Intermediate Signal Spacing and Control

"What is your opinion as to the most desirable arrangement in regard to spacing, location and control of intermediate signals and their approach signals in single track automatic blocking? What are your present practices, also the special advantages and disadvantages?"

No Fixed Formula

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It is my opinion that no fixed formula can be used in the spacing, location and control of intermediate signals and their approach signals in single track automatic blocking. The spacing and location are largely governed by the location of sidings, grades and curves; therefore, the proper controlling arrangement would depend on the first two factors enumerated.

In blocks having more than two pairs of intermediates, the matter of controls is relatively simple; provided, of course, that the intermediate signals are spaced stopping distance apart. The conventional circuits would apply in this case as no complications arise due to the possibility of opposing trains entering opposite ends of the block simultaneously.

For blocks with one pair of intermediates, controls would depend entirely on local conditions with respect to grades, speed, etc. Where additional overlap protection is needed, it may be provided by the use of a P.C. relay in the intermediate signal controlled through the track circuit in the rear of the absolute head-block signal. Coupled with the proper stick relays, this arrangement insures an additional restrictive indication for opposing moves. With this arrangement the single pair of intermediate signals can be either opposite or staggered. Somewhat similar protection may be secured with semaphore signals by pole changing the control for the signal in the rear at 67 instead of 42 degrees. An overlap of this type would, of course, be effective for both opposing and following traffic.

Two Special Problems

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Where the distance between passing sidings is as much as four times braking distance, and three or more sets of intermediate signals are provided, no change in the standard control of A.P.B. signals is necessary. Should two trains moving in opposite directions receive clear signals and leave adjacent passing sidings simultaneously, each would receive a stop indication at the first intermediate signal and would have full braking distance before reaching the point of danger.

If the distance between passing sidings is less than four times braking distance and there are two sets of intermediate signals, trains under the same circumstances will receive stop signals at the first intermediate signal, and the braking distances for these trains will then overlap, creating the possibility of an accident, this being based on the assumption that the enginemen would not be able to have very much view of the intermediate signal, or if, on account of adverse conditions, he would not be able to see it until passing it. In such a case, trains running in opposite directions should receive indications which are not more favorable than approach restrictive at the ends of passing sidings, so that they would be under control at the intermediate signal and able to stop before reaching the danger point.

In the case of passing sidings with only one set of intermediate signals and only double braking distance between the sidings, this situation would be very much worse, as each train leaving the passing siding under a clear signal would find the intermedi-

To Be Answered in a Later Issue

(1) What effects on the timing operation of time-element relays are caused by high temperatures up to 100 deg. F. or low temperatures down to 20 deg. below zero F., which may be encountered in outdoor housings, and how can objectionable operation be corrected?

(2) What are the advantages or disadvantages of using 2-ohm as compared with 4-ohm d-c. track relays, and under what circumstances of: type of battery, length of circuit bonding, and ballast conditions, should one or the other type of relay be used and why?

(3) When frozen ground causes the back points in searchlight type signals to bounce, thus opening contacts in checking circuits, what methods can be used to eliminate this trouble?

If you have a question you would like to have someone answer, or if you can answer any of the questions above, please write to the editor. Answer to any of the questions above will be paid for in cash or by a subscription to Railway Signaling.

ate signal in stop position, and there would be no braking distance for either, except that provided by the advance view of the intermediate signal. Therefore, in this case, trains running in opposite directions should receive caution signals at the ends of passing sidings, expecting the intermediate signals to be in the stop position. It is possible that this would slow up the movement of following trains to some extent, but this cannot be avoided if it is desired to give full protection for head-on movements.

Testing Insulation

"What is the most practicable means of testing the insulation on insulated wires and cables?"

Nomogram for Computing Resistance

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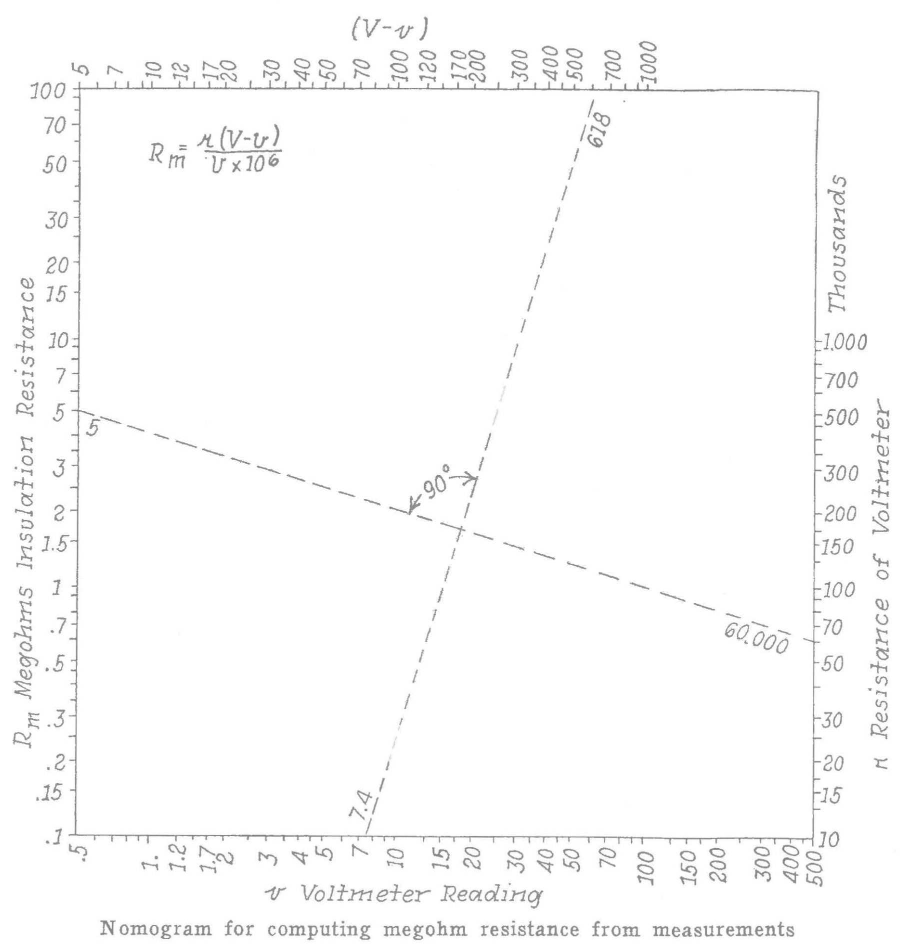
In the May, 1939, issue, pg. 293, W. R. Smith showed a method for testing the insulation resistance of a wire by the use of a direct current voltmeter. The accompanying illustration is a nomogram that will automatically compute the megohm resistance from the measurements as described below, without any arithmetical calculation.

Let *V* be the reading of the voltmeter when it is connected directly across the battery; in other words, the battery or line voltage. Let *v* be the reduced voltmeter reading when the insulation of the wire is cut into this circuit in series, in the appropriate manner. *V-v* is one of the quantities to be used. Let *r* be the resistance of the voltmeter at the particular scale that is being used, and let *Rm* be the required insulation resistance in megohms (million ohms); then it can be shown that $Rm = \frac{(10)^6 r}{r(V-v)}$

The chart or nomogram is the solution of this equation such that any two lines at right angles will cut the four scales at values that will satisfy the equation. Therefore, at the observed values, draw a line from the scale marked *V-v* to the value on the scale marked *v*, and from the voltmeter resistance scale *r* draw a line at right angles to the first line, prolonging it until it cuts the megohm scale *Rm*, which is the required insulation resistance. It is more convenient and quicker to use as a templet a piece of tracing cloth on which two lines are drawn at right angles; if this is shifted on the chart so that three ends pass through the known quantities on the three scales, the fourth end will cut the remaining scale at the value to be found. The particular computing secants drawn on the chart show that, using a 60,000-ohm voltmeter *(r)* with a reading of 7.4 volts *(v)* with the insulation in series, and 625 volts *(V)* across the line, corresponding to the battery voltage, the insulation resistance, *Rm*, of the wire is 5 megohms.



Nomogram for computing megohm resistance from measurements

Proceeding by a Head-Block Signal

"On single track, when automatic signals are out of order and a head-block signal is indicating 'stop', what is the rule for handling a train to proceed by the head-block signal?"

On the Missouri Pacific

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The rules on the Missouri Pacific covering this situation read:

"Rule 529. When a train is stopped by a stop signal, it must stay until authorized to proceed; or on information from the train dispatcher that there is no opposing train in the block it may, after filling out clearance card, Form C, proceed at restricted speed to the next signal displaying a proceed indication. In case of failure or lack of communication, it may proceed, when preceded by a flagman, to the next signal displaying a proceed indication." I am not quoting the remaining part of Rule 529 since it does not have any bearing on the question. An additional rule applying reads:

"Rule 536. A train which is to take siding at a point where the switch to be used is within 100 ft. in advance of an automatic block signal may pass such signal at 'Stop' to enter the