. Three independent steps involved include: automatic measurement of blood sample and reagent volumes; release of the blood gases on the timer-equipped shaker; and analysis of the released gases by the dual-column, dual-detector gas chromatograph. The instrument requires less than 0.2 ml of blood sample for duplicate blood gas analyses. Lung gases, anesthetic gases as well as gases dissolved in liquid or solid samples can also be analyzed.

Described in Bulletin 4500. Basic Price: \$2495.\* (including recorder)

F.O.B. Avondale: not including recorder except where noted.





# ... and a complete line of accessories for immediate delivery

F & M offers a complete line of columns, syringes, integrators and other accessories to extend the performance and versatility of gas chromatographs and other analytical instruments. All are specially engineered for top performance with F & M instruments. Most are described in the F & M "Columns and Accessories" catalog.

**COLUMN MATERIALS**—one of the widest selections of liquid phases, adsorbents, solid supports, column packings and packed columns.

GV-10/11 GAS SAMPLING VALVE----for the accurate, reproducible and leak-free introduction of gases, with sample loop capacities of 0.5 to 25.0 cc. Basic Price: \$225.\*

SI-4 SOLID SAMPLE INJECTOR—introduces solids or hardto-handle liquids into the injection port of a gas chromatograph using standard melting point capillaries. Basic Price: \$150.\*

MODEL 80 PYROLYSIS UNIT—pyrolyzes non-volatile substances in the injection port for characterization by GC. Operates on a timed sequence with regulated power for greater reproducibility. Particularly suited for the characterization of plastics, solid samples and other high molecular weight materials. Basic Price: \$350.\* TCS-3 TOTAL COLLECTION SYSTEM---connects to exit port of a gas chromatograph to collect 100% of a component, both solute and carrier gas. Collects samples that are gases at room temperature without refrigerant. Concentrates sample into small, removable tip. Basic Price: \$95.°

MODEL 200 VARIABLE POWER REGULATOR—provides a wide adjustable range of output voltages regulated for input voltage fluctuations. Solid-state design; small and light; rated at 1500 watts; equipped with receptacles and plugs. <u>Basic</u> Price: \$95.\*

MODEL 220 POWER PROPORTIONING TEMPERATURE CON-TROLLER—Lightweight, compact unit for precisely controlling temperatures up to 500°C. Applications include DTA units, hot-stage microscope studies, heated cells for IR, ovens for crystal growing and other uses where precise temperature control is required. Basic Price: \$395.°

MODEL 240 POWER PROPORTIONING TEMPERATURE PRO-GRAMMER—same as Model 220, but includes a programmer to provide precise linear programming of heating or cooling rates. Power output to 1500 watts with twelve heating rates from 0.5 to 30°C/min. Modified unit (Model 240M) operates to 1000°C. Basic Price: \$595.\*

\*F.O.B. Avondale. All prices and specifications subject to change without notice.

Europe

#### F & M SCIENTIFIC EUROPA N.V.

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#### ENGLAND

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#### SWEDEN

Apparatus Department Rudolph Grave AB Solna 1, Sweden

## DENMARK Bie & Berntsen

35, Pilestraede Copenhagen K, Denmark

For information on representatives in other European countries, contact F & M Scientific Europa N.V. in Amsterdam.

# International

For information on the names and addresses of representatives in countries outside Europe, contact International Department, F & M Scientific Corporation, Route 41 & Starr Road, Avondale, Pennsylvania, U.S.A.



# F & M SCIENTIFIC CORPORATION

AVONDALE / PENNSYLVANIA





# **General Features**

The F & M Model 700 Dual Column Thermal Conductivity Gas Chromatograph gives optimum performance at a moderate price. It is a quality instrument designed for applications that do not require the many convenience and versatility features of more elaborate instruments such as the F & M Model 720 Dual Column Programmed Temperature Gas Chromatograph. The Model 700 is an isothermal gas chromatograph which is quite useful in routine analytical work where the same kind of separations are frequently repeated at fixed temperatures. It is also ideally suited for use as a teaching unit where some of the more advanced gas chromatography techniques such as dual column compensation, temperature programming and high temperature operation can be demonstrated. Manual temperature programming and rapid changes to different constant temperatures are readily employed when required.

#### Modular Design

In the Model 700's modular design, one unit comprises the column oven, detector, injection ports and all temperature and flow controls while a second unit houses all the DC electronic components including temperature indicators and bridge circuitry. The recorder forms the third module. Besides the flexibility that this design affords, it also completely isolates the DC from the AC circuitry and thus minimizes the possibility of interference between them. Further, the design permits the addition of useful accessories as required to extend the versatility and operational possibilities of the basic unit.

#### Temperature Control

The Model 700 has separate and independent temperature controls for the detector, injection port and column compartment so that each can be adjusted to the optimum temperature for the analysis to be performed. Voltage stabilized temperature control is used with the detector and column compartments to minimize temperature variations. Heat transfer from the detector block and injection port has almost no effect on column temperatures and by virtue of a unique design, this is accomplished without troublesome cold spots where condensation could occur.

#### Columns and Oven

To facilitate maintenance, the Model 700 oven, columns, and detector are completely accessible when the cover is removed. Changing columns is particularly easy because both fittings are in the same plane as the column coil itself; no complex bends are required to attach the column to the carrier gas fittings. The column oven, which is 12 in. square and 6 in. deep, can accommodate up to 150 feet of  $\frac{1}{4}$  in. column. Preparative work can also be performed on the Model 700 with the use of an 8' x  $\frac{1}{2}$ " OD prep column. Columns of other diameters and lengths can also be used in the 700 oven.

#### Recorder

A Minneapolis-Honeywell Class 15 recorder with 10-inch wide calibrated chart and multi-speed chart changer is recommended for maximum performance and accuracy in the interpretation of the chromatogram.



BULLETIN 7000

# MODEL

# DUAL COLUMN GAS CHROMATOGRAPH

with proportional temperature control and integral power supply

#### Specifications

#### Model 700

Column oven temperature control: Solid state electronic voltage regulator to minimize line voltage fluctuations Temperature Range: Ambient to 400°C on all components

Temperature Readout: Individual readout of detector, column oven and injection port temperatures by selector switch

Detector: Thermal conductivity filaments (W-2 high sensitivity filaments are optional at extra cost)

Column Oven: Heating rate - ambient to 400°C in 17 min.

Cooling rate -- 400°C to 50°C in 16 min.

Power Requirements: 115V, 15 amps

Cobinet: 16 gauge steel

Oven and detector unit -24 in. long Oven and detector unit -18 in. deep Oven and detector unit - 17 in. high Control unit - 10 in. long 10 in. deep 13 r. high

Price: \$995.00 f.o.b. Avondsie (without recorder)

Model 701 - All specifications the same as the Model 700 except:

Column oven temperature control: Solid state power proportioning temperature controller

Power supply: Transistorized and zener diode regulated with 12 volt output and currents up to 300 ma.

Price: \$1395.00 f.o.b. Avondale (without recorder) Prices and specifications subject to change without notice

For those who want thigher performance level that comes with power productioning control of column oven comparature, the Model 701 includes an F & M propor-torial temperature controller and ar integral 12 volt DC power supply to power the detector circuit.

#### Proportional Temperature Controller

The 701's column even proportional temperature controller continuously compares actual oven temperature (measured by a thermocranice) with desired conjectsture (controller net point) and supplies power to the oven better in pro-portion to the difference between the tree temperatures, into providing true power-proportioning temperature con-

#### Power Supply

The integral power supply furnished with the Motel 201 is completely transistorized and power diode regulatori. It converts line voltage supply to a stable DC support of 12 volts with currents up to 300 ma.

## Accessories for the Model 700 and 701

A complete line of F& M gas chromatography accessories and options are available for use with the Model 730 and

Model 700 with W-2's and 250-00 (12-24V)
Model 701 with W-2's and 250-00 (12-24V)
power supply \$1495.00
Recorders M-H Model Y-153-015 \$1000.00 M-H Model Y-153-999
(with 8 speed chart changer) \$1075.00 Other recorders are available on request.
Columns — order in accordance with the information on Page 5 of the F & M Columns and Accessories Catalog
Prep Column — 8' x ½" OD stainless steel column pre- coiled into spiral to fit into Model 700/701 oven housing
Empty \$60.00 Packed \$95.00
Gas Sampling Valve — GV-10 (without shut-off valves) \$225.00
Gas Sampling Valve — GV-11 (with shut-off valves) \$275.00
Solid Sample Injector — SI-4 (Specify for Model 700/701) \$150.00
Model 220 Power Proportioning Temperature Controller
Model 240 Power Proportioning Temperature Programmer
DC Power Supply CT-300 (not required for Model 701) \$195.00
Model 50 Automatic Attenuator (specify recorder model) from \$250.00
Disc Integrator (specify recorder model) \$585.00
Daystrom Atten-U-Matic (specify recorder model) from \$1835.00
Infotronics Integrator (CRS-1) from \$4400.00

# F & M SCIENTIFIC CORPORATION

Infotronics Integrator (CRS-1)

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Sales Offices: Atlanta + Boston + Chicago + Cleveland + Dallas + Houston + Los Angeles . New York . Pittsburgh . St. Louis . Toronto . Washington

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