FRIEZ

STANDARD BAROGRAPHS INSTRUMENTS

A BAROGRAPH is a scientific instrument for making a continuous charted record of variations in atmospheric pressure due either to weather conditions or changes in elevation above sea level.

• All Friez Barographs follow the same general principles of design. The graph is produced on a rectangular chart, which is the long accepted form for such records, since it is the easiest type of chart to read and study and is the most handy for filing. The recording pens are of our own design and manufacture, made to produce as fine a line as possible. The ink likewise is of our own formula, which much experience has demonstrated to be best suited for the conditions under which a barograph functions. The chart cylinder is revolved once in a week by a clock of the very best grade that will operate for eight days without rewinding.

• In addition to the extreme care exercised by our technical workers in the making and fitting of all parts of all our instruments, our Barographs have long held leadership for accuracy and reliability for two outstanding reasons. First, we employ as the element that responds to changes in atmospheric pressure an evacuated seamless diaphragm, in the use of which we have developed a special skill that can easily be called a technical secret of our organization. Second, our Barographs are thoroughly compensated against temperature influences, not only at any particular point of the scale but for the whole range of the Barograph.

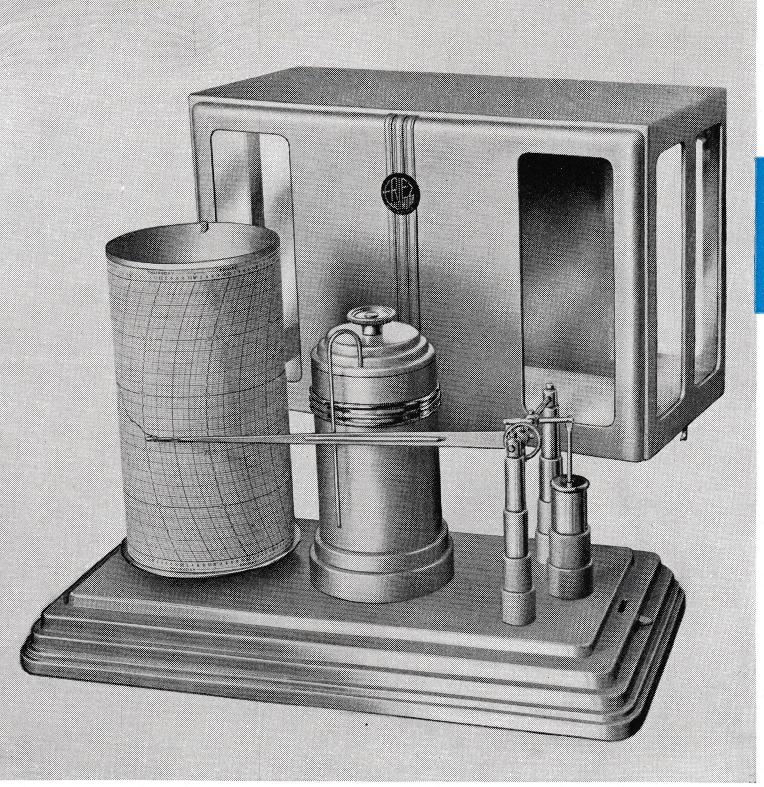
• It is only by use of the seamless pressure chamber that the Barograph can be made a truly reliable instrument, as sensitive and accurate in its readings as a mercurial barometer. The use of the vacuum chamber contributes more than any other material cause to the unrivalled performance of Friez Barographs . . . there is no lag, since the seamless element reacts throughout its whole length. Leaks hardly ever occur.

• The need of temperature compensation in a Barograph is self-evident. Without it, the instrument may act as a thermometer, since the same unit which reacts to atmospheric pressure will expand and contract under temperature changes. Likewise barometric pressure itself also varies. The National Bureau of Standards set a maximum allowable error in this regard. No Friez Barograph ever exceeds one-third of this established maximum. Temperature compensation is partially achieved by the use of a small thermostatic bar integral with the lever system connecting the pen arm with the pressure element. This same compensation is perfected by a secret skill in the preparation of the element itself.

• In this bulletin we represent two of our Barographs which are of chief interest to a wide range of customers. One we style a Barograph of Universal Pattern and the other a Microbarograph, with an enlarged scale for precision work.

PACIFIC SCIENTIFIC COMPANY
BENDIX BLDG. - 1206 MAPLE AVE.
LOS ANGELES, CALIF.

FRIEZ BALTIMORE



Friez

MICROBAROGRAPH

Precision Pattern—Weekly Recording

Scale: 2½ inches of chart equals 1 inch of mercury

- Many years ago scientists attempted extremely precise readings of a mercurial barometer. The best they attained was a Micro-Barometer, by which readings could be made on a micrometer scale.

- The Friez Microbarograph not only reads to micrometer refinements; it enlarges the barometer scale two and one-half times. On a chart six and one-quarter inches wide a record is made of two and one-half inches of mercury. It is as though the mercury column had been expanded to seventy-five inches of action.

- The value of such enlargement is obvious. Barometric changes are ordinarily slow. By expanding the recording scale slight variations stand out in bold relief. It is only from a study of them that current shifts in atmospheric pressure can be quickly detected.

- To achieve this enlargement additional power is required to move the pen across the wide traverse of chart. Not one sensitive pressure element, as is usual, but two are employed, one placed above the other, insuring precision throughout the entire range. This double pressure unit is encased in a metallic dome. Easily accessible at its top is a knurled nut to be used to adjust the pen arm when starting a record. To dampen out all vibrations of the sensitive pen-arm a dash-pot is provided.

- The high-grade clock movement revolves the chart cylinder once in seven days. The pressure lines of the chart are numbered in inches of mercury. In the standard type, namely that which is used in elevations not exceeding 500 feet above sea level, the chart is numbered from 28½ to 31 inches of mercury.

- The Microbarograph is of pleasing modern design, with an attractive finish in satin-aluminum and chrome. The base and the case are of metal, and a window is provided for clear vision of the record at all times.

- This instrument is the fruitage of long years of sincere effort to sustain our world-wide reputation for fine Barographs. Its perfomance cannot be excelled and its appearance well befits what is destined to be the permanent possession of any laboratory or office.

Catalogue Number	*Elevation Range (Feet)*	*Pressure Range (In. of Mercury)*	*Chart Number*	*List Price* (At Baltimore)*
790	0 to 500	28½ to 31	1071	$150.00
790-A	500 to 1000	28 to 30½	1071-A	150.00
790-B	1000 to 1500	27½ to 30	1071-B	150.00
790-C	1500 to 2000	27 to 29½	1071-C	150.00
790-D	2000 to 2500	26½ to 29	1071-D	150.00
790-E	2500 to 3000	26 to 28½	1071-E	150.00

For regions of higher elevation, charts properly numbered will be supplied by us, if this desire is clearly expressed at the time of order. * Instrument complete with pen, ink and year's supply of charts.

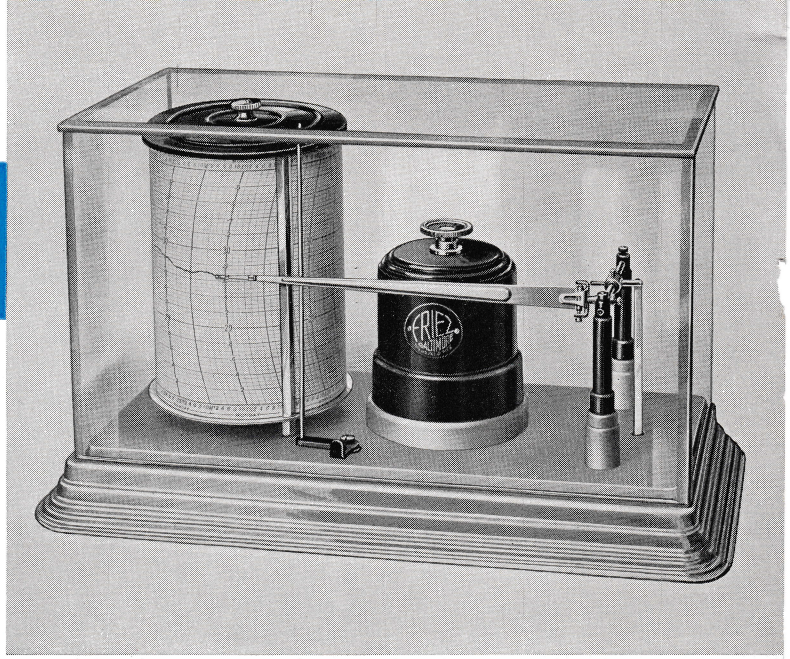
Shipping Weight: Gross, 22 lbs.; Net, 11½ lbs.

FRIEZ BALTIMORE

Friez

STATION BAROGRAPH

Universal Pattern—Weekly Recording



Scale: 1½ inches of chart equals 1 inch of mercury

● This new instrument, with its enlarged barometer record, marks a very definite advancement for weather studies and weather forecasts. It is surpassed only by our Microbarograph, offered for extreme technical studies.

● The Station Barograph such as has been used throughout the U. S. Weather Bureau for many years, and which is also of our own manufacture, employs a chart on which one inch of graph is allotted for one inch of mercury change. On our new Barograph, intended for more universal and not so specialized a service, one and one-half inches of chart is allotted for each inch of mercury change.

● Appearance has been highly emphasized, so that with pleasing lines in case and base, and with full glass panels, this Barograph wears a dignified smartness well worthy of its reliable character. The chart cylinder and record are always in view as is also the metallic dome encasing the pressure element with the knurled nut above for any necessary setting of the pen. This novel feature, so handy and so simple, renders the setting of the Barograph pen a finger-light positive operation.

● The excellent clock movement revolves the chart cylinder once in seven days for a complete weekly record, and needs rewinding but once a week. Charts are provided marked with suitable pressure numbers for elevations up to six thousand feet. For each thousand feet a separately designed chart is used, and when ordering this instrument it is necessary that the customer state at what elevation above sea level it will be used. The elevation need only be given within any one thousand feet between one and six thousand. The various elevations and the appropriate charts are listed in the appended table.

● The performance of this instrument is on a par with that which has brought to Friez Barographs a world-wide distinction. We use as always a thoroughly seasoned seamless diaphragm and add a temperature compensation unit to insure reliable records of permanent and accurate character.

● By reason of its enlarged barometer record, its highly pleasing appearance, and its very great accuracy, this instrument is valuable anywhere as a Barograph truly representative of fine instrument manufacture.

Catalogue Number	*Elevation Range (Feet)*	*Pressure Range (In. of Mercury)*	*Chart Number*	*List Price* (At Baltimore)*
610	0 to 1000	28 to 31	1070	$100.00
610-A	1000 to 2000	27 to 30	1070-A	100.00
610-B	2000 to 3000	26 to 29	1070-B	100.00
610-C	3000 to 4000	25 to 28	1070-C	100.00
610-D	4000 to 5000	24 to 27	1070-D	100.00
610-E	5000 to 6000	23 to 26	1070-E	100.00

*** Instrument complete with pen, ink and year's supply of charts.**
Shipping Weight: Gross, 20 lbs.; Net, 10 lbs.

FRIEZ BALTIMORE

Instructions for FRIEZ Barographs

1. To begin a record fill the pen with ink, using the eye-dropper provided. To insure an even flow of ink a piece of paper of chart thickness should be drawn through the nibs of the pen. Wind the clock, using the same precaution as would be used in winding a good domestic clock.

2. To install a chart the complete clock-chart-cylinder is removed from the instrument. The chart should be snugly wrapped around the drum and secured in place by the chart clip supplied. Return the chart cylinder to the instrument and set it to the actual time by turning the cylinder about its spindle in the same direction as when winding the clock. Time lines on the weekly chart are at every two hours.

3. The pens should be set to the true barometric reading ascertained from a mercurial standard barometer or it can be gotten by telephone from a station of the U. S. Weather Bureau. You adjust the pen up or down on the chart to the true barometric reading by turning the knurled nut at the top of the dome encasing the sylphon.

4. The Microbarograph, Instrument No. 790, is provided with a liquid filled dash-pot located on the base, which serves to dampen out all vibrations. This dash-pot should be kept filled within 3/8 of an inch of its top with the special liquid supplied by us. To fill the dash-pot the small metal cover should be removed and the liquid dropped in from an eye-dropper.

5. Barographs should be so located that the sun will not shine on them.

6. In returning a clock for cleaning or repair, it is absolutely necessary that the clock spindle and gears be returned with it. If the complete instrument is to be transported or shipped for any reason, great care should be taken that the pens are cleaned of ink, that the pen arms be loosely tied to the pen shifter arm and that the clock cylinder is secure on its shaft.

7. Charts, pens and ink should be ordered by number, which can be taken from the instrument plate.

The Genesis of Barometry

● It was Galileo who first suggested that the weight of the atmosphere above the earth could be determined by means of an instrument. Torricelli, his pupil, followed up the suggestion, proceeding in this fashion: He filled a long glass tube with mercury, and inverting the tube he set the open end in a bowl to notice that the metallic liquid did not all flow out of the tube but that it merely receded to a certain point, which many experiments showed him to be fairly constant. Atmospheric pressure on the surface of the mercury in the bowl was sufficient to maintain a column of mercury approximately thirty inches high. Many observations of this mercury column showed that weather conditions caused it to vary somewhat. On his tube Torricelli marked nine different points, identifying nine different conditions of weather. Thus under the eye of Galileo's pupil began the use of the barometer as a weather index.

● Almost at the same time young Blaise Pascal in Paris saw another possibility in Torricelli's tube. Could heights of mountains and variations in level be measured by the same mercury column? Perier, his brother-in-law, lived on the slope of a mountain not far away. He constructed two mercury tubes of Torricelli's design. One he left at home, the other he carried up the mountain side. The difference in levels was very manifest. Pascal repeated the experiments, carrying a tube to the peak of a Paris belfry. Again the same scientific fact was clear before him. This method, originated by Pascal, has become the world-wide standard for surveying land heights.

● Following Torricelli and Pascal, Comte, one of the early upper-air investigators, needed something more stable than a long tube filled with mercury to determine elevations above the earth in his balloon experiments. Out of his necessity he invented and constructed an aneroid barometer, one namely that did not use a liquid as its pressure index. He made it a metallic air-sealed case that would expand and contract under outside air-pressure variations. The lift and decline of vertical height of this air-sealed case served him very well as an indicator of heights attained by his balloon. Thus began the aneroid barometer; thus, too, the altimeter, an instrument so essential to aircraft. The aneroid barometer mechanism is also the heart of a recording barometer or barograph. Many refinements in its perfect functioning have developed through the years. Friez Barographs incorporate them all; indeed we say with some pride that many of these improvements originated within the Friez organization.

JULIEN P. FRIEZ & SONS, INC.
Baltimore - - - - - Maryland
Subsidiary of Bendix Aviation Corporation