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Subject: 4 x 1 Ohm = 16 Ohms (sometimes)  
Posted by [Damir](#) on Mon, 25 Jul 2005 20:01:05 GMT  
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Reading the specs for some "Partridge" SE OPTs, I found something that can be interesting (if you like OPTs and math and have nothing better to do). The specs say: "Primary impedance  $R_{pr}=3500$  Ohms, and four secondaries of 1 Ohms - for 4, 8 & 16 Ohms connection." How? We have turns ratio between the primary,  $N_{pr}$  (number of turns of the primary winding), and four identical secondaries  $N_{s1}=N_{s2}=N_{s3}=N_{s4}$   $n = N_{pr} / N_{s1-4}$  We don't have those numbers, but we know impedance ratio(s):  $z = R_{pr}/R_{sec1-4} = 3500/1 = 3500$  And from imp. ratio, our turns ratio is:  $n = z^{0.5} = 3500^{0.5} = 59,16$  Note that  $z^{0.5}$  is the square root of  $z$ . Simplified, we can "assume" that  $N_{pr}=5916$  turns, and  $N_{s1-4}=100$  turns. a) We can connect all four 1-Ohm secondaries in series: Then we have  $n1=N_{pr}/(N_{s1}+N_{s2}+N_{s3}+N_{s4})= 5916/400 = 14,79$  And  $R_{s-a} = R_{pr}/n1^2 = 3500/14,79^2 = 16$  Ohms b) We can connect only three secondaries in series, then we have  $n2=N_{pr}/(N_{s1}+N_{s2}+N_{s3})=5916/300 = 19,72$   $R_{s-b} = R_{pr}/n2^2 = 3500/19,72^2 = 9$  Ohms ("close enough" to nominal 8 Ohms) c) We can connect only two secondaries in series (but probably, better to connect  $N_{s1}$  &  $N_{s2}$  in series, then  $N_{s3}$  &  $N_{s4}$  in series too, then both series "combinations" in parallel)  $n3=N_{pr}/(N_{s1}+N_{s2}) = 5916/200 = 29,58$   $R_{s-c} = R_{pr}/n3 = 3500/29,58^2 = 4$  Ohms Simple enough, when we know what is impedance ratio ( $z$ ), and what is turns ratio ( $n$ ). Turns ratio is equal to voltage ratio, and if we measure, say, 100Vrms across the primary, and say, 5Vrms on 4-Ohms winding, we have voltage/turns ratio= $100/5 = 20$ , and our impedance ratio is  $z=n^2 = 20^2 = 400$ . Then our primary impedance is  $R_{pr} = z * R_{sec} = 400 * 4 = 1600$  Ohms.

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