



PACIFIC
NORTH
WEST
FOREST AND RANGE
EXPERIMENT STATION

USDA FOREST SERVICE RESEARCH NOTE

751001

PNW-185

September 1972

A 31-DAY BATTERY-OPERATED RECORDING WEATHER STATION

by

Richard J. Barney, *Principal Fire Control Scientist*

ABSTRACT

The battery-powered recording weather station measures and records wet bulb temperature, dry bulb temperature, wind travel, and rainfall for 31 days. Assembly procedures and cost of supplies and components are discussed.

Keywords: Weather, measuring equipment.

INTRODUCTION

It is often desirable to monitor meteorological information in accessible as well as remote sites. Desired observation intervals are usually frequent enough to warrant some type of recording system. Many of the currently available commercial recording weather stations are quite expensive.

This article discusses a recording weather station system which will operate 31 days using battery power. The system measures wind travel, temperature, and rainfall continuously. Hourly observations are recorded for an aspirated wet bulb temperature providing relative humidity or dewpoint measurements. Figure 1 shows the recording system with all the transducers. Most of the items are "off the shelf" components. The only fabrications necessary are the "battery saver" and a psychrometer or thermistor and fan assembly. The most attractive feature of the entire system is its basic simplicity.

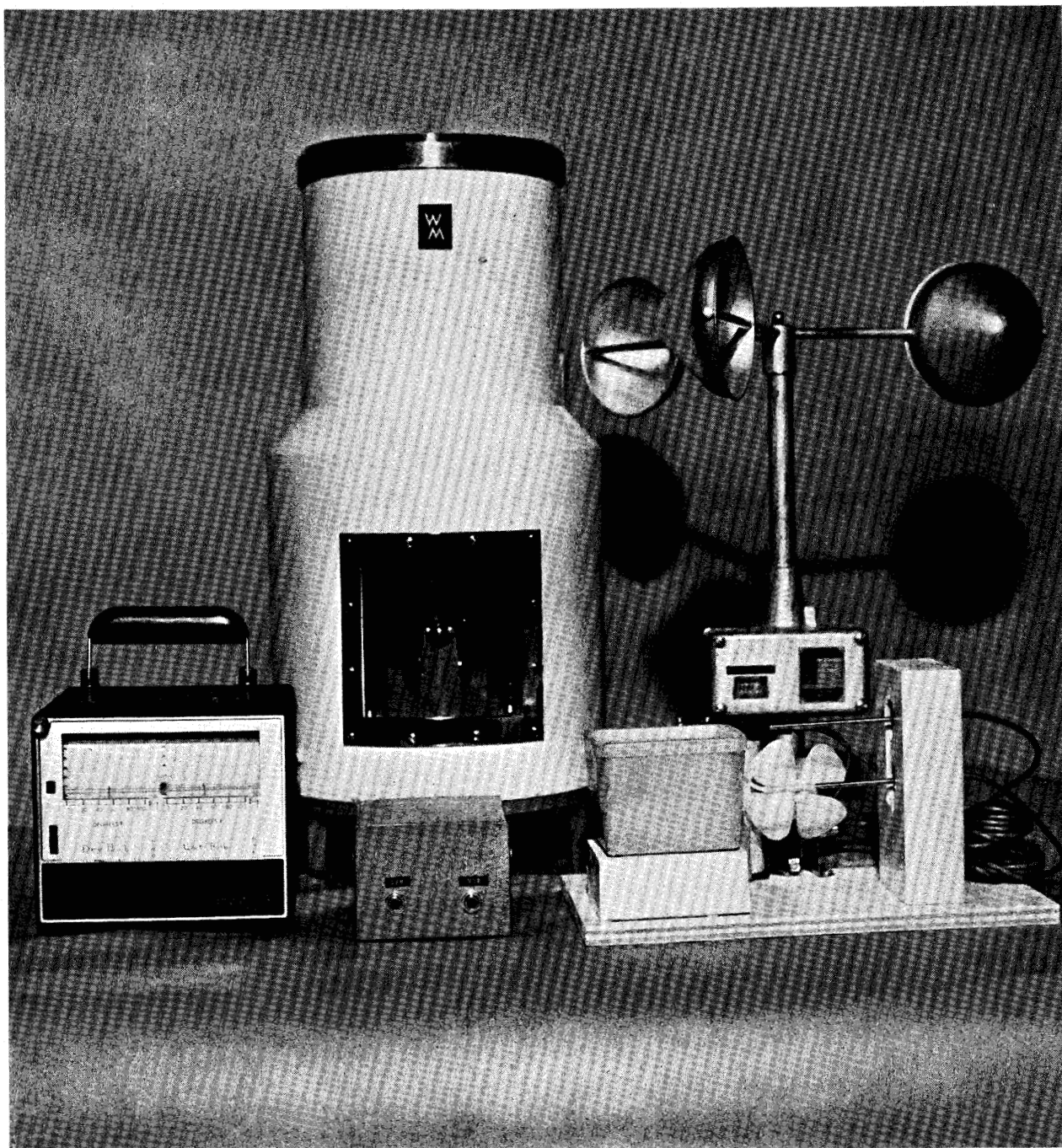


Figure 1.--Components of the recording weather station. Front row, left to right: recorder, "battery saver," psychrometer. Back row: tipping bucket rain gage, anemometer.

CONSTRUCTION

The following is a list^{1/} of primary parts, estimated cost, and a source of possible suppliers:

Anemometer, Belfort model

Belfort Instrument Company	
1600 South Clinton Street	
Baltimore, Maryland 21224	\$ 170.00

Tipping bucket rain gage, model P501

Weather Measure Corporation	
P. O. Box 41257	
Sacramento, California 95841	180.00

Thermistor, Yellow Springs model 403 (2 each)

Van Waters and Rogers	
P. O. Box 3200, Rincon Annex	
San Francisco, California 94119	44.00

Psychrometer fan

Western Fire Equipment	
440 Valley Drive	
Brisbane, California 94005	26.00

Recorder, Rustrak model 3133/3146 with a 1-hour interval timing switch (2-4 minutes on time) and two each 12-volt d.c. event channels

Rustrak Instrument Division	
Gulton Industries, Inc.	
Municipal Airport	
Manchester, New Hampshire 03103	650.00

Miscellaneous supplies-- "battery saver" parts, hookup wire, dry batteries, etc.

30.00

Total estimated cost
(January 1972)

\$1,100.00

^{1/} Names and products listed are for the convenience of the reader and do not indicate endorsement by the USDA Forest Service. Parts of a similar type can be obtained from other suppliers.

The thermistor psychrometer shown in figure 2 is easy to construct. A stand must be built to hold the two thermistors. Cotton wicking is placed over the bottom thermistor and is then run into the water reservoir. The water reservoir is a plastic food container obtainable at a variety store. Standard one-hole rubber laboratory stoppers are used to hold the thermistors firmly in the stand. The layout should allow free air movement from the fan across the thermistors. Note that the dry bulb thermistor is above the wet bulb, avoiding possible dripping. The distance from the reservoir to the thermistor must also be limited (1 to 2 inches) to avoid excessive evaporation before the water reaches the sensing tip of the thermistor. The only additional item needed in construction is the "battery saver." Details for the "battery saver" construction can

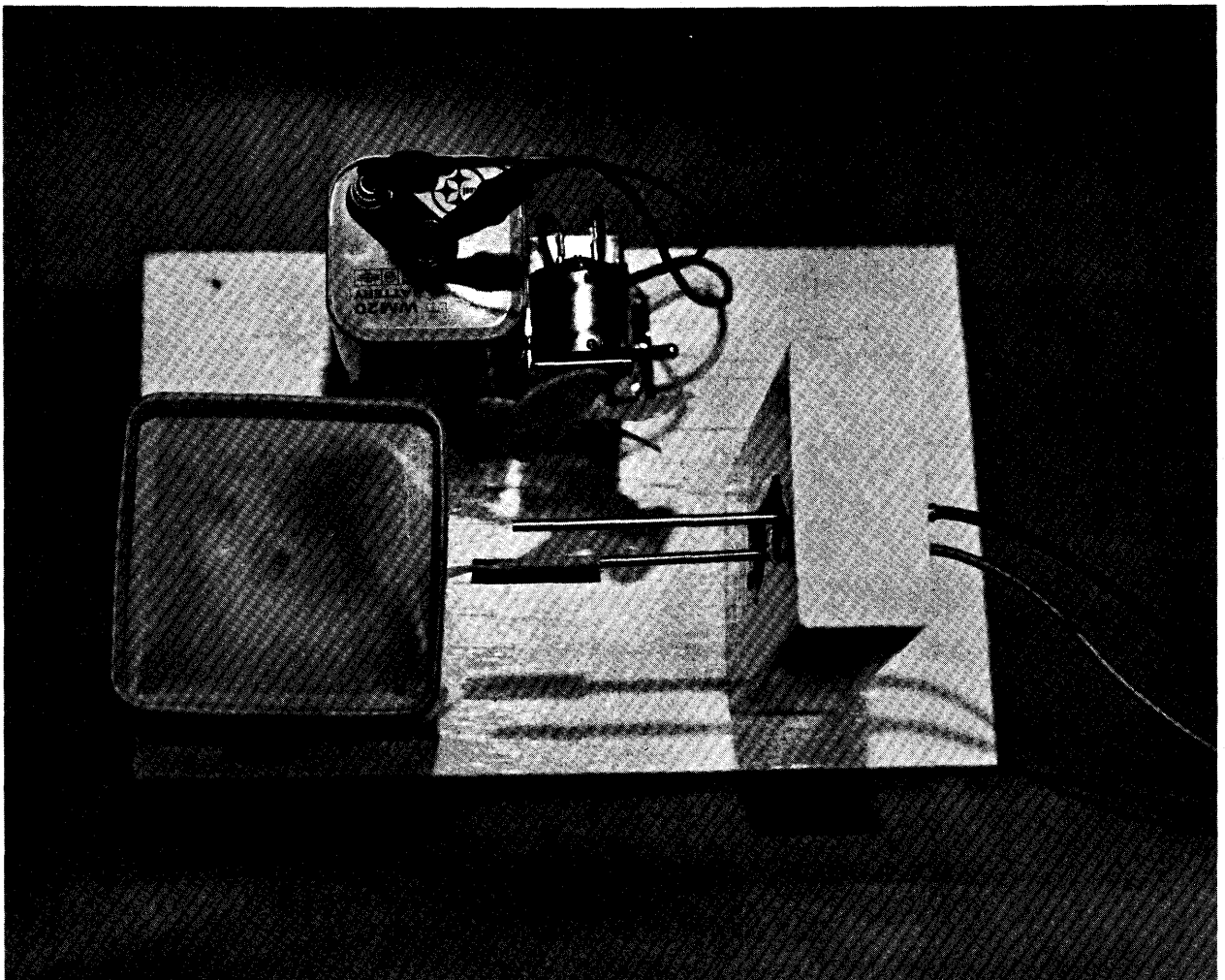


Figure 2.--Thermistor psychrometer used in the recording weather station.

be found in an earlier publication.^{2/} This battery saver is designed to eliminate excessive battery drain when the contacting transducers remain in the "on" or closed position for prolonged periods. The recording weather station can be assembled with or without this device; however, experience indicates that it is good insurance against losing data.

STATION OPERATION

Operation of the station is simple. Once the transducers have been placed in a "Cotton Region" instrument shelter and connected to the recorder, the wick reservoir is filled with mineral-free water. Mineral-free clean water prevents scaling and keeps water moving from the reservoir through the wicking to the thermistor. A 6-volt battery is connected to the psychrometer fan and 12-volt batteries are connected to the "battery saver" and the recorder. Once the recorder is operating, the appropriate temperature channels can be adjusted, using an accurate psychrometer, for both the dry bulb and wet bulb temperatures.

The psychrometer fan, when connected to the timing switch, will run 2 to 4 minutes once every hour. With a 1-inch-per-hour chart speed, the recorder chart paper will last slightly over 31 days. Chart paper is sensitive to pressure; therefore, no cleaning or inking of the pens is required. At each servicing, mineral-free clean water should be added and the old wick cut off and fresh wick pulled out of the reservoir and placed on the wet bulb thermistor. The 12-volt recorder and 6-volt fan batteries should be changed at the end of each month. The "battery saver" battery should be checked at this time and replaced when necessary. Figure 3 is a schematic of the weather station hookup.

An example of the recorder chart is shown in figure 4. This chart is an actual example of data obtained using the system. Point A in the figure shows that the 11:00 wet bulb temperature was 56° F., and the dry bulb temperature at point C was 66° F. Precipitation in the amount of 0.04 inch (point B) was recorded between 11:00 and 12:00. For the same 1-hour time period, point D on the chart showed 6 miles of wind or a 6 m.p.h. average.

We have had several months of satisfactory service from this system. Psychrometric readings have been found to be as accurate as those made with a portable fan-aspirated psychrometer. Its relatively inexpensive cost makes this station within the reach of many budgets.

^{2/} Richard J. Barney and Thomas C. Van Wickle. A "battery saver" for event recorders. Portland, Oreg., Pac. Northwest Forest & Range Exp. Stn., USDA Forest Serv. Res. Note PNW-168, 6 p., illus., 1971.

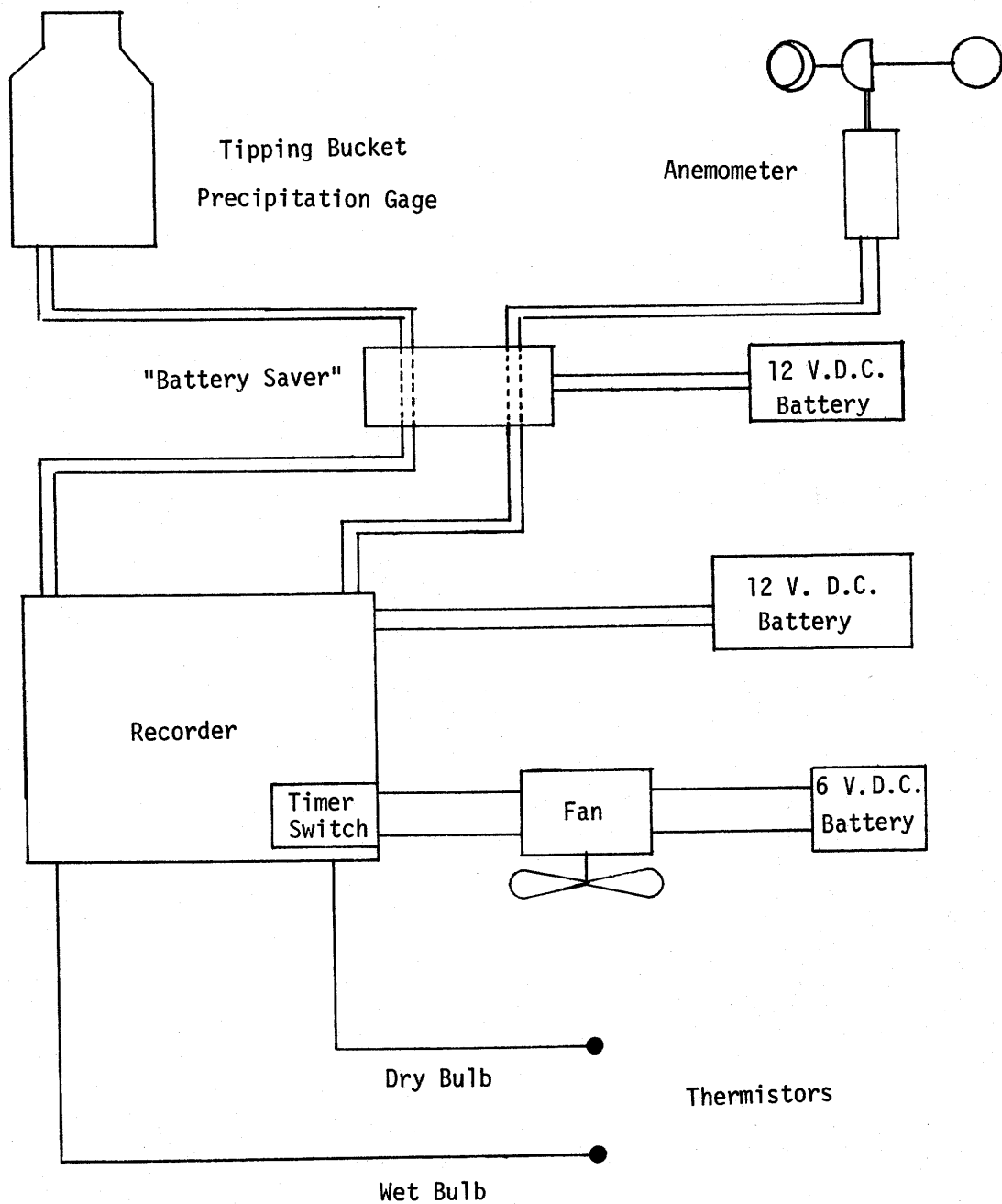


Figure 3.--Schematic of weather station hookup.

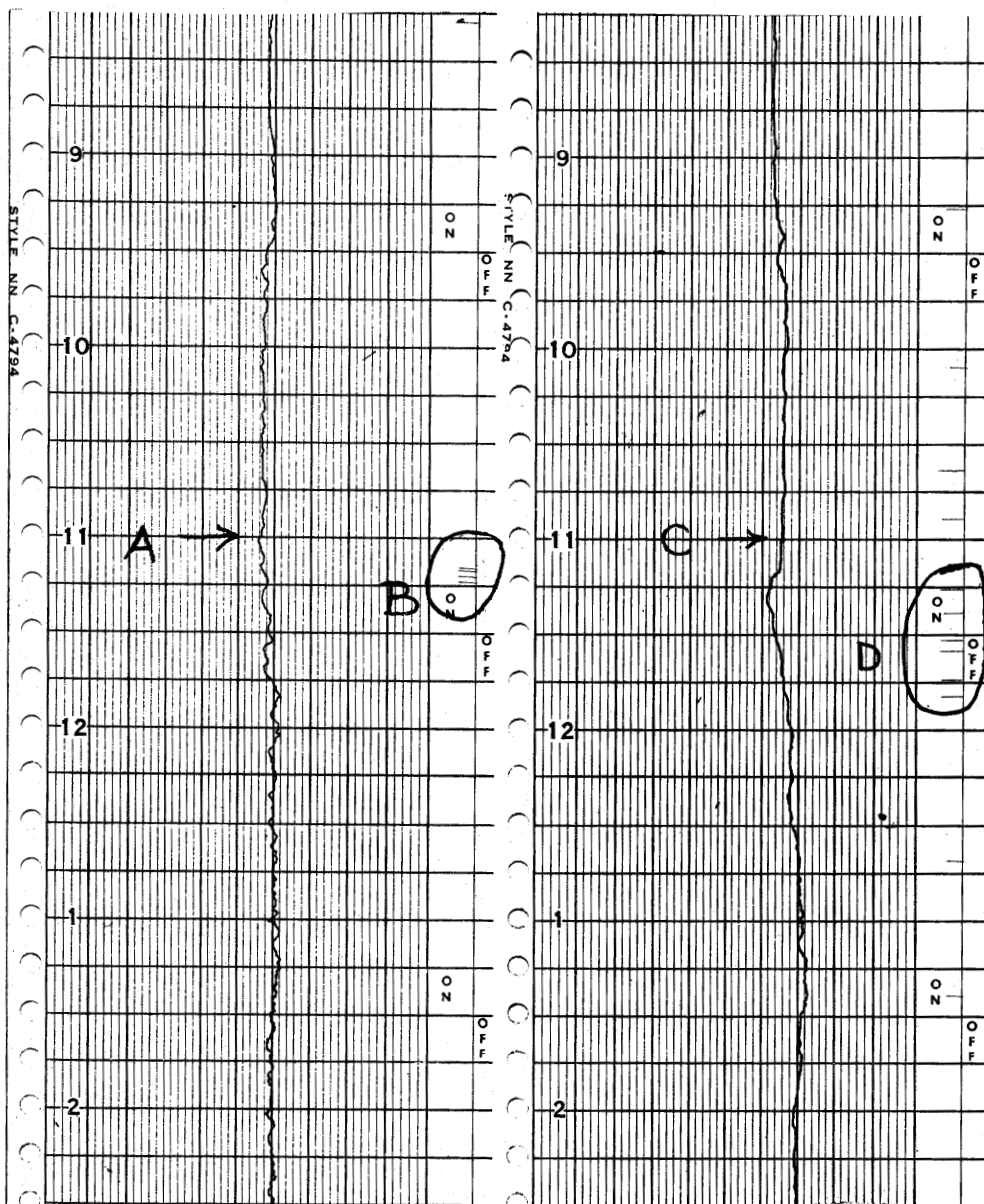


Figure 4.--Example of actual recording weather station chart (full size).

The mission of the PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION is to provide the knowledge, technology, and alternatives for present and future protection, management, and use of forest, range, and related environments.

Within this overall mission, the Station conducts and stimulates research to facilitate and to accelerate progress toward the following goals:

- 1. Providing safe and efficient technology for inventory, protection, and use of resources.**
- 2. Development and evaluation of alternative methods and levels of resource management.**
- 3. Achievement of optimum sustained resource productivity consistent with maintaining a high quality forest environment.**

The area of research encompasses Oregon, Washington, Alaska, and, in some cases, California, Hawaii, the Western States, and the Nation. Results of the research will be made available promptly. Project headquarters are at:

Fairbanks, Alaska	Portland, Oregon
Juneau, Alaska	Olympia, Washington
Bend, Oregon	Seattle, Washington
Corvallis, Oregon	Wenatchee, Washington
La Grande, Oregon	