SECONDARY CONSTANTS OF NONLOADED CABLE

24 GAUGE DSM, FSM

At 68°F.*

Freq. kHz	Characteristic Impedance			
	R ohms	X ohms (neg.)	Z ohms	Angle Degrees (neg.)
.1	1,613	1,606	2,276	44.9
.2	1,142	1,135	1,610	44.8
.3	934	926	1,315	44.8
.5	725	716	1,019	44.6
1	516	503	721	44.3
2	369	352	510	43.7
3	305	285	417	43.0
5	242	216	324	41.8
8	197	165	257	39.9
10	181	145	231	38.7
15	156	112	192	35.9
20	142	93	170	33.2

Through Carrier Frequencies — At 55°F.*

Freq. kHz	Characteristic Impedance			
	R ohms	X ohms (neg.)	Z ohms	Angle Degrees (neg.)
.1	1,594	1,586	2,249	44.9
.2	1,128	1,121	1,590	44.8
.5	716	707	1,006	44.6
1	510	497	712	44.3
2	365	348	504	43.6
5	239	213	320	41.7
10	179	143	229	38.6
15	154	111	190	35.6
20	141	91	168	32.9
50	115	45	123	21.3
100	107	27	110	14.0
200	102	17	104	9.3
250	101	15	102	8.2
500	98	10	98	5.6
1,000	95	6	95	3.9
2,000	93	4	93	2.6
4,000	92	3	92	1.7
5,000	91	2	91	1.5
10,000	90	2	90	1.0

* For temperature variations see page 3.

At 68° F.*

Freq. kHz	Propagation Constant Per Mile			Phase Delay Sec./Mile (X10⁻⁶)	Velocity of Propagation Miles/Sec. (X10³)
	Attenuation		Phase Shift β Radians		
	$\propto$ Nepers	dB			
.1	.0851	.74	.0851	135.47	7.4
.2	.120	1.04	.121	95.90	10.4
.3	.147	1.28	.148	78.37	12.8
.5	.189	1.64	.191	60.82	16.4
1	.266	2.31	.272	43.21	23.1
2	.372	3.24	.388	30.87	32.4
3	.451	3.92	.480	25.46	39.3
5	.570	4.95	.633	20.14	49.6
8	.699	6.07	.826	16.44	60.8
10	.766	6.65	.944	15.02	66.6
15	.893	7.76	1.218	12.92	77.4
20	.985	8.55	1.480	11.78	84.9

Through Carrier Frequencies – At 55° F.*

Freq. kHz	Propagation Constant Per Mile			Phase Delay Sec./Mile (X10⁻⁶)	Velocity of Propagation Miles/Sec. (X10³)
	Attenuation		Phase Shift β Radians		
	$\propto$ Nepers	dB			
.1	.0837	.73	.0837	133.23	7.5
.2	.118	1.03	.119	94.35	10.6
.5	.186	1.62	.188	59.83	16.7
1	.262	2.27	.267	42.51	23.5
2	.366	3.18	.382	30.37	32.9
5	.560	4.87	.623	19.85	50.4
10	.752	6.53	.931	14.81	67.5
15	.875	7.60	1.203	12.76	78.4
20	.964	8.38	1.464	11.65	85.8
50	1.203	10.45	2.982	9.49	105.4
100	1.468	12.75	5.544	8.82	113.3
200	1.920	16.68	10.61	8.45	118.4
250	2.106	18.30	13.11	8.35	119.8
500	2.976	25.85	25.42	8.09	123.6
1000	4.361	37.88	49.46	7.87	127.0
2000	6.447	56.00	96.73	7.70	129.9
4000	9.582	83.23	190.5	7.58	132.0
5000	10.86	94.33	237.5	7.56	132.2
10,000	16.36	142.1	469.5	7.47	133.8

Notes: dB = 8.686 $\propto$

phase delay = $\beta / 2 \pi f$

velocity of propagation = $2 \pi f / \beta$

* For temperature variations see page 3.

Estimated Average Temperature Variation *

Freq. kHz	Per Mile Per Degree F.			
	dB	Phase Radians	R ohms	X ohms
.3	.0016	.00019	.829	−.850
.5	.0021	.00024	.654	−.662
1	.0030	.00034	.452	−.476
2	.0042	.00048	.316	−.343
3	.0052	.00059	.250	−.283
5	.0067	.00075	.192	−.228
10	.0099	.00100	.128	−.166
15	.0124	.00119	.096	−.142
20	.0144	.00131	.074	−.124
50	.0207	.00165	.017	−.074
100	.0242	.00203	−.004	−.050
200	.0267	**	**	**
250	.0275			
500	.0311			
1,000	.0412			
2,000	.0736			
4,000	.1524			
5,000	.1912			
10,000	.4030			

* Average values between 34° and 76° F.

** At high frequency, inductance has a significant effect on phase shift and impedance; therefore, due to the uncertainty of the effect of temperature variation on inductance, the phase and impedance variations above 100 kHz are not given.