TRANSMISSION CHARACTERISTICS POLYETHYLENE
INSULATED VIDEO PAIRS — 16 PSV AND 16 PEV

1. GENERAL

1.01   This section provides transmission infor-
mation on the 16-gauge PSV and 16-gauge
PEV pairs used with the A2A video transmission
system. The pairs are incorporated in standard
sheathed cables, usually in conjunction with
regular exchange telephone pairs.

2. SHIELDED POLYETHYLENE INSULATED VIDEO PAIRS

2.01   Three types of 16-gauge polyethylene in-
sulated pairs are normally used with the
A2A system as follows:

16 PSV-S String-insulated 16-gauge pairs cov-
ered with two copper wrappings wound
spirally in opposite directions. Manufactured
1947-1950.

16 PSV-L Similar to 16 PSV-S except that
inner tape is applied longitudinally instead of
spirally with outer tape applied spirally as
before. This design results in improved cross-
talk performance and a small reduction in
attenuation. Manufactured 1950-1954.

16 PEV-L New design in which polyethylene
tape and string construction was supplanted
by individual insulation of the conductors with
expanded (foamed) polyethylene together with
expanded polyethylene fillers. Longitudinal
and spiral copper tapes are applied as for
16 PSV-L. This construction results in a cable
whose impedance can be held to closer toler-
ances and one with reduced internal echoes
due to manufacturing irregularities. Manufac-
tured 1954 to date.

All three types are referred to collectively as
16-gauge video pair. Values of attenuation of the
16 PSV and 16 PEV video pairs are given in
Table I. A more complete table of character-
istics of these cables is given in Table II.

2.02   Because of the effective shielding of 16-
gauge video pairs there are no limitations
on direction of transmission or number of cir-
cuits obtainable within any given size of cable.
For noise reasons the 16-gauge video pairs should
be separated from the remainder of the cable
conductors at the building entrance and carried
to the video equipment under a separate sheath.

2.03   The characteristic impedance (Zo) of 16
PSV and 16 PEV cable is almost a pure
resistance of 124 ohms at the higher frequencies.
Below about 500 kHz the resistance component
increases to about 1000 ohms at 60 Hz and the
reactive component, essentially zero at the
higher frequencies, increases to about the same
value as the resistance at 60 Hz. The character-
istic impedance approaches infinity as the fre-
quency approaches zero.

2.04   Variations in attenuation due to tempera-
ture changes in 16-gauge video cable are
about one-tenth of one per cent per degree Fahr-
enheit, expressed in db. For all practical pur-
poses it may be assumed that temperature
changes cause a slope change equal to one-tenth
of one per cent of the normal 4.5 MHz loss for
each degree (F) of temperature change. Thus,
the primary effect of seasonal temperature vari-
ations is to change the effective cable length. To
the degree that this is the major effect, varying
the amount of equalization will compensate for
these changes.

3. OFFICE CABLING

3.01   Several types of solid dielectric coaxial
and paired cables are used for office ca-
bling and the transmission losses of these cables
are also given in Table I with the complete
table of characteristics listed in Table III. The
paired cables (except the 754A) may also be
used in lieu of 16 PSV and 16 PEV pairs for
temporary installations of short lengths in the
outside plant. However, since the office cables
are not designed for continuous outside plant
use, this alternative should be used only under
emergency conditions and the paired cables
should be scheduled for replacement with 16 PSV
or 16 PEV pairs as soon as possible. The trans-
mission characteristics of the office cables are
sufficiently similar to those of 16-gauge video
pairs that the same equalizers may be used.

TABLE I

Attenuation of Video Line Facilities

TYPE	SHIELDING	LOSS PER 1000 FEET-DB AT 75°F		LOSS PER MILE-DB AT 75°F	
		0*	4.5 MHz	0*	4.5 MHz
Shielded Video Pairs					
16 PSV-S	Spiral inner tape	0	3.65	0	19.3
16 PSV-L	Longitudinal inner tape	0	3.52	0	18.6
16 PEV-L	Longitudinal inner tape, expanded polyethylene	0	3.52	0	18.6

Office Cabling

PAIRED		AT 70°F	
720	Single braid	0	10.0
754A	Single braid	0	5.3
754B	Single braid	0	5.3
754D	Double braid	0	5.2
754E	Double braid	0	5.2
KT51	Double braid	0	6.6
KT52	Double braid	0	5.3
COAXIAL			
KS-8086	Double braid	0	11.0
724	Double braid	0	5.2

* It may be assumed that for the lengths of cable employed in A2A repeater sections the loss at essentially zero frequency is zero db.
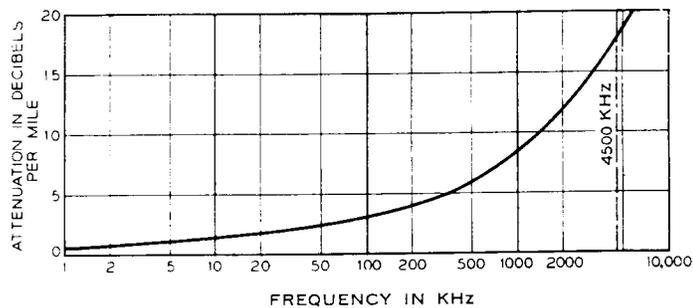
Attenuation of 16 PSVL or 16 PEVL Cable

TABLE II

Nominal Characteristics of 16 PSV-L or 16 PEV-L Video Pair

(16-Gauge Polyethylene String or Foam Insulated Pair, Shielded
With One Longitudinal and One Spiral Copper Tape)
Temp. Approx. 75°F.

FREQUENCY f Hz	CHARACTERISTIC IMPEDANCE R₀ OHMS	X₀ OHMS	ATTENUATION 8.69α db	PHASE SHIFT β RADIANS	RESISTANCE R OHMS	INDUCTANCE L MILLIHENRIES
10.0	2585	−2580	0.0139	0.00161	8.30	0.235
12.5	2315	−2308	.0156	.00180	8.30	.235
15.0	2112	−2106	.0171	.00197	8.30	.235
17.5	1956	−1949	.0184	.00213	8.30	.235
20	1829	−1823	.0197	.00228	8.30	.235
25	1637	−1630	.0221	.00255	8.30	.235
30	1495	−1487	.0241	.00279	8.30	.235
35	1383	−1376	.0260	.00302	8.30	.235
40	1296	−1287	.0278	.00323	8.30	.235
50	1160	−1150	.0311	.00361	8.30	.235
60	1060	−1049	.0340	.00396	8.30	.235
70	982	− 970	.0367	.00428	8.30	.235
80	920	− 904	.0392	.00458	8.30	.235
100	824	− 810	0.0437	0.00513	8.30	0.235
125	739	− 723	.0488	.00574	8.30	.235
150	676	− 658	.0533	.00631	8.30	.235
175	627	− 608	.0576	.00679	8.30	.235
200	588	− 567	.0613	.00731	8.30	.235
250	528	− 505	.0682	.00821	8.30	.235
300	484	− 459	.0744	.00904	8.30	.235
350	450	− 423	.0800	.00981	8.30	.235
400	423	− 394	.0854	.01053	8.30	.235
500	382	− 349	.0944	.01188	8.30	.235
600	352	− 316	.1025	.01313	8.30	.235
700	328	− 290	.1097	.01430	8.30	.235
800	310	− 269	.1163	.01542	8.30	.2345
1000	282	− 236	0.1278	0.01755	8.30	0.2340
1250	258	− 208	.1404	.0201	8.35	.2325
1500	242	− 187.4	.1518	.0226	8.45	.2307
1750	229	− 170.7	.1614	.0249	8.50	.2292
2000	220	− 157.3	.1700	.0272	8.55	.2277
2500	203.5	− 136.6	.1846	.0316	8.65	.2250
3000	193.0	− 121.5	.1969	.0360	8.75	.2226
3500	185.3	− 109.7	.208	.0403	8.85	.2206
4000	179.1	− 99.9	.216	.0446	8.90	.2188
5000	170.4	− 85.4	.231	.0530	9.05	.2155
6000	164.6	− 74.9	.243	.0614	9.20	.2128
7000	160.3	− 66.6	.252	.0698	9.30	.2106
8000	157.1	− 60.1	.260	.0782	9.40	.2085
10,000	152.7	− 50.8	0.275	0.0950	9.65	0.2053
12,500	149.2	− 42.9	.290	.1160	9.95	.2020
15,000	146.8	− 37.4	.303	.1370	10.25	.1994
17,500	145.1	− 33.6	.317	.1580	10.60	.1973
20,000	143.7	− 30.4	.328	.1788	10.85	.1954
25,000	141.8	− 26.0	.351	.221	11.45	.1923
30,000	140.4	− 22.9	.371	.262	12.00	.1899
35,000	139.3	− 20.6	.390	.303	12.50	.1878
40,000	138.4	− 18.9	.408	.344	13.00	.1860
50,000	137.0	− 16.4	.444	.426	14.00	.1831
60,000	136.0	− 14.6	.474	.507	14.85	.1809
70,000	135.2	− 13.4	.506	.589	15.75	.1791
80,000	134.5	− 12.4	.536	.669	16.60	.1775

FREQUENCY f MHz	CHARACTERISTIC IMPEDANCE R₀ OHMS	X₀ OHMS	ATTENUATION 8.69α db	PHASE SHIFT β RADIANS	RESISTANCE R OHMS	INDUCTANCE L MILLIHENRIES
0.100	133.5	−10.87	0.588	0.830	18.05	0.1752
.125	132.5	− 9.56	.646	1.031	19.70	.1730
.150	131.8	− 8.58	.697	1.230	21.1	.1712
.175	131.2	− 7.89	.745	1.428	22.5	.1697
.200	130.6	− 7.29	.787	1.625	23.7	.1684
.25	129.8	− 6.44	.870	2.02	26.0	.1664
.30	129.2	− 5.81	.942	2.41	28.0	.1649
.35	128.6	− 5.34	1.000	2.80	29.9	.1636
.40	128.2	− 4.97	1.069	3.19	31.7	.1625
.50	127.6	− 4.41	1.192	3.97	35.0	.1609
.60	127.1	− 4.00	1.294	4.74	37.9	.1597
.70	126.7	− 3.67	1.385	5.59	40.6	.1587
.80	126.4	− 3.43	1.475	6.29	43.1	.1580
1.00	125.9	− 3.03	1.643	7.83	47.6	0.1569
1.25	125.5	− 2.69	1.831	9.79	52.9	.1560
1.50	125.2	− 2.46	1.999	11.68	57.6	.1552
1.75	125.0	− 2.27	2.15	13.61	61.9	.1547
2.00	124.8	− 2.12	2.30	15.52	66.0	.1542
2.5	124.5	− 1.90	2.57	19.36	73.5	.1535
3.0	124.3	− 1.73	2.82	23.2	80.5	.1530
3.5	124.1	− 1.60	3.05	27.0	87.0	.1525
4.0	124.0	− 1.51	3.26	30.9	93.0	.1522
5.0	123.8	− 1.35	3.65	38.5	104.0	.1517
6.0	123.6	− 1.23	4.01	46.1	113.9	.1513
7.0	123.5	− 1.14	4.33	53.8	123.0	.1510
8.0	123.4	− 1.07	4.64	61.4	131.5	.1508
10.0	123.3	− 0.96	5.19	76.7	147.0	0.1505
12.5	123.2	− .86	5.79	95.8	164.4	.1502
15.0	123.1	− .78	6.34	114.8	180.1	.1500
17.5	123.0	− .73	6.89	133.9	194.6	.1498
20.0	122.9	− .68	7.36	152.9	208.0	.1496
25	122.8	− .61	8.24	191.0	232.5	.1494
30	122.8	− .56	9.04	229	254.7	.1492
35	122.7	− .51	9.84	267	275	.1491
40	122.6	− .48	10.44	305	294	.1489
50	122.6	− .43	11.69	381	329	.1488
60	122.5	− .39	12.82	457	360	.1486
70	122.5	− .36	13.85	533	389	.1485
80	122.4	− .34	14.82	609	416	.1484
100	122.4	− 0.31	16.52	761	465	0.1482
125	122.3	− .27	18.47	951	520	.1481
150	122.3	− .25	20.2	1141	570	.1480
175	122.2	− .23	21.9	1331	615	.1480
200	122.2	− .22	23.4	1520	658	.1479
250	122.2	− .19	26.2	1900	735	.1478
300	122.1	− .18	28.7	2280	805	.1477
350	122.1	− .16	31.0	2660	870	.1476
400	122.1	− .15	33.1	3040	930	.1475
500	122.0	− .14	37.1	3800	1040	.1474
600	122.0	− .12	40.6	4550	1139	.1474
700	122.0	− .12	43.9	5310	1230	.1473
800	121.9	− .11	46.9	6070	1315	.1472
1000	121.9	− .10	52.5	7580	1470	0.1472

C = 0.0099 μF per 1000 ft., constant
G = 0.000025 x 2πfc (mhos - farads)

$$\lambda = \frac{2\pi}{\beta} \text{ in 1000's of feet}$$

$$V = \frac{\omega}{\beta} \text{ in 1000's of feet per sec.}$$

TABLE III

Nominal Characteristics of 754D & 754E Cable, 10 Hz to 1000 MHz

(Some of the Data Based on Extrapolation, Above 10 MHz)
Temp. Approx. 75°F.

FREQUENCY f Hz	CHARACTERISTIC IMPEDANCE Ro OHMS	Xo OHMS	PER 1000 FEET ATTENUATION 8.69α db	PHASE SHIFT β RADIANS	RESISTANCE R OHMS	INDUCTANCE L MILLIHENRIES
10.0	3280	—3280	0.0225	0.00260	17.00	0.255
12.5	2930	—2930	.0252	.00290	17.00	.255
15.0	2680	—2670	.0276	.00318	17.00	.255
17.5	2480	—2470	.0298	.00343	17.00	.255
20	2320	—2310	.0319	.00367	17.00	.255
25	2070	—2070	.0356	.00411	17.00	.255
30	1894	—1889	.0389	.00450	17.00	.255
35	1754	—1749	.0421	.00486	17.00	.255
40	1641	—1635	.0450	.00520	17.00	.255
50	1469	—1462	.0503	.00581	17.00	.255
60	1341	—1334	.0550	.00637	17.00	.255
70	1243	—1234	.0594	.00689	17.00	.255
80	1163	—1154	.0635	.00737	17.00	.255
100	1041	—1031	0.0709	0.00824	17.00	0.255
125	932	— 921	.0792	.00923	17.00	.255
150	852	— 840	.0867	.01012	17.00	.255
175	790	— 777	.0935	.01094	17.00	.255
200	740	— 726	.0998	.01171	17.00	.255
250	663	— 648	.1113	.01312	17.00	.255
300	607	— 590	.1217	.01441	17.00	.255
350	563	— 545	.1311	.01560	17.00	.255
400	528	— 508	.1399	.01672	17.00	.255
500	474	— 453	.1556	.01878	17.00	.255
600	435	— 411	.1697	.0207	17.00	.255
700	405	— 379	.1824	.0224	17.00	.255
800	380	— 353	.1941	.0241	17.00	.255
1000	343	— 313	0.215	0.0272	17.00	0.255
1250	311	— 276	.238	.0307	17.00	.254
1500	287	— 249	.258	.0341	17.00	.254
1750	269	— 228	.275	.0372	17.00	.253
2000	254	— 211	.291	.0403	17.00	.253
2500	233	— 185.0	.318	.0461	17.05	.252
3000	218	— 165.5	.342	.0516	17.10	.251
3500	206	— 150.2	.362	.0571	17.15	.250
4000	196.9	— 137.9	.380	.0623	17.20	.249
5000	183.8	— 119.3	.410	.0728	17.35	.247
6000	174.9	— 105.3	.435	.0831	17.50	.246
7000	168.4	— 94.5	.454	.0933	17.65	.245
8000	163.5	— 85.9	.473	.1035	17.80	.244
10,000	156.5	— 72.8	0.501	0.1239	18.05	0.242
12,500	151.0	— 61.4	.528	.1494	18.35	.240
15,000	147.3	— 53.3	.550	.1751	18.65	.238
17,500	145.0	— 47.1	.568	.201	18.95	.237
20,000	143.2	— 42.5	.586	.227	19.30	.236
25,000	140.8	— 35.5	.611	.279	19.80	.234
30,000	139.2	— 30.7	.634	.331	20.3	.232
35,000	138.1	— 27.1	.653	383	20.8	.231
40,000	137.2	— 24.4	.672	.435	21.2	.230
50,000	136.0	— 20.4	.704	.538	22.0	.228
60,000	135.2	— 17.71	.734	.642	22.8	.226
70,000	134.6	— 15.88	.768	.746	23.8	.225
80,000	134.1	— 14.50	.802	.849	24.7	.224

FREQUENCY f MHz	CHARACTERISTIC IMPEDANCE Ro OHMS	Xo OHMS	PER 1000 FEET ATTENUATION 8.69α db	PHASE SHIFT β RADIANS	RESISTANCE R OHMS	INDUCTANCE L MILLIHENRIES
0.100	133.4	—12.56	0.869	1.056	26.6	0.222
.125	132.7	—11.01	.952	1.313	28.9	.220
.150	132.1	— 9.84	1.022	1.569	31.0	.219
.175	131.7	— 9.01	1.092	1.624	33.0	.217
.20	131.3	— 8.34	1.156	2.08	34.8	.216
.25	130.6	— 7.33	1.272	2.59	38.1	.214
.30	130.1	— 6.62	1.378	3.09	41.1	.213
.35	129.7	— 6.06	1.474	3.60	43.8	.212
.40	129.4	— 5.63	1.566	4.10	46.4	.211
.50	128.8	— 5.00	1.740	5.10	51.3	.209
.60	128.2	— 4.55	1.903	6.09	55.8	.207
.70	127.8	— 4.19	2.05	7.09	59.8	.206
.80	127.5	— 3.91	2.19	8.08	63.7	.205
1.00	126.8	— 3.49	2.45	10.04	70.8	0.203
1.25	126.3	— 3.12	2.73	12.50	78.7	.201
1.50	125.8	— 2.84	3.00	14.94	85.8	.1994
1.75	125.5	— 2.63	3.24	17.38	92.4	.1982
2.00	125.1	— 2.45	3.46	19.81	98.3	.1973
2.50	124.7	— 2.18	3.85	24.7	109.0	.1959
3.0	124.4	— 1.99	4.24	29.5	119.5	.1949
3.5	124.1	— 1.84	4.59	34.4	129.0	.1942
4.0	124.0	— 1.72	4.90	39.3	137.5	.1938
5.0	123.9	— 1.54	5.50	49.0	153.7	.1933
6.0	123.7	— 1.40	6.04	58.8	168.4	.1929
7.0	123.6	— 1.30	6.53	68.5	181.9	.1926
8.0	123.6	— 1.21	7.00	78.3	194.4	.1924
10.0	123.4	— 1.08	7.86	97.7	217	0.1920
12.5	123.3	— .96	8.82	122.1	243	.1917
15.0	123.2	— .88	9.70	146.3	266	.1914
17.5	123.2	— .81	10.50	170.6	288	.1911
20	123.1	— .76	11.25	194.9	307	.1909
25	123.0	— .67	12.66	243	344	.1906
30	122.9	— .61	13.94	292	377	.1904
35	122.9	— .57	15.12	340	407	.1902
40	122.8	— .53	16.22	389	435	.1900
50	122.7	— .47	18.26	486	486	.1897
60	122.6	— .43	20.1	583	532	.1895
70	122.6	— .39	21.9	679	575	.1894
80	122.5	— .36	23.5	776	615	.1892
100	122.5	— .32	26.5	970	687	0.1890
125	122.4	— .28	29.9	1211	769	.1887
150	122.3	— .26	33.0	1453	842	.1885
175	122.3	— .24	36.0	1694	909	.1884
200	122.2	— .22	38.8	1935	972	.1882
250	122.2	— .19	43.9	2420	1087	.1880
300	122.1	— .17	46.7	2900	1191	.1878
350	122.1	— .16	53.5	3380	1286	.1877
400	122.0	— .14	57.3	3860	1375	.1876
500	122.0	— .13	65.2	4830	1537	.1874
600	121.9	— .11	72.6	5790	1684	.1872
700	121.8	— .10	79.5	6750	1819	1871
800	121.8	— .09	86.1	7710	1944	.1870
1000	121.8	— .08	98.5	9640	2170	0.1868

$C = 0.0126 \ \mu F$ per 1000 ft., constant

$G = 0.0005 \times 2\pi f c$ (mhos - farads)

$\lambda = \dfrac{2\pi}{\beta}$ in 1000's of feet

$V = \dfrac{\omega}{\beta}$ in 1000's of feet per sec.