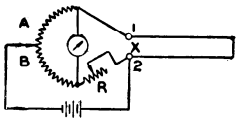
DIRECTIONS FOR OPERATING LEEDS & NORTHRUP TEST SET No. 5430-AM-1

RESISTANCE MEASUREMENTS



$\frac{A}{B}$ = ratio dial setting

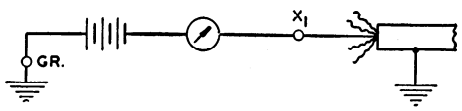
R = rheostat setting

$X = \frac{A}{B} R$

Connect the unknown resistance to posts X1 and X2 Set the lever switch at RES. Set the ratio dial as shown in the table below, and balance the bridge by varying the rheostat dials until the galvanometer does not deflect when a GA key is depressed. Balance first with GA .01 key, then with .1 and 1. The unknown resistance equals the rheostat setting multiplied by the ratio dial setting.

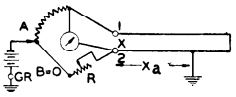
Unknown Resistance	Ratio Dial Setting
Below 10 ohms	1/1000
10 ohms to 100 "	1/100
100 " " 1000 "	1/10
1000 " " 10000 "	1/1
10000 " " 100000 "	10/1
100000 " " 1011000 "	100/1

PICKING OUT A GROUNDED WIRE



Set the ratio dial on M1000 and the lever switch at VAR. Connect the GR post to ground or cable sheath and connect wires in cable, one after another, to post X1. The faulty wire will be detected by a strong galvanometer deflection when a GA key is depressed. The pointer will deflect a scale division for 1 volt through 1 megohm, hence a very high resistance ground or fault can be detected.

MURRAY LOOP TEST



r = resistance of loop

Xa = resistance of faulty wire from set to fault

R = rheostat reading

A = ratio dial "M" setting

$Xa = \frac{R\,r}{A + R}$

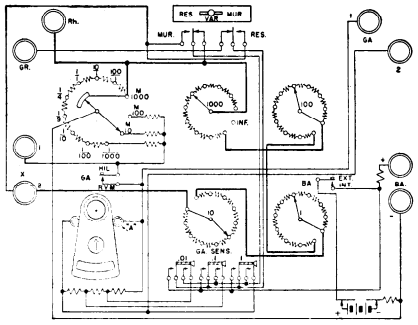
In case of a ground, join the faulty wire to a good one at the distant end of the cable; connect faulty wire to X2 and good wire to X1. Connect GR post to ground. Set ratio switch on M1000, which places 1000 ohms in A ratio arm. Set the lever switch at MUR. Vary rheostat to balance the bridge. If a satisfactory balance cannot be obtained with ratio switch at M1000, set at M100 or M10. The setting used is the value of A in the formula.

In case of a cross, connect one crossed wire to X2 and a good wire to X1 and join their distant ends. Connect the other crossed wire to GR post and proceed as above.

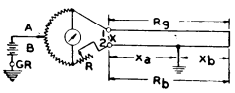
Set the lever switch at RES, measure total resistance of the loop and call this r.

TO CONVERT RESISTANCE INTO DISTANCE TO FAULT

Multiply the resistance (Xa) by feet per ohm for proper wire gauge.



VARLEY LOOP TEST



r = total resistance of loop

Xa = resistance of faulty wire from set to fault

Xb = resistance of faulty wire from strap to fault.

$\frac{A}{B}$ = ratio dial reading

R = rheostat reading

$Xa = \frac{rB - AR}{A + B}$

$Xb = \frac{A(R + Rb) - BRg}{A + B}$

In case of a ground, join the faulty and good wires at the distant end of the cable; connect the faulty wire to X2 and the good wire to X1. Connect post GR to ground. Set lever switch to VAR. Set ratio switch at 1/10 or 1/100, and vary rheostat to balance the bridge.

If the fault is a cross, connect one of the crossed wires to X2, a good one to X1, and join them at the distant end of the cable. Connect the other crossed wire to the GR post.

Measure the total resistance of the loop and call this r.

SIMPLE VARLEY

For this test the good and bad wires must be equal in resistance. Make connections as for regular Varley. Set ratio dial on 1/1. Vary rheostat until balance is obtained. Resistance from fault to strap is Xb = R/2.

TO USE OUTSIDE BATTERY

Connect battery to BA posts, having disconnected the contained battery by throwing BA switch to EXT. When additional sensitivity is required beyond that provided by the 4.5 volt internal battery, an external battery from 5 to 200 volts may be used, the voltage depending upon the measured resistance, the ratio dial setting and the required accuracy of measurement. For potentials over 45 volts use external resistance in series with battery, 40 ohms for each volt over 45 up to 200.

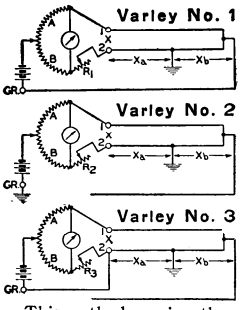
GALVANOMETER SWITCH

The GA switch should be in the R. V. M. position for all tests except the Hilborn loop. To use outside galvanometer, disconnect internal galvanometer by removing screw "A" and connect outside galvanometer to GA posts.

TO USE RHEOSTAT AS RESISTANCE BOX

Connect to Rh and X2 terminals to obtain resistances from 0 to 10110 ohms. Safe rating 1/2 watt per coil.

THREE VARLEY METHOD



Balance bridge and call reading R_1

Balance bridge and call reading R_2

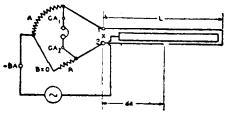
$Xb = \frac{A}{A+B}(R_2 - R_1)$

Balance bridge and call reading R_3

$Xa = \frac{A}{A+B}(R_3 - R_2)$

This method requires three readings of R with different sets of connections. Keep the lever switch at VAR throughout. Set the ratio dial at 1/9 or 1/4, the same setting throughout. The other connections in the three tests are as follows: No. 1, join the faulty wire to two good wires at the distant end; connect faulty wire to X2, one good wire to X1, the other good wire to GR post. No. 2, connect GR post to ground instead of good wire. No. 3, connect GR post to X2 instead of to ground.

OPEN LOCATION—QUADDED CABLE



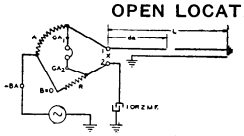
da = distance from set to open, in feet

L = length of cable in feet

$da = \frac{2LA}{A+R}$

Turn BA switch to EXT. and disconnect internal galvanometer by removing screw "A". Connect a telephone receiver between the GA posts 1 and 2. Connect the open wire to post X2 and a good wire of equal gauge and length in the same cable to X1, and strap them together at the distant end of the cable. Join the mates of these wires at both ends. All wires must be free from grounds and crosses. Connect one terminal of source of a.c. (such as a tone or buzzer) to the —BA post and the other terminal to the near end of the joined mates. Set ratio switch on M1000, M100 or M10. Set lever switch at MUR. Depress GA1 key and balance bridge by varying the rheostat for silence or minimum tone in telephone.

OPEN LOCATION—PAIRS



$da = \frac{R_1 L}{R_2}$

Connect the open wire to X1 and ground its distant end. Ground the near end of its mate with distant end open. Connect X2 to one terminal of a condenser with the other terminal grounded. Arrange bridge as in preceding description, but ground outer terminal of source. Balance the bridge and note rheostat reading as R1. Disconnect near end of faulty wire from X1 and ground it. Disconnect near end of good wire from ground and connect it to X1. Balance the bridge and note rheostat reading as R2.

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