

# Long Distance Hot Box Detection

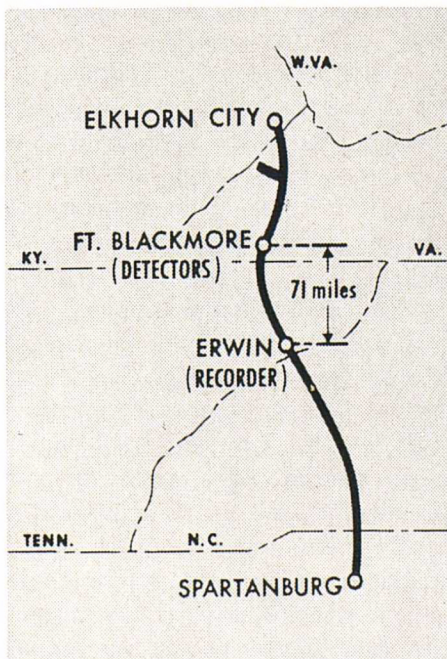
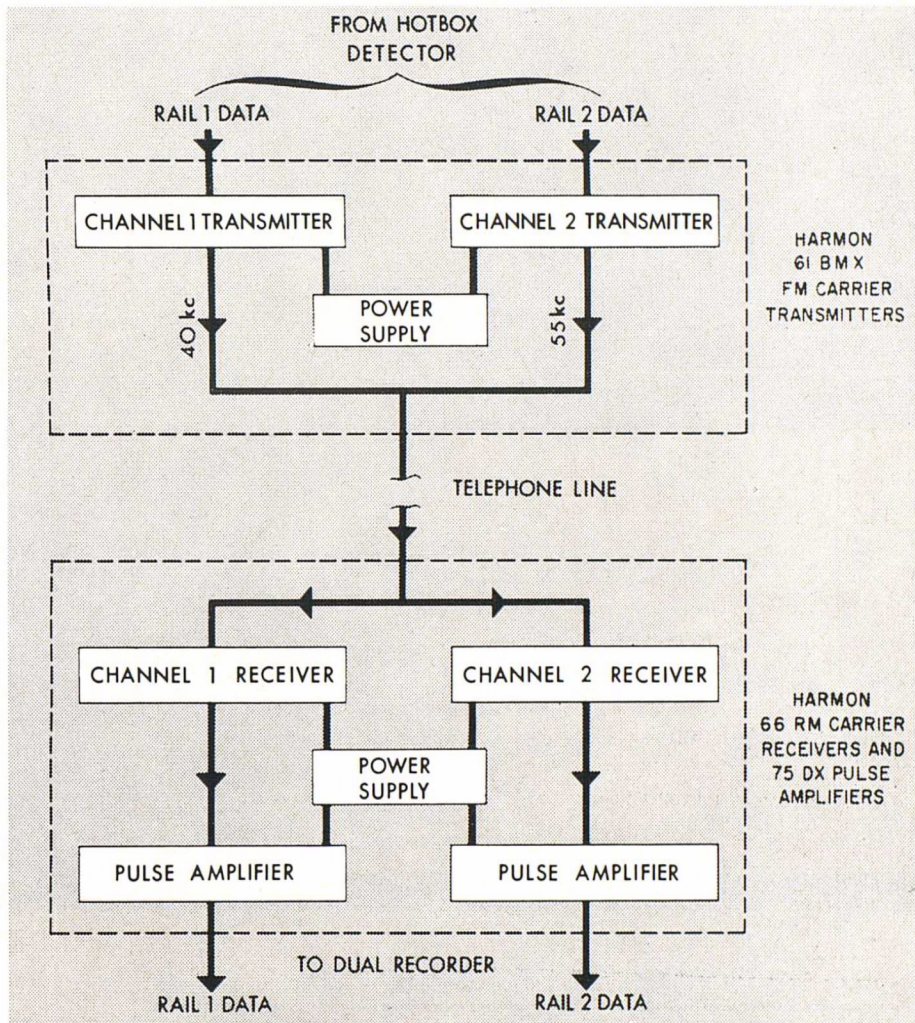
The Clinchfield Railroad has installed a Servo hotbox detector near Fort Blackmore, Va., a location that had had a high incidence of overheated journals. The detectors inspect the heavy southward coal trains passing here, and have cut the number of setouts due to hotboxes in half. The detectors are about 64 miles south of the railroad's northern terminus at Elkhorn City, about halfway to the division point at Erwin.

Choosing the exact location for the detectors posed a problem: Servo Corp. engineers recommend that the detectors be placed on tangent track at least 2,600 ft from a curve. Finding a piece of tangent that long in the desired area on this curving mountain railroad was not easy. The tangent section was located, however, although the inspected trains go around a curve soon after passing the detector.

As the entire 277-mile railroad has CTC signaling, it was desirable to have the hotbox recorder at the dispatcher's office at Erwin, Tenn., the location of the CTC control machine. Erwin, however, is 71 miles from the detector site. It was decided, therefore, to transmit the heat signals from the detector to recorder by carrier.

The carrier signals are superimposed on the message circuit. Two separate Harmon FM carrier channels were provided, one for the heat signal from each side of the train. The frequencies chosen were 40 kc and 55 kc. The presence or absence of carrier controls the recorder on and off by means of contacts on the carrier squelch relay.

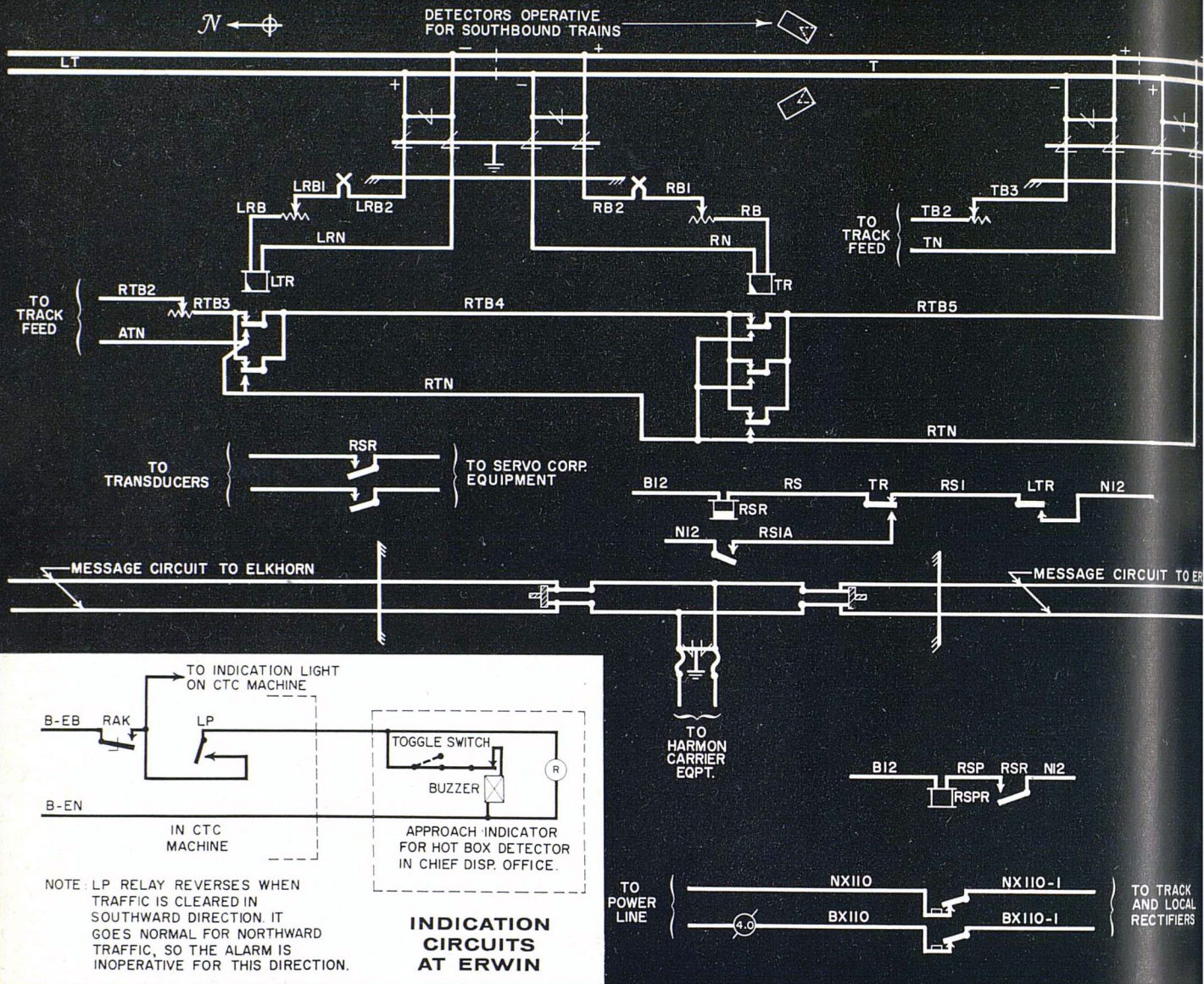
At Erwin, the recorder is located in the chief dispatcher's office. To alert the chief dispatcher of the approach of a train to the detector, a buzzer is sounded and a red indication lamp is lighted approximately eight minutes prior to the train's arrival at the detector location. Connections to the CTC indication circuits are utilized to



**Above:** The carrier system (block diagram) transmits the heat detector signals 71 miles from the field location to the office at Erwin, Tenn.

**Left:** The detectors are located about 64 miles south of the northern terminus at Elkhorn City. Future installations are planned 50 miles south of Erwin and 30 miles north of Spartanburg for southward and northward trains respectively.

# CLINCHFIELD RAILROAD CO. HOT BOX DETECTOR CIRCUITS



## LONG DISTANCE HOT BOX DETECTION *continued*

provide this warning. The buzzer may be silenced by operating a toggle switch, but the red lamp remains on until the train clears the approach circuit in which the detector is located.

The chief dispatcher scans the graph of the journal temperature deflections and advises the dispatcher to stop the train if an abnormal deflection is noted. The train dispatcher places a controlled signal (no special aspect) about five miles past the detector to stop, and turns on the maintainer call light. Operating rules on the Clinchfield require any person seeing a mainliner call light on to contact the train dispatcher. When a member of the crew calls in, he is told of the location of the hot journal.

"The train crew at present decides

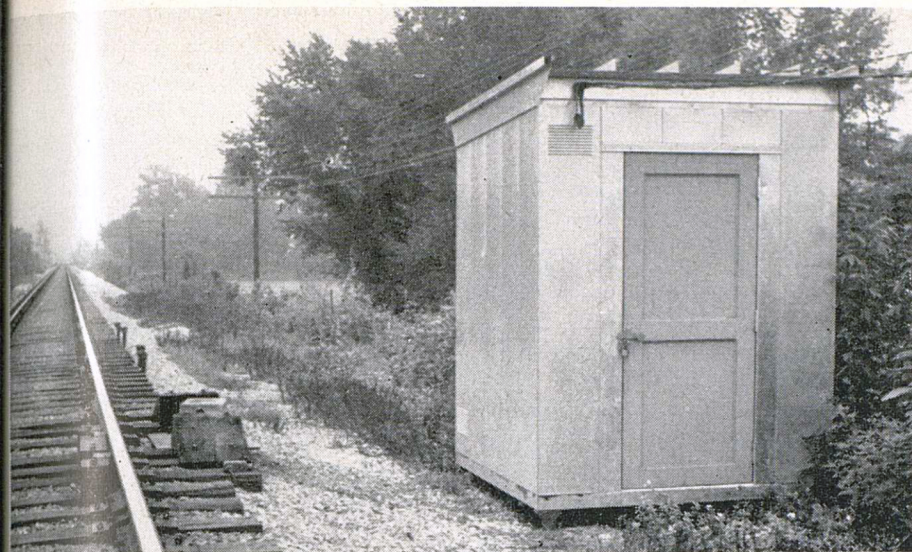
if the car can be moved or must be set out," says Engineer of Signals and Communications, W. E. Prince, Jr. "We have not set a fixed deflection point beyond which cars will always be set out, but every deflection of more than 10 to 12 mm above the normal is reason to stop the train for inspection."

Southbound traffic through here amounts to an average of 450 cars per day hauled in five trains. The hotbox setouts for the months of September, October, and November for 1958 and 1959 (before and after the detector installation) reveal that about half as many cars were set out after passing the detector, whereas about the same number of cars were set out

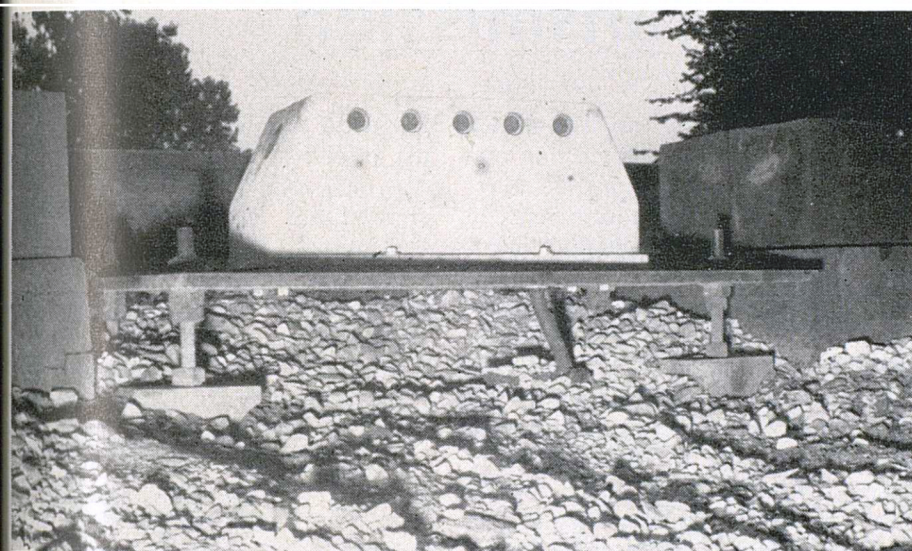
north of the detector before and after the detector installation. In essence, stopping the train and cooling and lubricating hot journals before serious damage was done, allowed 10 more cars to get to their consignees without undue delay.

### Detector Operation

The transducers are normally not operative. A short track circuit, about five rail lengths long, was cut into the existing track circuit. This is used to provide a directional circuit which allows the transducers to become operative for southbound trains. In the circuit diagram, track relay LTR must pick up before TR in order to energize relay RSR. Contacts of relay RSR



Pulse processing and carrier equipment is in steel house at the site.



Two dwarf signal foundations support each detector head.

close the circuit to the transducers. A repeater of this relay, RSPR, opens the ac power to the rectifiers. This is done because of the extreme sensitivity of the preamplifiers on the detector heads to the ripple voltage present in the output of the rectifiers. During the short period that a southward train is occupying track section T, the track circuits and the local dc power supply are supplied entirely from battery.

Two dwarf signal foundations, one under each end, are used to support the steel plate on which the Servo Corp. detectors are mounted. These foundations are 28 in. high and are set on six inches of gravel with cement grouting. An Armco Steelox building houses the carrier and the detector pulse processing gear.

The circuits were designed and the installation was made under the jurisdiction of W. E. Prince, Jr., Engineer, Signals and Communications. Total cost of the system was \$20,674, of which \$717 represents the cost of the carrier system.

The Clinchfield is planning installation of detectors at two more points. The first will be approximately 50 miles south of Erwin to check southbound trains and the second about 30 miles north of Spartanburg, S. C., to check northbound trains from connections at the southern terminus. The first recorder will be in the Erwin Yard office and the second at Bostic Yard, N. C. The purchase of General Electric detectors and carrier is contemplated.

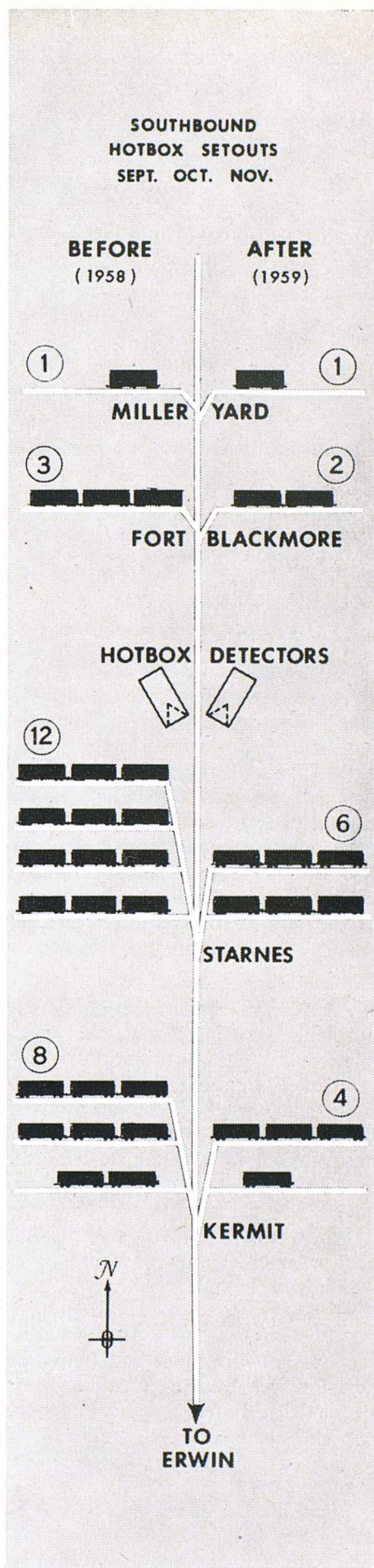


Diagram illustrates before (left) and after (right) effect of hotbox detector on car setouts.