CABLE TESTING - GENERAL
RESISTANCE OF CABLE CONDUCTORS

Contents **Page**

1. GENERAL

1.01 This section replaces Issue 1. It contains tables giving the resistance of cable conductors. The section has been reissued to cover changes in the tables.

2. RESISTANCE TABLE

2.01 The resistance of the various gauges of conductors found in telephone cables at 68° F. is given in the following table:

Gauge		Actual Feet-Per-Ohm	Approx. Feet-Per-Ohm	Actual Ohms Per 1000 Feet	Approx. Ohms Per 1000 Feet
Copper	Aluminum				
10		986.92	1000	1.032	1
13		493.46	500	2.026	2
16		251.43	250	3.977	4
	17	121.35	121	8.24	8
18		156.6	157	6.386	6
19		124.24	125	8.049	8
	20	59.54	60	16.76	16 ←
22		61.75	62	16.19	16
	22	37.08	37	26.7	27
24		38.54	39	25.94	26
26		24.00	24	41.67	42
28		15.08	15	66.31	66

2.02 For temperatures above 68° F. the conductor feet-per-ohm will be less than that indicated in the tables and for temperatures below 68° F. the feet-per-ohm will be higher. To determine the feet-per-ohm of a wire at any temperature above or below 68° F., the following equations may be used. It has been found that the maximum range in the temperature of underground cables is about 40° to 50° F. The temperature of aerial cable and open wire on the other hand follow closely the temperature of the atmosphere except where the cable or wire is exposed to the sun. In the latter case cable and wire temperatures over 120° F. have been recorded.

For temperatures above 68° F.

$$F_t = F_a [1 - .00218 (t - 68)]$$ ←

For temperatures below 68° F.

$$F_t = F_a [1 + .00218 (68 - t)]$$ ←

Where

F_t = feet-per-ohm at temperature t, Fahrenheit.
F_a = feet-per-ohm at 68° F.

3. CONVERSION TABLE EQUIVALENT LENGTH

3.01 The actual length of a conductor of a given gauge can be converted into the equivalent length of another gauge by multiplying the length of the line by a conversion factor based on the resistances of the two wires.

3.02 The following table gives the conversion factors for the various cable conductors. The equivalent length can be obtained by multiplying the length of the wire by the appropriate conversion factor given in the columns headed "Factor for Desired Equivalent Gauge."

Actual Gauge		Factor for Desired Equivalent Gauge										
		10 cu.	13 cu.	16 cu.	17 al.	19 cu.	20 al.	22 cu.	22 al.	24 cu.	26 cu.	28 cu.
10 cu	MULTIPLY BY	1.	.5	.255	.123	.126	.060	.062	.037	.039	.024	.015
13 cu.		2.	1.	.51	.246	.252	.121	.125	.075	.078	.049	.030
16 cu.		3.92	1.96	1.	.483	.494	.237	.246	.147	.153	.095	.06
17 al.		8.13	4.07	2.07	1.	1.02	.491	.509	.305	.317	.198	.124
19 cu.		7.94	3.97	2.02	.977	1.	.479	.497	.298	.31	.193	.121 ←
20 al.		16.57	8.29	4.22	2.04	2.09	1.	1.04	.623	.647	.403	.253
22 cu.		16.0	7.99	4.07	1.96	2.01	.964	1.	.60	.624	.389	.244
22 al.		26.6	13.3	6.78	3.27	3.35	1.61	1.66	1.	1.04	.647	.407
24 cu.		25.6	12.8	6.52	3.15	3.22	1.54	1.6	.962	1.	.623	.391
26 cu.		41.1	20.6	10.5	5.06	5.18	2.48	2.57	1.54	1.61	1.	.628
28 cu.		65.4	32.7	16.7	8.05	8.24	3.95	4.09	2.46	2.56	1.59	1.

cu. = copper al. = aluminum ←

Example: A conductor 1550 feet long consists of 400 feet of 24-gauge wire, 350 feet of 22-gauge wire and 800 feet of 19-gauge wire. The equivalent length of the wire in terms of 19-gauge wire is:

400 × 3.22 = 1288.0 equivalent feet of 19-gauge
350 × 2.01 = 703.5 equivalent feet of 19-gauge
800 × 1 = 800 feet of 19-gauge

2791.5 equivalent feet of 19-gauge

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