



# JULIEN P. FRIEZ & SONS, INC.

(A Subsidiary of The Bendix Aviation Corporation)

BALTIMORE, MARYLAND, U. S. A.

ESTABLISHED 1876

BULLETIN #G

THE RECORDING OF HUMIDITY AND TEMPERATURE

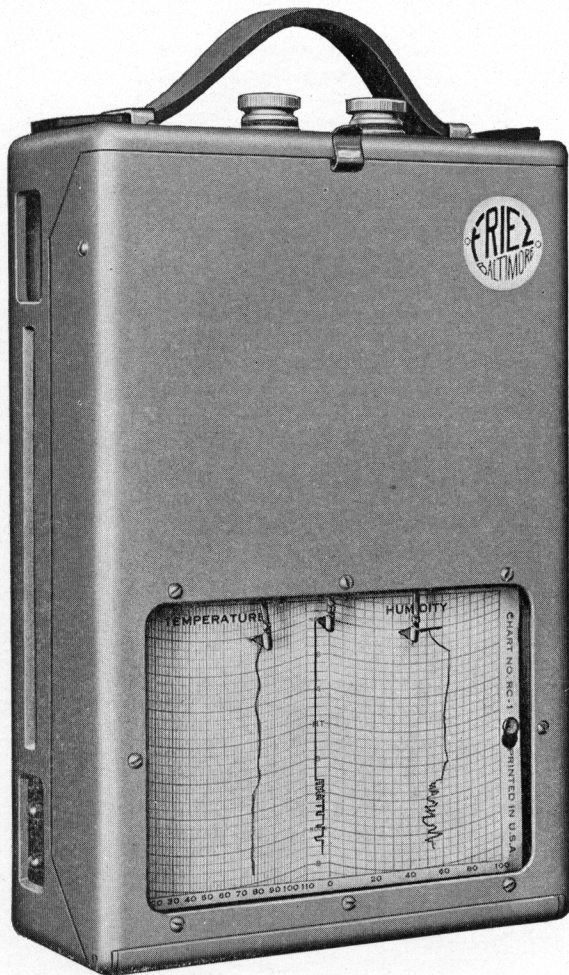
Nov., 1936

## FRIEZ PORTABLE RECORDERS

These new and improved models are now available—greater sensitivity, closer accuracy, no additional cost.

**D**ESIGNED for hard service by all engaged in heating, ventilating, refrigeration—Air Conditioning Fields, and for many industrial uses. Of great value in testing, selling, installation, and servicing. For permanent use in schools, hospitals, stores, theatres, restaurants, office buildings, residences, etc., and invaluable in many industrial processes, particularly in textile, tobacco, food products, baking, fruit ripening and storage, cold storage, printing and paper, railway, marine, oxygen tent therapy and other medical, fields. This new range of **Recording**

**Instruments** incorporates many innovations and fills a very long-felt need. There is nothing equivalent to them on the market. **Extremely robust die-cast cases** are employed fitted with unbreakable observation windows and stout leather carrying handles. They are very compact and easily portable. (Size— $8\frac{1}{2}$ " x  $5\frac{1}{2}$ " x  $2\frac{1}{4}$ ". Wgt.—52 oz.) Provision is made in the hinged cover of the case for carrying a week's supply of charts. Two screw-topped containers are also provided in the top of the case, one for carrying a spare detachable pen, the other containing an efficient pen cleaner. Supply of ink is now carried in separate container inside Recorder. **Charts are of index file type (size—3" x 5") with space on the back for simultaneous filing of general data,** and clear, progressive, and easily-read records are given, covering either **10-hour or 30-hour periods.** Time lines are common to temperature, humidity, and operations or running time, and excellent comparison is assured. The same total chart travel is used on both the 30-hour type and the 10-hour type, and therefore, while the 30-hour type is more generally required, those who are likely only to run shorter tests should select the 10-hour type, the record of which is opened up into time increments 3 times as large as on the 30-hour type. The progressive and lineal, rather than circular, record made by all Friez Recorders is **considerably easier to read** and portrays more natural pictures of events than the records given by instruments that use circular charts. These progressive charts are specified on the very high-grade humidity and temperature recording instruments that the Friez Company has built for many years for the U. S. Weather Bureau, Navy, and other Government Departments. All who are familiar with recording instruments will appreciate how much easier these stiff index card type Friez charts are to file and retain for later reference than are the circular type charts.



Size— $8\frac{1}{2}$ "x $5\frac{1}{2}$ "x $2\frac{1}{4}$ "; Weight—52 oz.

These Recorders perform with reliability and considerable accuracy. (Humidity pen is sensitive to changes of 1% relative humidity and accurate throughout its range to within 3%; temperature pen is sensitive to changes of 1° F. and accurate throughout its range to within 2° F.) No calculations or tables are needed as **% Relative Humidity and Degrees F. Dry-Bulb Temp. are recorded directly,** rather than Wet and Dry-Bulb Temperatures. **There are no wicks to keep clean, no water reservoirs to fill—nothing to give service trouble or errors in results.**

First-class instrument practice is incorporated throughout and considerable pains have been taken to make this Recorder sufficiently rugged to stand the hardest type of field service work. It is a Recorder that can be placed safely in the hands of those not ordinarily used to handling sensitive instruments. All mechanism throughout is heavily cadmium plated on the Udylite process, and proof against corrosion even under adverse service conditions. Special attention has been given to the provision of generous ventilation to insure quick and accurate response.

The chart tables of these instruments are driven by hand-wound clock work mechanism and **no electrical connections are required** on any of the types shown below except where it is desired in the case of types R/4 and R/4-A to simultaneously record electrical operation or running time.

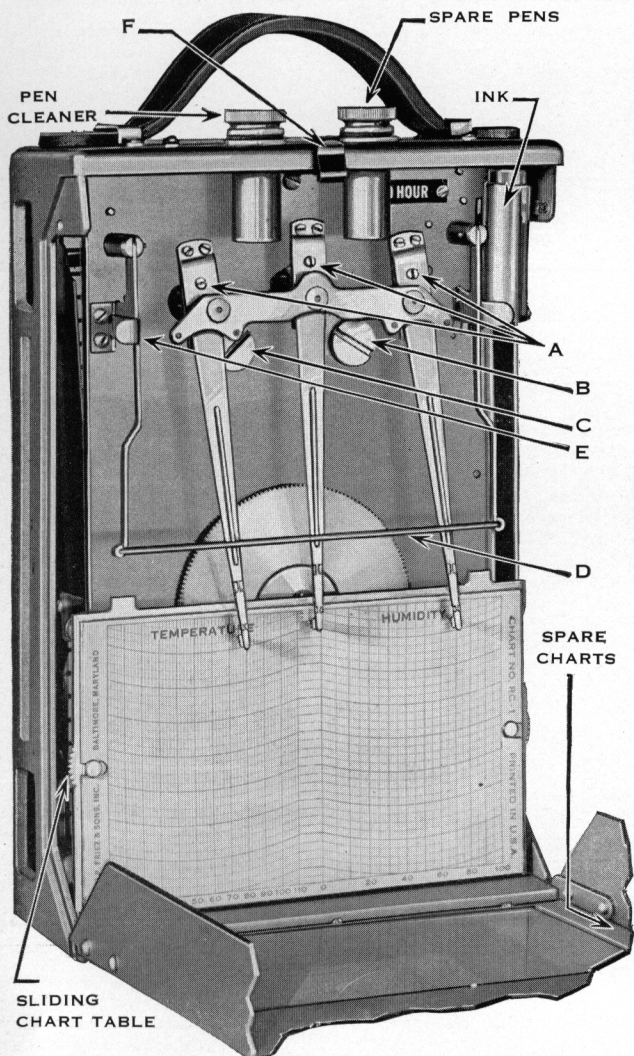
For those who desire to also **record the operation or running time** of the equipment responsible for producing the humidity and temperature record the operation or running time conditions recorded, types R/4 and R/4-A are offered. These Recorders incorporate a third pen in the center position and when electrically connected, either in series or in parallel (see below) with the heating, cooling, humidifying, or dehumidifying equipment, clearly shows the number of times that the equipment concerned comes on, how long it ran in each case, and just when it shut down. This operation or running time record is very valuable in many classes of work, as will be appreciated. **These Friez Recorders are unique in providing relative humidity, temperature, and running time records in a single instrument and on a common chart.**

The standard finish given to the cases of these Recorders is "satin silver." Backed by sixty years of experience as "The Makers of America's Weather Instruments" and now incorporating the improvements developed in thousands of Friez Recorders in daily use in the Air Conditioning, Refrigeration, Industrial, Railroad and other varied fields, these new instruments are more than ever the established leaders.

Particulars of the types available are given on the next page, and further details of the construction and operation will be gained from the latter part of this bulletin, which is devoted to operating instructions.

PORTABLE RECORDERS—Bulletin #G

# NEW IMPROVED TYPES AT NO ADDITIONAL COST



Front View With Cover Open

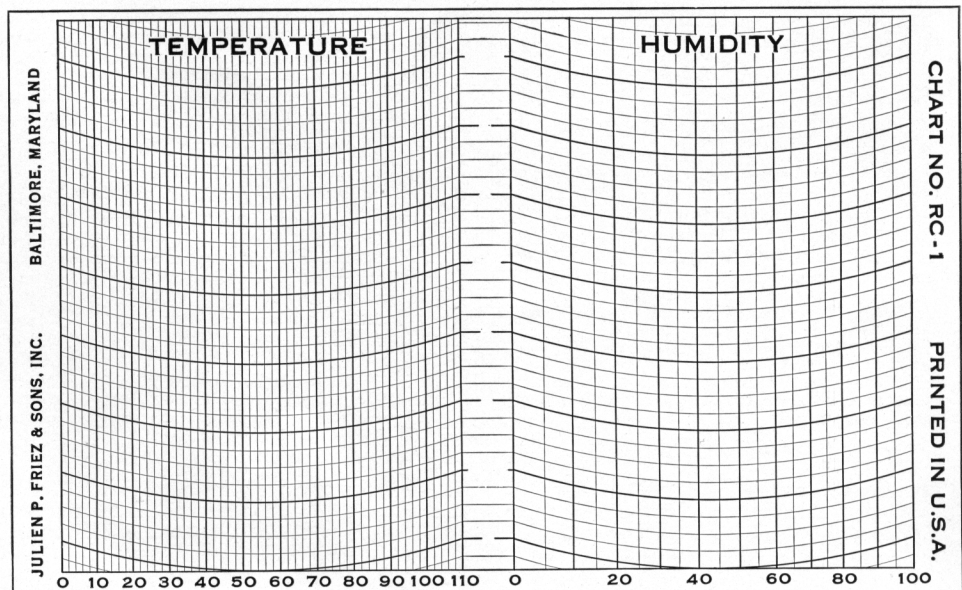
TYPE	LIST PRICE (f. o. b. Baltimore) (C)
<b>R/1</b> —For Relative Humidity records only.....	<b>\$45.00</b>
<b>R/2</b> —For Temperature records only.....	<b>\$45.00</b>
<small>(NOTE: Either of the above types can be obtained, where desired, to also incorporate electrical running time, or operation, record.)</small>	
<b>R/3</b> —For Relative Humidity and Temperature .....	<b>\$55.00</b>
<b>R/4</b> —For Relative Humidity, Temperature, and Operation records, and complete with 12 ft. flexible lead, plugs, etc., whereby instrument can be instantly plugged into domestic refrigerator, unit air conditioner, or other similar circuits without disturbing wiring. For use in series with loads of from 2 to 8 amps. (Maximum inrush not to exceed 30 amps.) on any voltage A. C. or D. C. up to 250 v.....	<b>\$65.00</b>
<small>(NOTE: Electrical connections are necessary on this Recorder only when it is desired to use the operation or electrical running time feature.)</small>	
<b>R/4-A</b> —For Relative Humidity, Temperature, and Operation records, similar to R/4 above but with operation feature wound for use straight across electric lines in parallel with load, and furnished complete with Friez Special Transformer Set, making that same portion suitable for use on 110 v. or 220 v., 50 or 60 cy. A. C., irrespective of how great or how small is the load being consumed by the equipment. Suitable for all applications not ideally covered by R/4 type above.....	<b>\$72.50</b>
<small>(NOTE: Electrical connections are necessary on this Recorder only when it is desired to use the operation or electrical running time feature. <b>This Recorder is advised for those requiring a Recorder for the widest range of applications.</b>)</small>	
<small>All above prices include 100 charts, ink and one spare pen.</small>	
Extra charts, per 100 (see below for type and reference numbers) .....	<b>\$3.00 Net</b>
<small>(NOTE: Reduction in price on larger quantities.)</small>	
Special ink, per bottle .....	<b>\$1.00 Net</b>
Spare pens, each .....	<b>\$1.65 Net</b>
Solid leather brown carrying cases for above, each ..	<b>\$5.00 Net</b>
Imitation leather black carrying cases for above, each	<b>\$3.00 Net</b>
<b>TIME:</b> Any of the above types are available for 30-hour records (standard) or 10-hour records. The latter use same total chart travel and give clear details. <b>Specify whether 10- or 30-hour records required.</b>	
<b>HUMIDITY RANGE:</b> From 0% to 100% Relative Humidity in all cases.	

**TEMPERATURE RANGE:** Two temperature ranges are available on all instruments, it being easily possible for the operator with the aid of a good Thermometer to adjust the temperature pen to either desired. Unless otherwise specified, all instruments are set for standard temperature range (0 to 110° F.) and arranged so that they can be altered by the operator to cover the low range (minus 30° to plus 80° F.) if desired. Instruments to cover Normal T High (100 to 210° F.) furnished only where so specified. **Specify clearly your requirement when ordering.** Suitable pocket Thermometers and Psychrometers for setting these instruments are listed in separate Friez bulletins # "S." and "L."

The following standard charts are offered to suit either the 30- or 10-hour instruments. One hundred charts are included in price of instrument. Extra charts, \$3.00 net per 100. (Centigrade, \$3.50 net per 100).

- Chart # **RC/1**  
0 to 110° F. (Standard) for 30 hrs.
- Chart # **RC/2**  
-30 to +80° F. for 30 hrs.
- Chart # **RC/3**  
100 to 210° F. for 30 hrs.
- Chart # **RC/4**  
0 to 110° F. for 10 hrs.
- Chart # **RC/5**  
-30 to +80° F. for 10 hrs.
- Chart # **RC/6**  
100 to 210° F. for 10 hrs.
- Chart # **RC/7**  
-14° to +41° C. for 30 hrs.
- Chart # **RC/10**  
-14° to +41° C. for 10 hrs.
- Chart # **RC/11**  
-40° to 150° F. for 30 hrs.

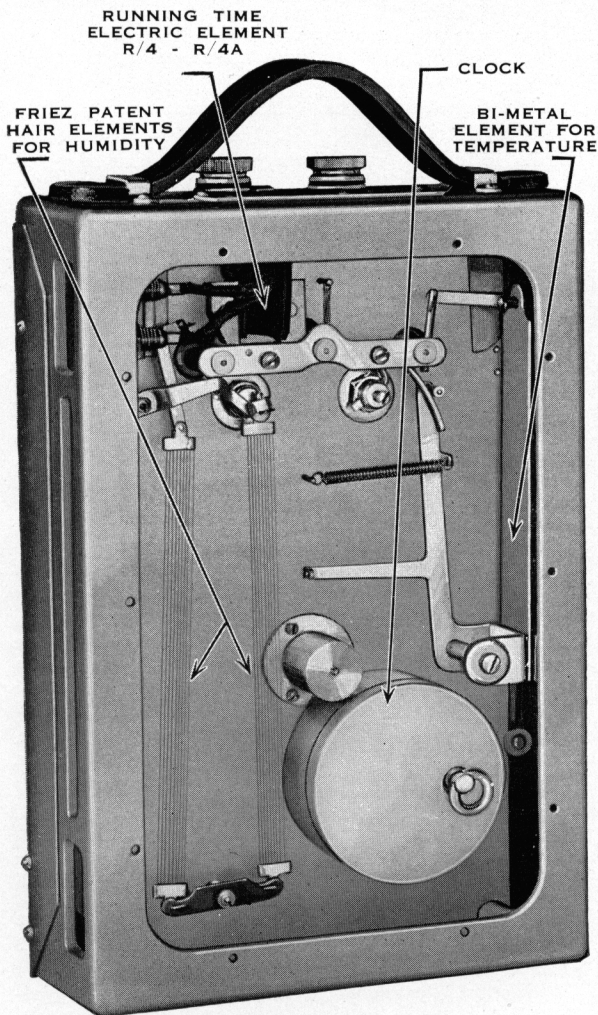
**State clearly type, hours, temperature range and if extra charts are desired, when ordering.**



30 Hr. Chart Illustrated—Full Size

## INSTRUCTIONS—Friez Recorders, types R/1, R/2, R/3, R/4 and R/4-A (New Sensitive Models)

The various types of these Recorders for relative humidity, temperature, and operation or running time may be identified by reference to pages 1 and 2 of this bulletin # "G", and users should read these earlier pages carefully for the information given there will not necessarily be repeated in these instructions. While die-cast case, unbreakable window, and stout construction have been provided, it should be remembered that these are sensitive instruments, and they cannot be expected to stand abuse. 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. Open Recorder cover by depressing catch F (illustration, page 2).



Rear View With Perforated Screen Removed

Taking care not to buckle chart and by using projections provided at side of table, **push complete chart table up to top of its travel** and close cover of case, after first checking to see that ink is flowing from pens on to chart. Wind clock from back, and make sure same is running. (Clock runs for 30 hours.) Instrument is now in operation as far as humidity and temperature recording are concerned. **See special notes later in this bulletin where operation or running time feature is incorporated on types R/4 and R/4-A.** Avoid overwinding clock.

Place instrument in position that is typical of conditions to be recorded, clear of direct sunshine, radiated heat, doors, windows, outside walls, dripping water, etc., and in general circulation of the air concerned. **Stand vertical.** Though some inclination is permissible, Recorder is not designed to work in horizontal position.

During test, record can be inspected through observation window or actual present conditions noted from position of pens. After completion of test, open cover, and if test has been for full length of time for which that particular instrument is constructed, chart table will now be found at bottom of its travel; if not, **slide same right down**, and carefully remove chart by just lifting clear of locking pin on top right corner. (Cut-away is provided in table for that purpose.) Be careful not to mar with ink from pens or by smearing moist graph lines.

If these notes are watched, a clear, graphic and easily-read record of conditions during the test should be secured. The charts of index file card type have space provided on back for entering name, date and general data. Complete record can then be filed in ordinary Standard index file and easily relocated if back of graph is filed facing forward.

**Sensitive Elements:** The temperature element (illustrated above) of this instrument is of bimetal and needs no attention. The hygroscopic element is of the Friez special multiple human hair type and as employed so successfully on our high-grade hygographs, 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 the Friez Humidistats now standard fitment with most 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. No attention is needed.

**Adjustment:** Great care is taken in seasoning and adjusting before dispatch, but where found necessary (after several careful checks with good Psychrometer, see Friez Bulletin #S for details), adjustment to both humidity and temperature pen positions is possible by movement of the two large-slotted adjusting screws that will be found to the right and left of the temperature and humidity pen shafts, respectively, and as one looks at the front of the mechanism with the instrument cover open. (B and C respectively on Illustration page 2.) 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.

**Inking Pens:** Ink container hinges out at top, and glass bottle rises from holder by spring action. Remove bottle from holder and ink pens with one or two applications from rod fitted into 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 getting on chart sliding table. Do not strain pen arms while inking. Pens should be allowed to lift clear of chart and table while inking. Depress clips at E and pen lifter will come into action. Depress pen lifter where it is desired to again allow pens to rest on chart. Shutting of cover automatically throws pens back on the chart when operator may forget to do this. As with all 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 the pen cleaner blade through center of the pens will assist in drawing ink through, when performing this operation for the first time. This method should also be employed for cleaning pens. Take care not to open up pen blades. Pens themselves are removable for cleaning or replacement.

**Pen Arm Tensions:** It is important that this be correct. Same is adjustable by screw provided in face of arm near top (marked A in illustration page 2.) Pens should never be set to bear heavily on chart or lag in pen movement will result. On the other hand, if insufficient tension is given, pen will skip chart and fail to make record. 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:** Remove 8 charts from their container. Place 7 in rack, provided in cover of case, and one on sliding chart table by pushing table to bottom of its travel and then placing left hand chart slot first in position, then right hand slot.

Push right hand side of card right down its keyhole slot and then **pinch top right hand corner to puncture chart card with sharp pin located in table, thus locking card.** Correct location of chart is clearly essential to secure accurate readings. If charts, under certain conditions, have any tendency to curl, this can be corrected by removing chart and giving a slight bend to same in opposite direction. It is important that charts at all times lie flat on the table, otherwise variable pen arm tension will result.

This shift is not of a permanent nature and will correct itself in the course of 24 hours. Where used in extreme humidities, or temperatures, 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, that the pen arm guard and lifter (D) be pushed down to relieve the pen from friction and allow the pen to rest on the chart and entirely free of contact with the pen arm guard.

It will have been noted from pages 1 and 2 that it is also possible for the user to change the temperature range from the **Standard** (0° to 110° F.) to a **Low** range (minus 30° to plus 80° F.) on standard Recorder; (or to a **High** range 100° to 210° F., where, when ordering, it has been specified that the normal and high range is preferred, instead of the standard normal and low range), by first providing himself with the low (or high) range charts and then correcting the temperature pen to agree with the special chart as checked with a good thermometer and after at least an hour has been allowed in a consistent temperature condition to reach balanced temperature in case and mechanism.

**NOTE:** Ten-hour instruments cannot be changed to thirty-hour or vice versa, except by the fitting of new gears, etc., at the factory. Quotations on application.

**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 adjustments. All instruments returned for attention should be sent Parcel Post, insured, carefully packed, and tagged, stating the attention required. **Quote serial number and type as obtained from nameplate in all correspondence.**

**Carrying Cases:** Handsome solid leather cases are available at \$5.00 net, and stout, stiff, black cases (imitation leather) at \$3.00 net, for those who desire them, and will appeal particularly for field work. These cases keep the instrument clean and protect it when not in use.

**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.

**It has been the very sincere endeavor of the Friez Company during its sixty 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.**

## SUPPLEMENTARY INSTRUCTIONS—Friez Recorders, types R/4 and R/4-A

**Type R/4:** Having given attention to the general points in the earlier part of this Bulletin, the following special points should be watched where the electrical operation or running time recording feature is incorporated. With the **Type R/4 Recorder** is furnished a 12-foot flexible lead, one end of which carries a "series" plug whereby it can be instantly placed into refrigerator or other similar load circuits without disturbing the wiring. The other end of this flexible lead plugs into the side of the Recorder casing. It must be noted particularly that the operation portion of the **R/4 Recorder is for use in series with electrical loads**, and it must never be placed in parallel, that is, directly across the line.

The mechanism is basically of the Ammeter type and comprises an electric coil, which, when the current flows through it to the main load, pulls magnetically on the lever mechanism that operates the center pen of the Recorder. This center pen normally travels up the left hand side of the center space on the chart and is pulled over to the right of that space when current flows through to the load. Therefore, a clear record is given of the number and duration of the functioning or running of the electrical load concerned, and on time lines which are common to the temperature and relative humidity records.

The standard mechanism will operate on **any voltage up to 220 A. C. or D. C., any cycle, and in series with loads from 2 to 8 amps.** continuous (inrush not to exceed 30 amps.). Care should be taken to watch that this instrument is not used in series with heavier loads than these. It will just fail to function if used on lighter loads than above.

The series plug provided on the standard flexible lead is first plugged into the electrical outlet, and then the lead to the load equipment is plugged in on top of the series plug. This arrangement is particularly designed for application to domestic refrigerators, and in such cases, the recording instrument is then placed in the refrigerated box, and the door closed carefully directly on to the flexible lead. Such refrigerator doors are provided with soft weatherstripping, which prevents the lead from getting cut or from damage. It is, however, a good plan to gently try shutting the door on the flexible lead at various points around the door until one finds, as is almost invariably the case, a place where the door can be shut on the lead with less pressure and danger from cutting. Where used continuously in this sort of application, the flexible lead will have to be renewed from time to time, and its condition should be watched, for it will be appreciated that as same is wired **in series**, this lead actually carries the full load of current consumed by the refrigerator motor.

**Type R/4-A:** is for use directly across the load lines, that is, **in parallel** with the load equipment. Type R/4-A has its operating recording feature wound along the lines of a Voltmeter, instead of an Ammeter, as is the case with type R/4. It can be **used on A. C. only, 50 or 60 cycle.** The amps. being passed down to the load equipment have no bearing on its operation, and therefore, it can be used on big and small loads alike without limits in respect to the amperage or wattage being drawn by the equipment being tested. There is furnished with the instrument in every case a special Friez Transformer Set which has primary connections clearly marked and which is suitable for **both 110 v. and 220 v., 50 or 60 cy.** Without this transformer set, the instrument cannot be used except on 6 to 12 v. circuits. Type R/4-A will therefore, cover all A. C. applications, that are not ideally covered by type R/4. Care should be taken to see that the transformer set is always interposed between the Recorder and the lines. The transformer, itself, should be placed as near as possible to the point of attachment to the load lines, thereby placing the longer lead to the instrument itself on low voltage, with added ease of application. The applications for which R/4-A are used vary so much and in many cases require considerable length of temporary flexible wire to the Recorder that no leads are supplied with the instrument unless specially ordered. All necessary binding posts, jacks, etc., are however provided.

Prospective purchasers and users should be very clear on the differences in the operation recording feature of type R/4 and type R/4-A, the essential point to remember being that R/4 is for use **in series** with electrical loads, and type R/4-A is for use **in parallel** with electrical loads. The latter is that in most general demand. Adaptations can be worked out so that this electrical operation feature can be used in all types of application. The makers will be pleased to give advice on special problems, and to work out with customers special features to suit particular needs.

### SAVE THIS INSTRUCTION BULLETIN FOR FUTURE REFERENCE

**We also manufacture** a complete range of automatic control instruments—HUMIDISTATS, THERMOSTATS, COMFORTROLS (Effective Temperature Controllers), HYTHERSTATS (combination instruments in single cases), etc.; you will also be interested in Friez "Tools of the Air Conditioning Industry"—PSYCHROMETERS, ANEMOMETERS, AIR METERS AND DRAFT GAUGES, RECORDERS for permanent installation and distance transmission, which we manufacture, in addition to the Friez famous Weather Bureau outdoor instruments for wind, rain, barometric pressure, etc.—**WRITE FOR BULLETINS.**

**AIR CONDITIONING UTILITIES, INC. P. FRIEZ & SONS, Inc.**  
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(A Subsidiary of The Bendix Aviation Corporation)



REG. U. S. PAT. OFFICE

**FOR SIXTY YEARS—"THE MAKERS OF AMERICA'S WEATHER INSTRUMENTS"**