WIRE-RELATED LOSSES

Wire is an important but often ignored component of a paging system. Because all wire has resistance, some of the voltage at the source is lost or dropped in the wire before it reaches the target destination. The amount of voltage lost in the wires is affected by the resistance or gauge of the wire and the current flowing in the wire. This is classic Ohm's law in action. If the drops in the cables are not anticipated, the final volume level at the passive speaker may not meet the requirement or, for a self-amplified speaker, there may not be enough DC voltage available to the speaker to allow the built-in amplifier to operate cleanly, or at all.

There are different charts for centralized and self-amplified speakers to determine the maximum cable lengths that should be allowed. In the case of central amplifier systems, try to keep the system power lost in the wires to 10% or less. However, less power at the speaker is the only negative effect larger losses have on the system. Clarity, intelligibility and frequency response are unaffected by larger losses in the wiring of centrally amplified systems.

Self-amplified systems are particularly sensitive to losses in the wire, especially the amount of supply voltage that is lost in the wires on the way to the self-amplified speaker. When the drop in the wiring becomes too large, the speakers may begin to distort or stop functioning altogether. For this reason it is important to adhere to the maximums shown in the tables below.

Wire Loss In Central Amplifier Systems

Once you have an idea of how many speakers are to be wired together in a run, estimate how long the wire run will be from the first to the last speaker in each run. Include the lead-in wire length from the amplifier to the first speaker in each run in your overall run length. For each run, sum up the speaker power and cable lengths.

With that information, refer to the Wire Loss Chart to ensure that the wire gauge is sufficient to support the power and cable length for the run. It may be necessary to increase the wire gauge, split the speaker loads, or shorten the wire run lengths if they exceed the chart maximums.

Wire Loss Chart*

(10% of Power Lost in Wire)

Wire Gauge	Load Power Per Wire Run (Watts)						
	5	10	15	30	50	100	200
16	10,000	7000	4600	2300	1400	700	350
18	9000	4500	2800	1400	830	415	205
20	5500	2700	1800	900	540	270	135
22	3400	1700	1100	550	330	115	60
24	2100	1000	700	350	210	105	50
	Maximum Wire Run Cable Length (ft.)						

** Use for 70V Speaker Systems Only*

Voltage Drop In Self-Amplified Systems

The most important wiring consideration with self-amplified speakers is to ensure that there will be enough voltage available at each device to allow its internal amplifier to operate correctly. If too much voltage is dropped in the wires leading to a speaker, this may not be the case.

Once you have an idea of how many speakers are to be wired together in a run, estimate how long the wire run will be from the first to the last speaker in each run. Include the lead-in wire length from the power supply to the first speaker in each run. Also sum up the CU ratings of all the speakers on the run.

With that information, refer to the Voltage Drop Chart to ensure that there are not too many speakers loading the wire used in the run or that the wire gauge is sufficient to support the power and cable length desired. To stay within the chart length limits, it may be necessary to either create a shorter run containing less speakers or double up on conductors in the cable to effectively lower the gauge of the supply wire. The Reducing Gauge Chart can be used to determine what effective gauge is achieved by doubling or tripling up on pairs in the cable.

Voltage Drop Chart

Total CU (Current Units) on cable run	Wire Gauge (AWG) 26	24	22	20	18	16
10	220	351	557	887	1413	2237
20	110	175	279	443	706	1118
30	73	117	186	296	471	746
40	55	88	139	222	353	559
50	44	70	111	177	283	447
60	37	58	93	148	235	373
70	31	50	80	127	202	320
80	28	44	70	111	177	280
90	24	39	62	99	157	249
100	22	35	56	89	141	224
110	20	32	51	81	128	203

Maximum Wire Run Cable Length (ft.)

Reducing Gauge		
Wire Gauge (AWG)	GAUGE OF 2 PARALLEL PAIR	GAUGE OF 3 PARALLEL PAIR
26	24	22
24	22	20
22	20	18
20	18	16
18	16	14
16	14	12