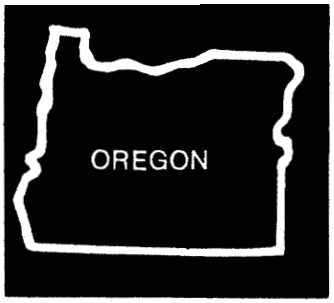

PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION

USDA FOREST SERVICE RESEARCH NOTE

PNW-168 November 1971

A "BATTERY SAVER" FOR EVENT RECORDERS

by

Richard J. Barney, *Principal Fire Control Scientist*
Pacific Northwest Forest and Range Experiment Station
College, Alaska

and

Thomas C. Van Wickle, *Development Electronic Technician*
Tanana Electronics Company
College, Alaska

ABSTRACT

An electronic circuit and device designed to eliminate some of the problems encountered with event recorders in field operations is described.

Keywords: Measuring equipment, transducers, electric batteries.

PROBLEM

Current research practices and instrumentation often include the use of contacting-type transducers. In the collection of such data, it is usually desirable to use event recorders. As an example, the anemometer is typical of contacting-type transducers generally used with event recorders in forestry and related research activities. One problem is that wind movement may cease at such a time as to leave

the contacts of the anemometer in the closed position. Whether it be anemometers, rain gages, or other transducers used to count events, sometimes the switch would stay in a closed position. When this occurred and when we were interested primarily in the event occurring rather than the duration of the event, it has been our experience that batteries would run down in a very short time. Subsequent loss of data seriously impaired or curtailed a study.

SOLUTION

Several years ago, the U. S. Forest Service developed a totalizing wind counter for contacting-type anemometers. This wind counter and circuit design are discussed in detail in an equipment development report.[1/] A feature of the basic electronic circuit is the capability to prolong battery life. We used this original version of counter on several occasions and then modified it to meet our more specific needs. We did not need the counter capability but used the basic circuitry that had already been developed. Essentially, we removed the digital counter unit from the original circuit and substituted our event recorders, adapting and applying a long-used principle and circuit.

"BATTERY SAVER"

The diagram of the "battery saver" box (fig. 1) consists of two identical control circuits. One of these control circuits is made up of J1, R1, C1, C2, and K1.

J1 is connected to the transducer and is shorted when the transducer contact is closed. When the transducer contacts close, the circuit is complete and energizes resistor R1, relay K1, and capacitor C2. C2 will begin charging at a high current rate which diminishes as the charge voltage of the capacitor approaches the applied battery voltage. Likewise, at the start of the charging period, the current flowing through the coil of relay K1, which is in series with C2, will be sufficient to close the contacts of K1. These relay contacts will remain closed until the current flowing through the coil of K1 is insufficient to hold them closed (12 milliseconds nominal). At that time, the relay contacts of K1 will open. If the transducer contacts remain closed,

---

1/ Intermountain Forest and Range Experiment Station, Division of Forest Fire Research. Totalizing wind counter for contacting-type anemometers. Washington, D.C., Forest Serv., U.S. Dep. Agr. Tech. Equip. Rep. F-2, 6 p., illus., May 5, 1958.

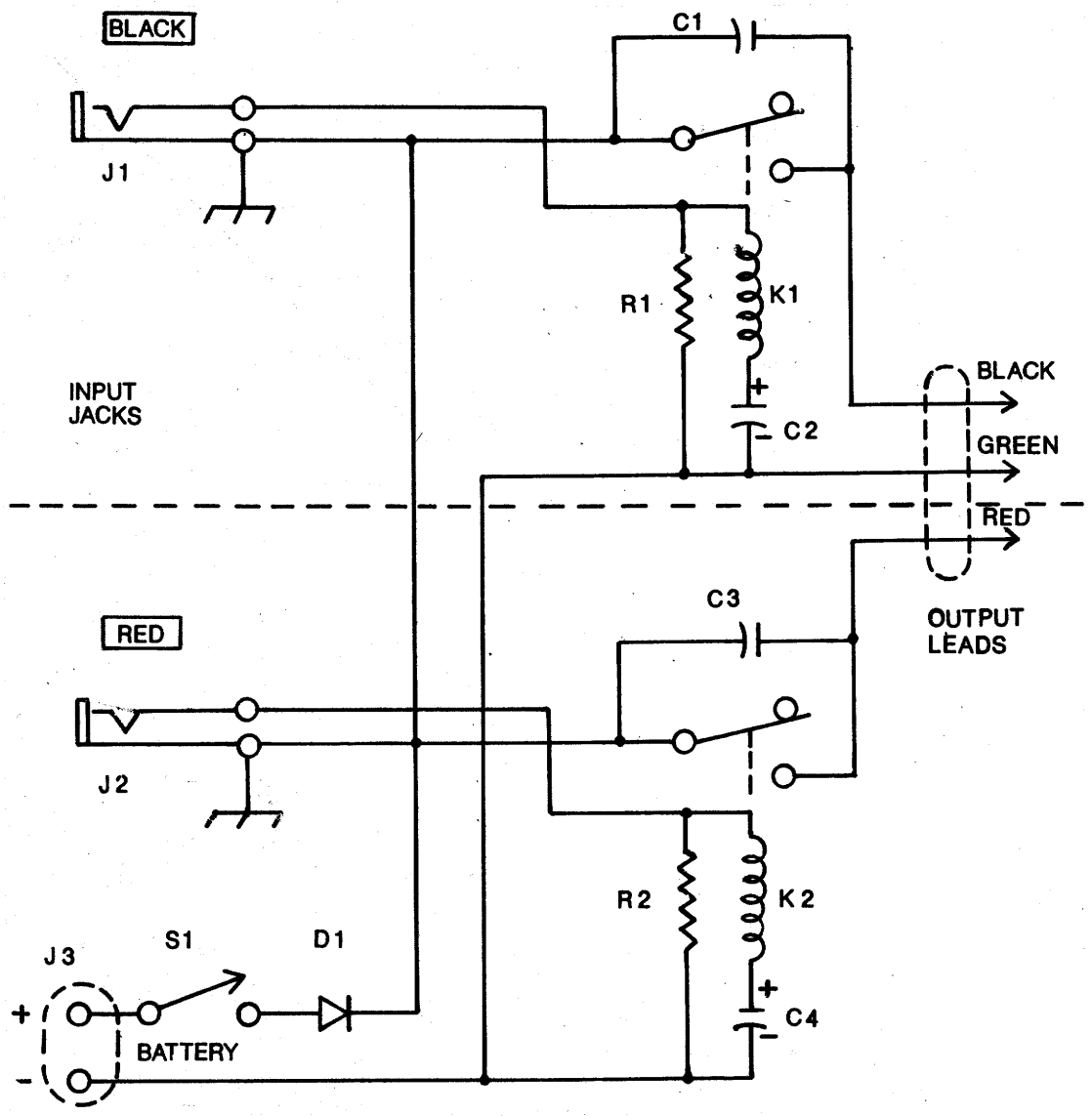

Figure 1.--Diagram of "battery saver" showing dual circuit configuration. Diagram portion above the dotted line is for a single-unit configuration.

C2 remains charged, K1 contacts remain open, and a continuous 10-milliampere (nominal) current is drawn from the battery by the control circuit. When the contacts of the transducer open, power is removed from R1, K1, and C2. C2 then discharges through K1 and R1, but the current is insufficient to cause the contacts of K1 to close again.[2/] When the contacts of K1 close, battery power is provided to the output leads. C1 is a spark suppression capacitor used to improve reliability of relay contacts when used to control solenoid-operated devices such as counters and chart recorder pens.

Battery power has an on-off switch and a diode in series. The switch is primarily a convenience, but the diode prevents an incorrectly connected battery's damaging the electrolytic capacitor C2. If the battery is incorrectly connected, the system will not function. Battery polarity must be observed. Depending on the mechanical characteristics of individual relays, the operational reliability will generally drop below 5 volts on the 6-volt version and below 10 volts on the 12-volt version. Under normal operating conditions, the battery drain is usually less than the shelf life of the battery. For insurance, we change the batteries periodically. Compared with lost data, battery replacement costs are minimal.

Since we installed the "battery saver," no data have been lost due to battery failure. The "battery saver" has reduced chatter problems which we have encountered using contacting-type devices. Our experience has shown that the circuit can easily handle 1 pulse per second. As in the case with some of our anemometers, this pulse rate is equivalent to a sustained wind of 60 miles per hour. These units may be built in single or multiple configurations. We have used both types and are currently using several dual circuits and a four-circuit model. In our construction process, we have attempted to provide color coding and external hardware of such a nature as to make field hookups relatively simple. Also we have designed an alternative to making the system adaptable to both 6-volt and 12-volt operations depending upon

---

[2/] Caution -- If a 6-volt "battery saver" box is used with a 12-volt battery, the discharge current is sufficient to cause the contacts of K1 to close again when the transducer contacts open and thereby cause a double count. However, no physical damage to the "battery saver" box is caused by such an error. The voltage of the recording device solenoid must equal that of the "batterv saver" voltage used.

the requirement of the actuators in the event recorder. This conversion is simply accomplished by changing a resistor (R1). The change could also be handled by a switching arrangement for more convenient substitution of the resistor (R1). Cost of parts on today's market is approximately $11 per circuit. Assembly time is 1 hour for the dual circuit model (fig. 2).

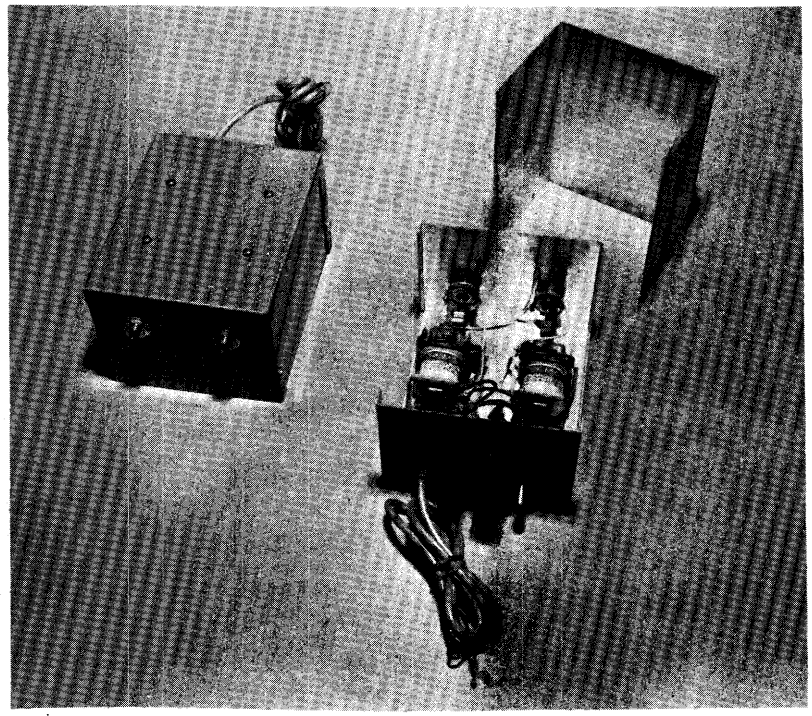

Figure 2.--External and internal views of a dual unit "battery saver."

ADVANTAGES

The advantages of such a circuit are:

1. Battery protection
2. Limit on imput frequency (antichatter)
3. Fixed pulse width on output independent of varying input width -- better identification of individual marks on slow chart.

We have had an equivalent of 9 years of satisfactory experience with a number of anemometers and various types of event recorders used in conjunction with our devices. Inclusion of the "battery saver" with an

event recorder results in approximately a 90-percent savings in current drain when the circuit is closed. Table 1 compares two frequently used voltages and recorders as found in our normal field operations.

Table 1.--*Comparison of current flow with and without the battery saver for two recorders*

Recorder type[1/]	Operation voltage	Measured current	
		Without battery saver	With battery saver
	Volts direct current	- - - - *Milliamperes* - - - -	
Esterline-Angus event recorder	6	165	12
Rustrak event recorder	12	110	10

[1/] Use of brand names is only for convenience and does not constitute endorsement by the U.S. Forest Service.

☆ GPO 795-295

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:

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

The FOREST SERVICE of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress — to provide increasingly greater service to a growing Nation.