Anderson Powerpole Connectors – the REST of the story
By Don Steinbach, AE6PM

Most of us are (and all of us should be) using Anderson Powerpole connectors for the dc power connections to our equipment. I say "should" because those connectors are the standard adopted by ARES/RACES. They come in several flavors: 15, 30, 45, 75, 120 and 180 amp product ratings. The ones we're usually concerned with are the 15, 30 and 45-amp variety. You probably already know that the connector (metal) part is the same length and width for all three, and that all three fit into the same colored modular plastic housing. The difference between them is in the size of the barrel – the part where you insert the wire to be crimped or soldered. The 15-amp connector barrel is sized for (i.e., accepts) #16 to #20 wire, the 30-amp is sized for #12 to #16 wire, and the 45-amp is sized for #10 to #14 wire.

The important thing to note here, and that's not obvious, is that the only thing that changes the current-carrying capacity specification of the connector is the size of the wire attached to it. Not because of the ability of the wire to carry the current, but because of the mass of the wire being able to conduct the heat away from the connector-to-connector interface of the mated Powerpole connectors. The connector contact resistance is low, but finite (525 to 875 micro-ohms per the data sheets), and the current through that resistance generates heat. If the wire doesn't remove the heat, the connector interface overheats, the contact spring tension deteriorates and things quickly go from bad to worse. The end result could be (I've seen a picture somewhere) a melted plastic conector block with the connector contacts welded together inside. Also, be aware that having the connector blocks joined side-to-side (multipole) instead of alone (singlepole) reduces the current carrying capacity even more.

Our ham radio current requirements are usually fairly benign (i.e., low duty cycle) so you might be able to ignore all of this. But if you wish to avoid problems, you should be aware of the information that follows.d from the Anderson data sheets.

The specified connector current carrying capacity (15, 30 or 45 amps) is based on a 65 deg C temperature at the connector contact interface. This would be a 40 deg C rise from an ambient temperature of 25 deg C.

The current carrying capacity for a 40 deg C rise in the singlepole or multipole configuration is:
15 amp contact with #20 wire: 10 amps singlepole; 8 amps multipole.
15 amp contact with #18 wire: 16 amps singlepole; 12 amps multipole.
15 amp contact with #16 wire: 22 amps singlepole; 16 amps multipole.
30 amp contact with #16 wire: 22 amps singlepole; 15 amps multipole.
30 amp contact with #14 wire: 28 amps singlepole; 19 amps multipole.
30 amp contact with #12 wire: 34 amps singlepole; 23 amps multipole.
45 amp contact with #14 wire: 28 amps singlepole; 17 amps multipole.
45 amp contact with #12 wire: 34 amps singlepole; 21 amps multipole.
45 amp contact with #10 wire: 46 amps singlepole; 31 amps multipole.

See Table 1. Note the significant derating when the contacts are in a multi-pole configuration.

Wire Size	Nominal Connector Rating					
	15A		30A		45A	
	S	M	S	M	S	M
#20	10A	8A	x	x	x	x
#18	16A	12A	x	x	x	x
#16	22A	16A	22A	15A	x	x
#14	x	x	28A	19A	28A	17A
#12	x	x	34A	23A	34A	21A
#10	x	x	x	x	46A	31A

Table 1. Powerpole connector current-carrying capacity as a function of wire size.
S = Single connector M = Multipole connector

Summarizing, the 15 amp connector might exceed specification temperature limits at currents as low as 8 amps (multipole with #20 wire), the 30 amp connector at currents as low as 15 amps (multipole with #16 wire) and the 45 amp conector at currents as low as 17 amps (multipole with #14 wire).

Now you have the REST of the story. Don't just take my word for it, download the datasheets from www.andersonpower.com and do your own analysis.