Cable Impedance, Attenuation, Phase

19 ga. H-88-50

Side

| Freq. | Mid-Section Impedance | | | | Attenuation | | Phase Shift | |
|---|---|---|---|---|---|---|---|---|
| | R | X | Z | Angle | $\alpha$ | db/mi | $\beta$ | B |
| 200 | 1210 | 465 | 1296 | 21.0 | .0373 | .324 | .095 | .0302 |
| 300 | 1165 | 330 | 1211 | 15.8 | .0385 | .335 | .137 | .0436 |
| 500 | 1145 | 200 | 1162 | 9.9 | .0397 | .345 | .223 | .0710 |
| 1000 | 1155 | 105 | 1160 | 5.2 | .0403 | .350 | .445 | .1415 |
| 1500 | 1205 | 75 | 1207 | 3.5 | .0408 | .355 | .670 | .2134 |
| 2000 | 1285 | 55 | 1286 | 2.5 | .0414 | .360 | .917 | .2919 |
| 2200 | 1330 | 50 | 1331 | 2.2 | .0417 | .363 | 1.020 | .3247 |
| 2400 | 1390 | 50 | 1391 | 2.1 | .0420 | .365 | 1.126 | .3584 |
| 2600 | 1465 | 55 | 1466 | 2.2 | .0428 | .372 | 1.236 | .3934 |
| 2750 | 1535 | 60 | 1536 | 2.2 | .0435 | .378 | 1.324 | .4214 |
| 2900 | 1620 | 60 | 1620 | 2.1 | .0443 | .385 | 1.415 | .4504 |
| 3200 | 1855 | 85 | 1857 | 2.6 | .0469 | .408 | 1.611 | .5128 |
| 3400 | 2100 | 113 | 2105 | 3.1 | .0501 | .436 | 1.768 | .5628 |

Phantom

| Freq. | Mid-Section Impedance | | | | Attenuation | | Phase Shift | |
|---|---|---|---|---|---|---|---|---|
| | R | X | Z | Angle | $\alpha$ | db/mi | $\beta$ | B |
| 200 | 725 | 250 | 767 | 19.0 | .0313 | .272 | .090 | .0287 |
| 300 | 690 | 175 | 712 | 14.3 | .0325 | .283 | .131 | .0416 |
| 500 | 675 | 110 | 684 | 9.3 | .0332 | .289 | .214 | .0682 |
| 1000 | 685 | 55 | 687 | 4.6 | .0338 | .294 | .427 | .1359 |
| 1500 | 715 | 35 | 721 | 2.8 | .0342 | .297 | .645 | .2054 |
| 2000 | 750 | 25 | 750 | 1.9 | .0345 | .300 | .878 | .2795 |
| 2200 | 785 | 20 | 785 | 1.4 | .0347 | .302 | .972 | .3094 |
| 2400 | 815 | 20 | 815 | 1.4 | .0351 | .305 | 1.071 | .3409 |
| 2600 | 845 | 25 | 845 | 1.7 | .0354 | .308 | 1.179 | .3755 |
| 2750 | 880 | 25 | 880 | 1.6 | .0357 | .310 | 1.261 | .4014 |
| 2900 | 920 | 30 | 920 | 1.9 | .0362 | .315 | 1.343 | .4275 |
| 3200 | 1030 | 40 | 1031 | 2.2 | .0380 | .330 | 1.525 | .4854 |
| 3400 | 1135 | 45 | 1136 | 2.5 | .0397 | .345 | 1.696 | .5308 |

Notes: All reactances are negative; Angles are in degrees and negative.

$\beta$ = phase shift in radians per mile.

B = phase shift in cycles per circuit mile, out and back, = $\frac{2\beta}{2\pi}$



(OVER)

## IMPEDANCE OF 19 GA. H-88-60 CIRCUITS AT VARIOUS END SECTIONS

### SIDES

| Frequency | 0 (Full Coil) | | .2 | | .3 | | .5 | | .7 | | .8 | | 1.0 (Full Section) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | R +j X | Z Angle | R +j X | Z Angle | R +j X | Z Angle | R +j X | Z Angle | R +j X | Z Angle | R +j X | Z Angle | R +j X | Z Angle |
| 200 | 1210 -j415 | 1279 /18.9 | 1210 -j450 | 1291 /20.4 | 1210 -j450 | 1291 /20.4 | 1210 -j466 | 1296 /21.0 | 1210 -j480 | 1301 /21.6 | 1210 -j480 | 1301 /21.6 | 1210 -j490 | 1306 /22.1 |
| 300 | 1165 -j235 | 1189 /11.4 | 1165 -j290 | 1201 /14.0 | 1165 -j310 | 1206 /14.9 | 1165 -j330 | 1211 /15.8 | 1165 -j365 | 1221 /17.4 | 1165 -j390 | 1229 /18.5 | 1165 -j410 | 1235 /19.4 |
| 500 | 1145 -j 45 | 1146 / 2.3 | 1145 -j110 | 1151 / 5.5 | 1145 -j150 | 1155 / 7.5 | 1145 -j200 | 1162 / 9.9 | 1145 -j265 | 1176 /13.0 | 1145 -j300 | 1184 /14.7 | 1145 -j330 | 1191 /16.1 |
| 1000 | 1105 +j190 | 1122 / 9.8 | 1130 +j100 | 1135 / 5.1 | 1150 +j 40 | 1151 / 2.0 | 1155 -j105 | 1160 / 5.2 | 1150 -j200 | 1168 / 9.9 | 1130 -j270 | 1161 /13.4 | 1105 -j350 | 1159 /17.6 |
| 1500 | 1045 +j380 | 1112 /20.0 | 1140 +j255 | 1168 /12.6 | 1180 +j170 | 1192 / 8.2 | 1205 -j 75 | 1207 / 3.3 | 1180 -j215 | 1199 /10.3 | 1140 -j310 | 1181 /15.2 | 1045 -j430 | 1130 /22.4 |
| 2000 | 975 +j560 | 1125 /29.9 | 1150 +j400 | 1218 /19.2 | 1230 +j280 | 1261 /12.8 | 1285 -j 55 | 1286 / 2.5 | 1230 -j275 | 1260 /12.6 | 1150 -j400 | 1218 /19.2 | 975 -j555 | 1122 /29.6 |
| 2200 | 940 +j620 | 1126 /33.4 | 1155 +j460 | 1243 /21.7 | 1260 +j325 | 1302 /14.5 | 1330 -j 50 | 1331 / 2.2 | 1260 -j315 | 1299 /14.0 | 1155 -j460 | 1243 /21.7 | 940 -j620 | 1126 /33.4 |
| 2400 | 900 +j680 | 1128 /37.1 | 1160 +j530 | 1276 /24.6 | 1295 +j380 | 1350 /16.4 | 1390 -j 50 | 1391 / 2.1 | 1295 -j370 | 1346 /15.9 | 1160 -j520 | 1272 /24.2 | 900 -j675 | 1125 /36.9 |
| 2500 | 880 +j705 | 1128 /38.7 | 1165 +j560 | 1293 /25.7 | 1315 +j410 | 1376 /17.3 | 1435 -j 50 | 1436 / 2.0 | 1315 -j400 | 1374 /16.9 | 1165 -j555 | 1290 /25.5 | 880 -j705 | 1128 /38.7 |
| 2750 | 820 +j775 | 1128 /43.4 | 1160 +j670 | 1339 /30.0 | 1360 +j510 | 1451 /20.5 | 1535 -j 60 | 1536 / 2.2 | 1360 -j510 | 1451 /20.5 | 1160 -j660 | 1335 /29.7 | 820 -j770 | 1125 /43.2 |
| 2900 | 780 +j820 | 1133 /46.4 | 1155 +j720 | 1360 /31.9 | 1390 +j580 | 1506 /22.7 | 1620 -j 60 | 1620 / 2.1 | 1390 -j585 | 1507 /22.8 | 1155 -j730 | 1367 /32.3 | 780 -j815 | 1127 /46.3 |
| 3200 | 675 +j900 | 1125 /53.1 | 1125 +j920 | 1453 /39.3 | 1460 +j780 | 1655 /28.1 | 1855 -j 85 | 1857 / 2.6 | 1460 -j785 | 1659 /28.3 | 1125 -j910 | 1448 /39.0 | 675 -j900 | 1125 /53.1 |
| 3400 | 595 +j950 | 1122 /57.9 | 1100 +j1070 | 1534 /44.2 | 1510 +j970 | 1793 /32.7 | 2100 -j113 | 2103 / 3.1 | 1510 -j970 | 1793 /32.7 | 1100 -j1060 | 1530 /44.0 | 595 -j950 | 1122 /57.9 |

### PHANTOMS

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 200 | 725 -j215 | 756 /16.5 | 725 -j250 | 767 /19.0 | 725 -j250 | 787 /19.0 | 725 -j250 | 767 /19.0 | 725 -j260 | 770 /19.7 | 725 -j270 | 774 /20.4 | 725 -j270 | 774 /20.4 |
| 300 | 690 -j120 | 700 / 9.9 | 690 -j145 | 705 /11.9 | 690 -j160 | 708 /13.1 | 690 -j175 | 712 /14.3 | 690 -j200 | 719 /16.2 | 690 -j210 | 721 /16.9 | 690 -j220 | 724 /17.7 |
| 500 | 655 -j 15 | 655 / 1.3 | 655 -j 50 | 657 / 4.4 | 660 -j 75 | 664 / 6.5 | 675 -j110 | 684 / 9.3 | 660 -j140 | 675 /12.0 | 655 -j150 | 672 /12.9 | 655 -j170 | 677 /14.5 |
| 1000 | 640 +j125 | 652 /11.0 | 660 +j 75 | 664 / 6.5 | 675 +j 30 | 676 / 2.6 | 685 -j 55 | 687 / 4.6 | 675 -j115 | 686 / 9.7 | 660 -j140 | 675 /12.0 | 640 -j200 | 670 /17.3 |
| 1500 | 625 +j235 | 668 /20.6 | 675 +j160 | 694 /13.4 | 700 +j105 | 708 / 8.5 | 715 -j 35 | 721 / 2.8 | 700 -j130 | 712 /10.5 | 675 -j180 | 699 /14.9 | 625 -j255 | 675 /22.2 |
| 2000 | 590 +j320 | 671 /28.5 | 695 +j235 | 734 /18.7 | 720 +j175 | 741 /13.7 | 750 -j 25 | 750 / 1.9 | 720 -j165 | 738 /12.9 | 695 -j235 | 734 /18.7 | 590 -j320 | 671 /28.5 |
| 2200 | 575 +j350 | 673 /31.3 | 700 +j260 | 747 /20.4 | 740 +j195 | 765 /14.8 | 785 -j 20 | 785 / 1.4 | 740 -j185 | 763 /14.0 | 700 -j260 | 747 /20.4 | 575 -j350 | 673 /31.3 |
| 2400 | 555 +j380 | 672 /34.4 | 700 +j295 | 760 /22.9 | 760 +j220 | 792 /16.2 | 815 -j 20 | 815 / 1.4 | 760 -j210 | 788 /15.5 | 700 -j295 | 760 /22.9 | 555 -j380 | 672 /34.4 |
| 2500 | 540 +j400 | 672 /36.5 | 700 +j310 | 766 /23.9 | 770 +j230 | 804 /16.7 | 830 -j 20 | 830 / 1.4 | 770 -j230 | 804 /16.7 | 700 -j310 | 766 /23.9 | 540 -j400 | 672 /36.5 |
| 2750 | 510 +j440 | 674 /40.8 | 700 +j365 | 791 /27.7 | 795 +j275 | 841 /19.1 | 880 -j 25 | 880 / 1.6 | 795 -j275 | 841 /19.1 | 700 -j365 | 791 /27.7 | 510 -j440 | 674 /40.8 |
| 2900 | 490 +j460 | 672 /43.2 | 700 +j400 | 806 /29.7 | 810 +j310 | 867 /20.9 | 920 -j 30 | 920 / 1.9 | 810 -j310 | 867 /20.9 | 700 -j400 | 806 /29.7 | 490 -j460 | 672 /43.2 |
| 3200 | 440 +j510 | 674 /49.2 | 695 +j490 | 851 /35.2 | 860 +j400 | 948 /24.9 | 1030 -j 40 | 1031 / 2.2 | 860 -j400 | 948 /24.9 | 695 -j490 | 851 /35.2 | 440 -j510 | 674 /49.2 |
| 3400 | 395 +j540 | 669 /53.8 | 680 +j560 | 881 /39.5 | 895 +j490 | 1021 /28.7 | 1135 -j 45 | 1136 / 2.3 | 895 -j490 | 1021 /28.7 | 680 -j560 | 881 /39.5 | 395 -j540 | 669 /53.8 |