car is in motion. You might remember that R.V. thought his tyres might be the cause. But as it turns out, the answer has nothing to do with the tyres, as our correspondent points out.

I once owned a Peugeot that had a very similar problem to that being experienced by R.V. We eventually traced the trouble to the lack of electrical bonding between the front axles and the vehicle body. The Peugeot used a number of rubber pads to isolate noise and vibration from the cabin, and in this respect it was quite effective. However, we found quite severe static discharge across the pads and it was this that was causing the radio noise.

We made a complete cure by bonding the car body to the front axles. Needless to say the bonds had to be flexible, and we used battery earth straps bolted or clamped to the respective parts of the vehicle. I hope this will help R.V. solve his problem. (B.P., Lenah Valley Tas.).

Thanks B.P., as it turns out R.V. has written back to me saying he has found the reason, which is much the same as you say. In fact, because this could be a fairly common problem, it's worth quoting the relevant part of R.V.'s reply.

Since receiving your suggestion about using a conducting lubricant in the wheel bearings (which shouldn't be necessary as the bearings are tapered roller types), I have further researched the problem.

I have since checked the earthing of the rear wheels (both from the wheel studs to the suspension assemblies and to the main chassis). Surprise, surprise! There was a resistance of 100 ohms between the assemblies and chassis. It was found to vary between 20 and 100 ohms if the car is moved.

It seems the rear suspension assemblies (there are two separate assemblies as the rear suspension is independent) as a whole are fairly well insulated from the car chassis by rubber bushes, etc. Being a front-wheel drive vehicle, there are no mechanical drive components to provide an earth to the rear wheels. A variable resistance of around 100 ohms, or even a few tens of ohms looks like being an accidental leakage path, (possibly via the handbrake cable?) The effect of adding definite chassis earths to the rear wheel suspension seems to be the answer.

So if you are having problems with your car radio reception, it seems the reason often lies in the rubber bushes used to improve the ride. Hopefully, car manufacturers read this column, and as the solution is relatively simple it shouldn't add much to the cost of a car!

```
1     CLS
2     PRINT "DESIGN OF AIR-CORED INDUCTANCE'
3     PRINT "From A. N. Thiele, 1975"
4     PRINT

10    INPUT "Inductance (microhenrics)"; L
20    INPUT "Resistance (Ohms)        "; R
30    K = L / R
40    C = SQR(K / 8.66): REM base dimension in millimetres
50    W = .1873 * SQR(L * C): REM length of wire in metres
60    N = 19.88 * SQR(L / C): REM number of turns
70    D = .841 * C / SQR(N): REM wire diam in millimetres
80    G = C * C * C / 21.4: REM gross weight of wire in grams
80    PRINT
100   PRINT "Coil core diameter  ="; 2 * C; "mm"
110   PRINT "Coil core length    ="; C; "mm"
120   PRINT "Coil cheek diameter ="; 4 * C; "mm"
130   PRINT "Wire diameter       ="; D; "mm"
140   PRINT "Weight required     ="; G; "grams"
150   PRINT "Number of turns     ="; N
160   PRINT "Length of wire      ="; W; "metres"
170   PRINT
180   PRINT "Want to try some real values? (Y or N)";
190   GOTO 330

200   INPUT "Core diameter  (mm) "; X
210   INPUT "Core width     (mm) "; Y
220   INPUT "Wire diameter  (mm) "; D
230   INPUT "Number of turns     "; N
240   C = 1.414 * N * D / Y
250   A = (X + C) / 2
260   L = .0394 * A * A * N * N / (6 * A + 9 * Y + 10 * C)
270   R = .0001948 * A * N * N / (Y * C)
280   PRINT "Calculated Inductance = "; L; "uH"
290   PRINT "Calculated Resistance = "; R; "ohms"
300   PRINT "Overall diameter of coil = "; X + C + C; "mm"
310   PRINT

320   PRINT "Want to try different values? (Y or N)";
330   INPUT A$: IF A$ = "y" OR A$ = "Y" THEN GOTO 200
340   END
```

Fig.2

Coils by computer

I've had a few replies concerning a letter presented in November, asking about computer programs to design an air-cored inductor. The next letter gives a very neat solution to the problem, including a computer program listing.

The query from P.S. MacDonald rang a bell in my mind, and I dug up a copy of a paper by A.N. Thiele titled 'Air Cored Inductors for Audio', published in the Proceedings of the IREE for October 1975.

In summary, Thiele states that the coil dimensions are determined by the time constant (L/R) of the coil, not by its inductance alone. He proposes a coil shape which is close to the theoretical optimum, with its inner radius, thickness and width all equal to a calculated dimension 'c'.

I have summarised the steps in the form of a BASIC language program, which I have tested against examples from Thiele's paper. Thiele suggests that errors due to approximations can be avoided by calculating for an inductance say 5% above that required, and removing turns while testing the coil on a bridge until the desired value is obtained.

He also suggests that coil cores are best cut from chip-board and the cheeks from hardboard. The cheeks should be cut about 10% oversize to avoid the last few turns spilling over the edge. The bobbin is assembled with PVA glue with a brass clamping bolt through the centre, which can also be used for mounting. A steel bolt can be used, which will increase the inductance a little. This may or may not be an advantage. (G.M., Dover Gardens SA).

The program listing sent by G.M. is shown in Fig.2. I haven't tried it, but it's obviously for an IBM type computer. Because BASIC is much the same for different computers, you can probably run this program on any computer, with a few minor changes. For instance, CLS (clear screen) is HOME on the Apple.

CD amplifier

The next letter poses a simple question, but one quite a few readers might relate to...

I was recently given a portable CD player. Unfortunately, I don't have the equipment or money to construct a small