<u>Northeast Frontier Railway</u>
Signal & Telecommunication Department
Technical Circular No. 01/2017

Sub: Calculation of Maximum Voltage Drop between Internal Bus BAR and Relay Coil.

As per IRS specification of Non Deterioring Type Low Voltage Electric Fuses, specification no.IRS: S 78-92, Para 7.3.3, the maximum allowable voltage drop between end caps of 2A fuse is = 0.500V---- (i)

Maximum contact resistance of a contact of Relay in full make or break position = 0.2 Ω

Maximum number of relay contact allowed in a circuit = 45 Nos.

For each relay contact there are two finger contacts at base with soldering.

So, for 45 numbers relay contact total numbers of relay contact in a circuit = 45X3 = 135 Nos.

Therefore Maximum contact resistance for 45 numbers relay contact = 135X0.2 = 27 Ω------ (a)

As per IRS Specification of PVC insulated cables and wires (IRS: S: 76-89), the maximum allowable resistance of each conductor per Km for cable of size 16/0.2 at 20°C is 38.60Ω.

Assumptions:

    (i)   The normal height of a relay rack = 2 meter.

    (ii)   Number of relays in a row of relay rack = 10 Nos

    (iii)   Numbers of relay racks in Relay room = 10 Nos

So maximum distance between the internal bus bar (+ ve) at the top of Relay rack no. 1 and the final relay placed at farthest bottom row will be = 2X10X10 meter = 200 meter.

Similarly for negative bus bar the distance also will be = 200 meter.

Therefore total length of the cable between internal bus bar of relay and relay coil = 400meter

With the safety margin we can take the distance is as 500 meter.

Therefore for maximum allowable resistance of flexible wires of length 500m = (38.60/2) Ω =19.3 Ω--- (b)

Total resistance offered between bus bar and relay coil = (a) + (b) = (27+19.3) Ω = 46.3 Ω

Pick up current of a 'QN1' relay is = 60 m A.

Therefore maximum voltage drop in the wiring = (0.06X 46.3) V = 2.78 V----- (ii)

Therefore maximum allowable drop between internal bas bar of Relay room and relay coil is =

(i) + (ii) = (2.78+ 0.500) V = 3.28 V ≈ 3.5 V.

However, the provision mentioned in this technical circular does not supersede any provision in this regard given in Signal Engineering Manual or Telecommunication Manual. This has approval of CSTE.

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