

JULIEN P. FRIEZ & SONS, INC.

(A Subsidiary of The Bendix Aviation Corporation)

BALTIMORE, MARYLAND, U. S. A.

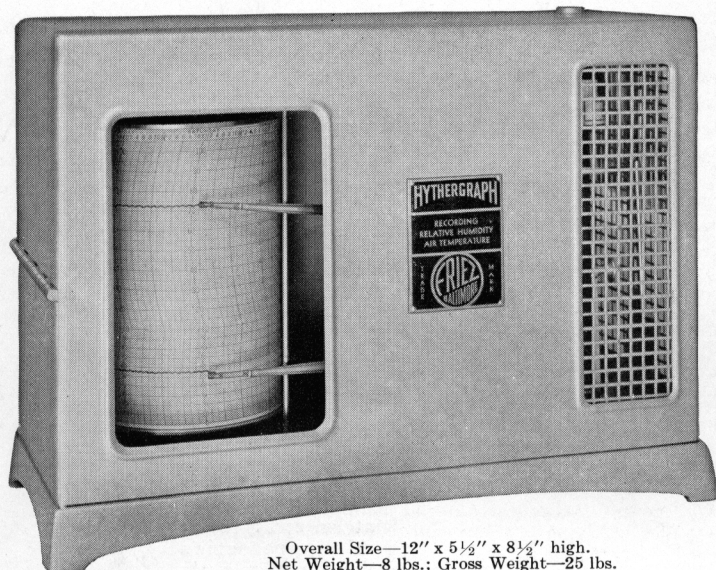
ESTABLISHED 1876

BULLETIN # H THE RECORDING OF HUMIDITY AND TEMPERATURE JULY, 1936

FRIEZ HYTHERGRAPHS

TO meet the strong demand which exists for a **first-class Recording Instrument for Relative Humidity and Dry Bulb Temperature** for application to the larger air conditioning comfort installations, industrial air conditioning, refrigeration, etc., the Friez Company now offer a modified form of their world famous Weather Bureau Hygro-thermograph at a more moderate price and under the name of The **FRIEZ HYTHERGRAPH**.

While the Friez Weather Bureau Hygro-thermograph will be continued in production to meet the highest grade laboratory, research and meteorological applications, **the new Friez Hythergraph has been designed primarily for permanent mounting in commercial, industrial and comfort air conditioning fields. Consulting Engineers and Architects will be particularly interested in this high quality, reliable, handsome, and reasonably priced instrument for inclusion in specifications for large air conditioned buildings, such as Department Stores, Theaters, Restaurants, Public Buildings, Office Buildings, etc.** These instruments are also available with carrying handles provided (at no extra cost) and this can be used for portable applications and for test or laboratory work in many fields.



Overall Size—12" x 5½" x 8½" high.
Net Weight—8 lbs.; Gross Weight—25 lbs.

Friez multiple human hair element is employed and **gives direct readings in percentage Relative Humidity** from 0% to 100% in 2% graduations.

The humidity element is sensitive to changes of 1% relative humidity, and accurate throughout its range to within 3%. Close accuracy will be found in the normal ranges. It should be pointed out that although the natural increments of expansion of hygrometric elements vary throughout the range, these increments have been smoothed out in the Hythergraph by means of scientifically designed and carefully machined cams; thus providing uniform graduations on the chart throughout the range. These elements have also been corrected carefully for temperature changes.

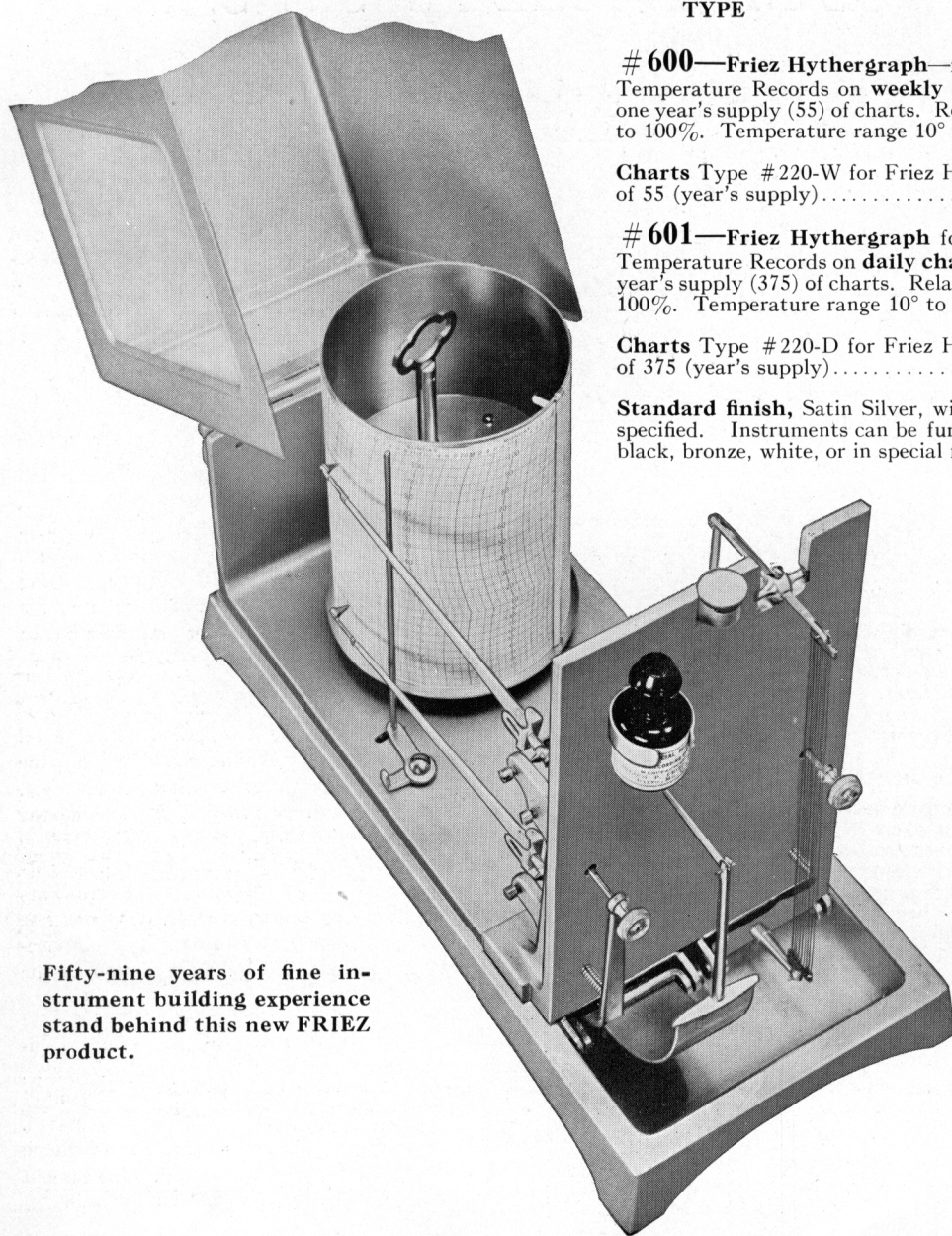
The Friez Hythergraph provides the most accurate direct record of relative humidity obtainable despite exaggerated claims sometimes made for hygroscopic instruments of various types.

The temperature element is of special bi-metallic formation and covers a range of 10° to 105° F in 1° graduations. It is sensitive to changes of 1° F. and accurate throughout its range to within 1° F., despite allowances for pen lag that is inherent in all such recording instruments.

Elements and mechanism are properly protected from damage or tampering and yet are fully ventilated. Glass window is provided in hinged case for the proper observation of the record during operation. Instruments are suitable for indoor or outdoor use, though where used outdoors they must, of course, be provided with a shelter to protect from rain or direct sunshine. (See Page 2). See section of this bulletin devoted to **"Instructions"** for fuller details of construction and operation of the Friez Hythergraphs.

Where it might be desired to have these instruments in semi-portable form so that they can be carried from room to room, or job to job, they are offered fitted with carrying handle.

Those interested in lighter and more compact instruments of moderate price for full portability are referred to Friez Portable Recorders, covered in separate Bulletin # G.



Fifty-nine years of fine instrument building experience stand behind this new FRIEZ product.

TYPE

LIST PRICE
(F.O.B. Baltimore)

600—Friez Hythergraph—for Relative Humidity and Temperature Records on **weekly charts** and complete with one year's supply (55) of charts. Relative Humidity range 0% to 100%. Temperature range 10° to 105° F. **\$142.00 (D)**

Charts Type # 220-W for Friez Hythergraph # 600 per box of 55 (year's supply)..... **\$5.00 (Spec.)**

601—Friez Hythergraph for Relative Humidity and Temperature Records on **daily charts** and complete with one year's supply (375) of charts. Relative Humidity range 0% to 100%. Temperature range 10° to 105° F. **\$147.00 (D)**

Charts Type # 220-D for Friez Hythergraph # 601 per box of 375 (year's supply)..... **\$10.00 (Spec.)**

Standard finish, Satin Silver, will be sent unless otherwise specified. Instruments can be furnished, where specified, in black, bronze, white, or in special finishes to order.

Special Gears for changing weekly type instrument to daily type or vice-versa..... **\$2.75 (D)**

NOTE:—The alternate charts required when such conversion is made must, of course, also be purchased. (See above for charts.)

Special ink per bottle (one bottle furnished with instrument)..... **\$1.00 Net**

Spare pens, each.... **\$1.65 Net**

Highly finished wooden carrying case with handle, hinged lid, etc., extra. **\$7.00 Net**

Loose-leaf binder for permanent filing of charts for reference... **\$5.00 Net**

Instrument Shelter # 983 for protection against outdoor weather conditions..... **\$18.00 (D)**

INSTRUCTIONS—Friez Hythergraph

UNPACKING: Instruments are very carefully prepared for shipment with the delicate parts of their mechanisms secured against jars occurring in transit. Corresponding care should be exercised in their unpacking. Users should read the earlier pages of this Bulletin carefully, for the information given there will not necessarily be repeated in these instructions. It should be remembered that these are sensitive instruments, and they cannot be expected to stand abuse. Check packing materials carefully to be sure all sundry packages have been disclosed.

After unpacking, raise the hinged cover of case and remove carefully the strings that hold the parts in firm position during shipment. Due to extremes of temperature and humidity to which the instrument may have been subjected during transit, it is well to take out of carrying case (if the latter has been purchased) and let stand for a while in conditions to be recorded before accurate results are expected. Similarly, time should be given before any particular test for the mechanism of the instrument to reach a balanced temperature condition. Thirty minutes are usually sufficient for that purpose, but considerably less time for this balance is required, where change of atmospheric conditions is only moderate.

INKING PENS: Free pen arms of any shipping bands, etc. (see above). Then lift pen arm from chart or cylinder—this latter should be done by using the shift rod. Using the clock-winding stem for a handle, lift the chart cylinder from the verticle shaft, removing it from the instrument and placing it on a table nearby. Handle with great care, as this cylinder contains the clock mechanism for rotating the chart cylinder, and must not be bent or damaged in any way. **NOTE**—This cylinder is shipped packed separately and is already removed upon its receipt from the factory.) Ink pens with one or two applications from ink container stopper.

Do not over-ink pens and keep ink off mechanism, case, etc. The special Friez ink will remain moist for long periods and give clear lines if pens are kept clean, etc. A good plan is to ink pens with an old chart in position, thus guarding against ink's getting on chart cylinder. **Do not strain pen arms while inking.** Pens should be lifted clear of chart while inking. As with all new pens, no matter of what type, some little difficulty may be experienced in inking the pens for the first time. **Never at any time more than half fill pens.** The sliding of a small piece of paper through the blades of the pens will assist in drawing ink through, when inking pens for the first time. This method may also be employed for cleaning pens. Pens themselves are removable for cleaning or replacement. Once in four months, or oftener if necessary,

the pens should be taken from the pen arms and carefully washed in warm water, special effort being made not to bend or distort the delicate points. A clip to carry the ink bottle is provided as standard on Friez Hythergraphs and is located inside case and on left face of main vertical movement plate.

PEN ARM ADJUSTMENT: The Friez Hytherstat is equipped with a constant pressure system on the pen arm which depends upon gravity; this assures that the pen will always be kept at the pressure required for producing a neat and fine record line. No adjustment for pen arm tension is required or provided. **It is assumed that the instrument will be located reasonably level.** Pens themselves are removable, and some adjustment in pen location on arm is permissible to secure exact alignment of the several pens on common time line. **This correct alignment should be watched if pens have been removed for cleaning.**

FITTING CHART: Lift pen arms from chart cylinder by means of the lift rod, and remove cylinder from instrument. Use great care in this proceeding—see instructions above under "Inking pens." A vertical spring chart clip will be noted on the chart cylinder. This should be pulled up and removed from the cylinder. The chart is then so wrapped around this cylinder that its **lower edge rests squarely and evenly all the way around on the projecting rim of the cylinder.** This latter point is very important—if the chart does not rest down perfectly on the cylinder rim, the entire record may be incorrect. **Be sure to wind the clock which is inside this chart cylinder before replacing the cylinder on the instrument.** The cylinder should then be lowered carefully on its upright shaft. Use care to insure that the gears at the bottom intermesh. Next rotate the cylinder containing the chart until the pens rest in their correct day and hour position on the chart.

To set the pen at the proper time line on the chart, the clock cylinder may be turned either clockwise or counter-clockwise, but the last final accurate setting to the precise position must be made by turning the clock unit counter-clockwise, that is opposite to the direction in which the hands of a clock move (thus taking up gear back lash). **CAUTION**—in removing chart, at completion of run, **be very careful not to mar the chart with ink from pens or by smearing the moist graph lines.** These lines will remain moist for a day or so after removal from cylinder.

LOCATION OF INSTRUMENT: Place instrument in a position that is typical of conditions to be recorded, clear of direct sunshine-radiated heat, doors, windows, elevator shafts, outside walls, dripping water, etc., and in general circulation of the air concerned. If for permanent installation, provide bracket or shelf and secure with bolts provided with instrument.

If these notes are watched, a clear, graphic and easily read record of conditions will be secured.

SENSITIVE ELEMENTS: The hygroscopic element is of the Friez special multiple human hair type, which is employed so successfully on the high grade hygographs which we have built for many years for the U. S. Weather Bureau, Navy, and for all classes of industrial and educational research. These same elements are employed on Friez Humidistats now standard fitment with many leading American manufacturers of air conditioning equipment. **These hair elements are considerably more accurate, sensitive and reliable than other types** and are not subject to trouble from dust deposit. They are free from inaccuracies and service difficulties that attend wet-bulb systems and **give readings direct in relative humidities.**

The temperature element of this instrument is of carefully seasoned bimetal and needs no attention.

ADJUSTMENT: WARNING—Before changing settings, read all instructions in this bulletin with great care. Great care is taken in seasoning and adjusting before dispatch, but where found necessary (after several careful checks with good Sling or Aspirated Psychrometer in the hands of experienced operator), adjustment to both humidity and temperature pen positions is possible by turning the knurled thumb nut provided for this purpose beside each of the sensitive elements. Where instrument has previously been subjected to extremely high or extremely low humidity condition, some small temporary shift in the hair element may take place. This shift is not of a permanent nature and will correct itself in the course of twenty-four hours. Where used in extreme humidities, or temperature, or under adverse conditions, it is well, however, to periodically check the pen positions and correct if necessary.

NOTE: It is obviously essential while making any adjustments of pen position to allow the pen to rest on the chart (not on the pen lifter rod).

FOR HUMIDITY CHECK: In case it becomes necessary to re-set the humidity pen, use a Sling Psychrometer according to the procedure outlined below:

First, the comparison must be made in a closed room so that there may not be any extremely rapid changes in humidity. Furthermore, if the air in the room is stagnant or stratified, there is no certainty that the prevailing humidity is the same at the instrument and the test Psychrometer, therefore, the air in the room must be thoroughly circulated by means of an electric fan. (Fan should not be close to instrument.) The instrument should be allowed to remain under the test conditions at least fifteen minutes before tests are started.

There are certain points about the use of a Sling Psychrometer that cannot be disregarded if a worthwhile check is to be made. First, the thermometers must be accurate, and they must be read precisely. Secondly, the Sling Psychrometer wick must be clean, and distilled water only should be used in wetting the wick. A dirty wick can cause errors as great as 5% in a Sling Psychrometer reading.

In operating a Sling Psychrometer, wet the wick on the wet bulb thermometer. Take care not to moisten the dry bulb in any way. Sling the Psychrometer, note the wet bulb reading, and then repeat. Continue slinging the Psychrometer and noting the wet bulb reading at intervals until a definite minimum wet bulb reading is determined. It must not be forgotten that **it is this lowest possible wet bulb reading by which relative humidity is determined** by a Sling Psychrometer. When the wick begins to dry out under this treatment, a rise will be noted in the wet bulb temperature. It is only by such repeated examinations of the wet bulb, while taking the sling reading, that the minimum wet bulb reading can be obtained. Always read the wet bulb first, then note the dry bulb reading, as this reading is less liable to change after the sling has been stopped. Moreover, **several separate observations of relative humidity must be made and the average of consistent observations** used for checking the humidity pen on the Hythergraph.

Small errors in reading the temperatures of the wet and dry bulbs may cause large errors in relative humidity. An examination of psychrometric tables will show how closely the thermometers should be read. Wherever it is desired to read the relative humidity as closely as 1% with a Sling Psychrometer, tables corrected for barometric pressure should be used. Only the U. S. Department of Agriculture Psychrometric Tables, W. B. 235, by C. F. Marvin are recommended. See Friez Bulletin #P Friez Thermo-Shielded Electrically Aspirated Psychrometer—the best instrument obtainable for precise wet and dry bulb checking.

We caution particularly against readjusting the Hythergraph in case only one Psychrometric observation shows an error. Several checks at intervals should be made and note should be made of the **tendency** of the recording instrument to read either too high or too low. Corrections should be made for this tendency and not for some temporary condition which may be affecting the recording instrument and the test equipment slightly differently. **Stationary wall hygrometers or wet and dry bulb thermometers are not sufficiently accurate ever to be used as checking instruments.** Furthermore, any instrument whose wick is continuously wet from a reservoir should not be relied upon as a checking instrument, as the water temperature will cause an error in the readings.

After the above instructions have been carefully followed, the reading of the humidity pen of the Hythergraph may be corrected by operating the knurled thumb nut located beside the hairs on the outside of the instrument. Turning this nut clockwise raises the pen, while an anti-clockwise rotation lowers the pen. Tap the base of the instrument lightly while making this adjustment.

FOR TEMPERATURE: If necessary, compare the readings of the temperature pen of the Hythergraph with the readings of an established good mercury thermometer. Note that the same precautions apply here as given above relative to the circulation of the air in the room where such checking is being made. The pen arm may be adjusted by turning the knurled thumb nut provided near the bimetal element to make the pen take an accurate position to agree with the thermometer readings.

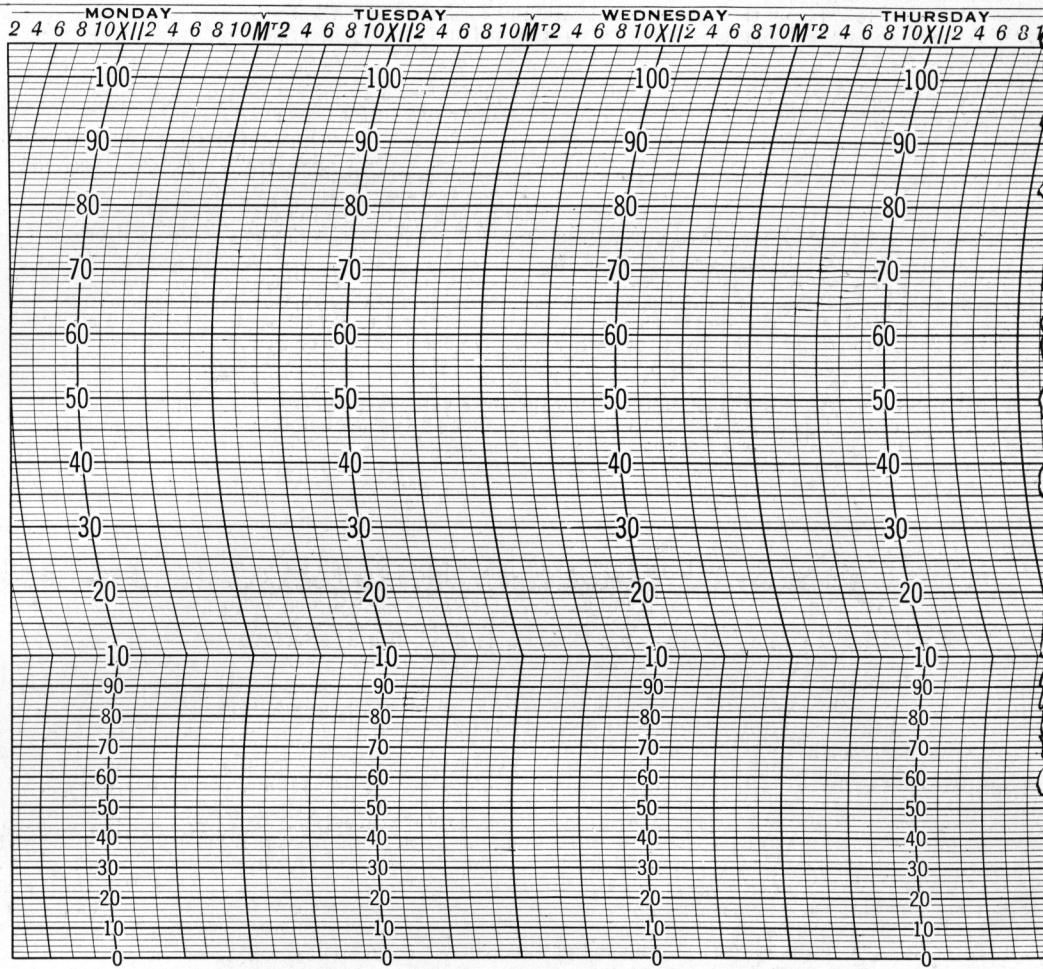
PRINTED IN U. S. A.

HYTHERGRAPH
CHART NO. 220-W, WEEKLY

USE NO. 1 PENS

Published by JULIEN P. FRIEZ & SONS, Belfort Observatory, Baltimore, Md., U. S. A.

Instrument No. Date Station



Portion of Chart No. 220-W, for Weekly Records on Friez Hythergraph (Full Size)

(NOTE—Continuous record, 11½ inches long, of Relative Humidity and Dry-Bulb Temperature reads from 6 A. M. Monday until 4:30 P. M. the following Monday.)

REPAIRS AND ADJUSTMENTS: Will be carried out promptly and reasonably at the Maker's factory, and much better results are secured by periodical factory check rather than attempted field repairs. All instruments returned for attention should be sent Parcel Post, insured, carefully packed, and tagged, stating the attention required. **Great care must be used in packing these sensitive instruments for shipment.** Remove the chart cylinder and pack separately. **Quote serial number and type as obtained** from name plate in all correspondence.

CARRYING HANDLES: While primarily intended for mounting on brackets or shelves in more or less permanent position, Friez Hythergraphs are adaptable for semi-portable uses, in which case carrying handle is fitted to case before dispatch from factory where so specified when ordered.

CARRYING CASES: These cases keep the instrument clean and protect it when not in use and are recommended. They are of wood, well painted and of very strong construction with hinged lid, plated fittings, etc.

SUNDRIES: Special ink, spare pens, etc., are noted on page 2. Charts and sundries will be sent C. O. D. post, unless cash accompanies order or unless purchaser has a general account with us. Charts are beautifully produced on non-hygroscopic linen base ledger stock, and charts should be ordered by reference #—printed on all Friez charts.

It has been the very sincere endeavor of the Friez Company during its fifty-nine years of fine instrument building to produce the best that specialized experience, expert craftsmanship and well-equipped laboratories could achieve, and to give the users of its products every service. We hope that this instrument will uphold our reputation, and that you will keep in touch with us to that end.

SAVE THIS INSTRUCTION BULLETIN FOR FUTURE REFERENCE

AIR CONDITIONING UTILITIES, INC.

8 W. 40th STREET NEW YORK CITY

PHONE MEDALLION 3-4280-1-2

Designed and Manufactured by

JULIEN P. FRIEZ & SONS, Inc.

(A Subsidiary of The Bendix Aviation Corporation)

BALTIMORE, MARYLAND, U. S. A.



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