



VAN DE GRAAF GENERATORS

BELT INFORMATION FOR VAN DE GRAAFS

IEC has been making Van De Graafs for many years ... right back to the 1960s.

Those early ones had a domed shape base cast from aluminium. My Dad made the casting pattens out of wood and I built them personally right down to painting them and delivering them to customers. I weep now whenever I see one.

OK, you might well say "how long will it be before we get it right". Touche.

WHY DO THEY CREATE A CHARGE ?

Have a look on the web for the 'TRIBO TABLE' of materials that make a static charge by contact with one another. The initial charge on the belt is created by the surface of the natural gum rubber belt touching and then pulling away from the plastic lower pulley. If the pulley has a film or scrunge coating on it or if the surface of the rubber belt has something coating it, the generation of the charge cannot occur because the materials cannot touch together and exchange electrons.

Over the years we have had various belts:

- Cut from large rubber sheets and the long strips joined with glue.
- Long strips vulcanised into a loop and the overlap ground away to make it smoother.
- Elastic rubber 'bandage' used for wrapping twisted ankles and the like.
- We tried the band from a pair of a staff member's pantyhose once and we were going to call our latest model the Panty Graff Generator, but it did not work very well actually I think they were anti-static

Anyway, eventually we devised a way to have a continuous band without a join and we passed through a dozen phases of problems there too regarding compounds and curing and on and on. We had some good and other batches not so good.

Very recently we decided to have another go at fixing poor belts.... And it WORKED.

Try this: Stretch the belt over the back of an old chair or around a slab of wood or anything that will hold the belt stretched to about 25% longer than normal.

Get some hot water and detergent and one of those scourers with the foam one side and that green hard stuff on the other side. Or a nail brush or anything with an aggressive bristle. Scrub the belt as hard as you like and flip it over to the other side and do it again with the hot water and detergent. Rinse it and dry it.

It might feel just a bit 'sticky' when dry ... this is good. If a bit 'sticky', dust it **very slightly** with talc (not enough to come off and make a mess).

INDUSTRIAL EQUIPMENT & CONTROL PTY.LTD.

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A GOOD WAY TO TEST IT:: If you hold the belt hanging down and place first finger and second finger either side of one thickness of the belt and pass your fingers briskly along the hanging belt while lightly allowing your fingers to brush along it, it might sound a bit crackly and the loosely hanging belt should want to attract to the back of your hand.

If this is so ... place it back on the VDG with clean pulleys (wipe them with methylated spirits).

Adjust the combs at both the top and bottom so they are just about brushing against the belt, then turn it ON and STAND BACK.

IMPROVE THE COMBS:

Over the years, we have developed a number of different combs. A comb will always work better if it presents a sharp edge to the belt or a series of pointed teeth (a serrated edge). If you have access to a handyman (handyperson ?), have her take a small triangular file or square file and make a series of small notches close together along the edge of the comb leaving sharp points as a serrated edge facing the surface of the belt. The charge will self-create with much better certainty.

BELTS THAT RUN TOO SLOWLY:

Part 1:: Our later belts are a bit thicker than they used to be and the ball bearings in the top pulley are filled with grease that makes them a bit firm to spin – especially as they rise in speed. The simplest answer is to reduce the belt tension. Our latest models VDGs have adjustable tension, but the old ones using the acrylic tube can be reduced in tension only by cutting say 40mm to 50mm off the tube length ... so find that handyperson before she leaves for the day. This reduction in tension will raise the speed of the system.

Part 2:: (see picture later in this sheet) One of our models has a 'U shaped' steel bracket that holds the motor in place. Two long screws passed through the motor and through the bracket and the motor shaft also passed through the 'U shaped' bracket. If you have this model, the motor will be under-powered.

WHY ?? The steel bracket is behaving as a magnetic shunt and much of the magnetic field of the motor is being bypassed by the bracket. We have made a lot of aluminium brackets which can be fitted to replace the steel one and will fix this problem. If you have the steel bracket, IEC offers replacement free of charge.

We would like feedback please as to any successes or otherwise....

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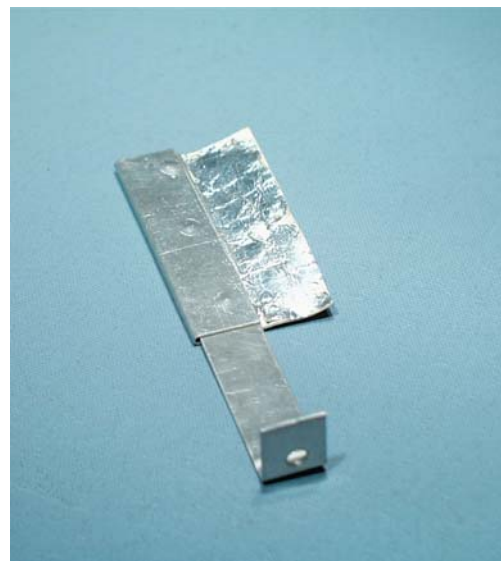
ANOTHER HINT: One of the wonderful people that go around schools getting kids interested in science once told me that before he goes 'on stage' he microwaves the belt for a short time and it never fails him. Maybe the heat activates the rubber or just removes microscopic amount of moisture – I don't know..... but I pass it on to you

HAS IEC IMPROVED THINGS YET ??

Yes, we have. Our latest model has the following:

- A good speed control that does what a speed control is supposed to do. Motor speed and knob position relate perfectly.
- Both of the pulleys are above the base and are directly accessible.
- We no longer use the acrylic tube and now have a removable cover from around the belt so the belt is easily accessible for study or changing etc.
- Our spheres are polished stainless steel and are beautiful.
- The discharge ball also is stainless and has a much better 'parking' system
- The sphere is held to the top magnetically and is easy to fit and remove but also is secure from falling off.
- There is adjustment for belt tension.
- The combs are now made from printed circuit boards (PCBs) and are a very cunning idea. They follow the curve of the pulley shape, they are held in place with 'Orings' and present sharp points to the belt surface for best performance. These new combs can be adapted to old models.

COMBS: The early upper comb was a bent strip of metal that could be pivoted so the sharp edge can come close to the belt. Lower combs were simple "L" shaped strips and later they carried a separate comb device. Image shows a rubber comb with a metal foil coating. It rubbed on the belt with foil on the outside and it could not be heard striking the join in the old belts.



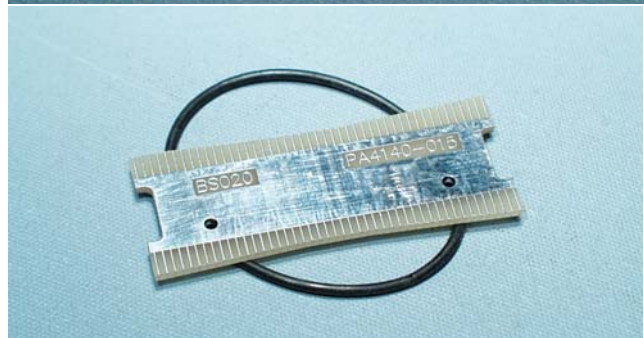
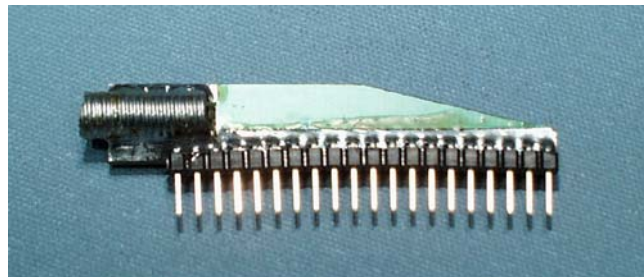
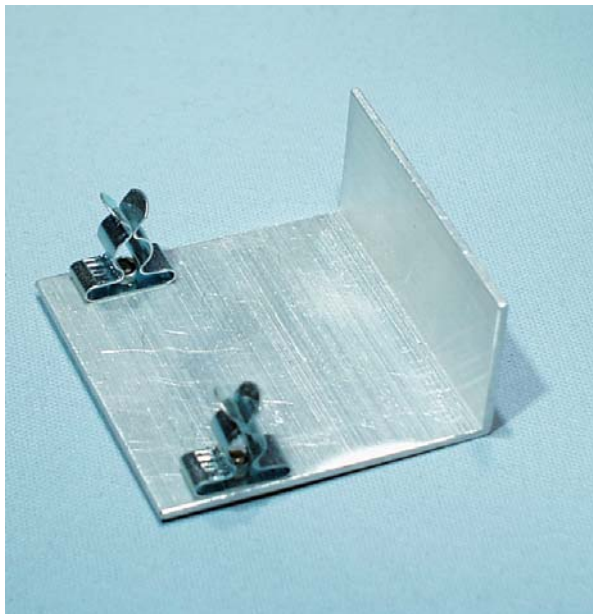
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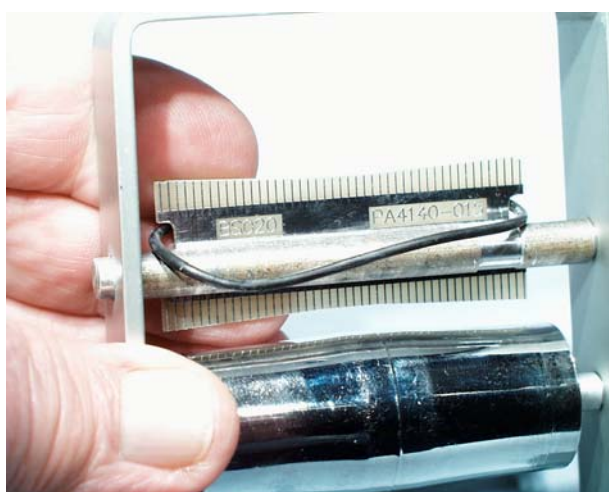
The later combs were an "L" shaped piece of aluminium that clipped into place and could be pivoted so that the edge was close to the belt. The motor mounting bracket was eliminated and the motor was mounted from its front face and we fitted a suitable rod to carry the comb. We did the same at the top too, so that the same comb was used at the top and the bottom pulleys.

This comb was used until our new model where we developed a removable "plug-in" comb with sharp points. However these proved to be expensive to make and we finally developed our latest and best comb to replace all the earlier types..



The new comb shown above is held to any support rod by an 'O'ring. The plated copper surface and the sharp points are on both sides of the comb and the edge contour follows the shape of the pulley surface so it can rest very close to the belt.

The images below show how the comb is fitted to the support pillar by using the 'O'ring. Something like a Chinese puzzle.



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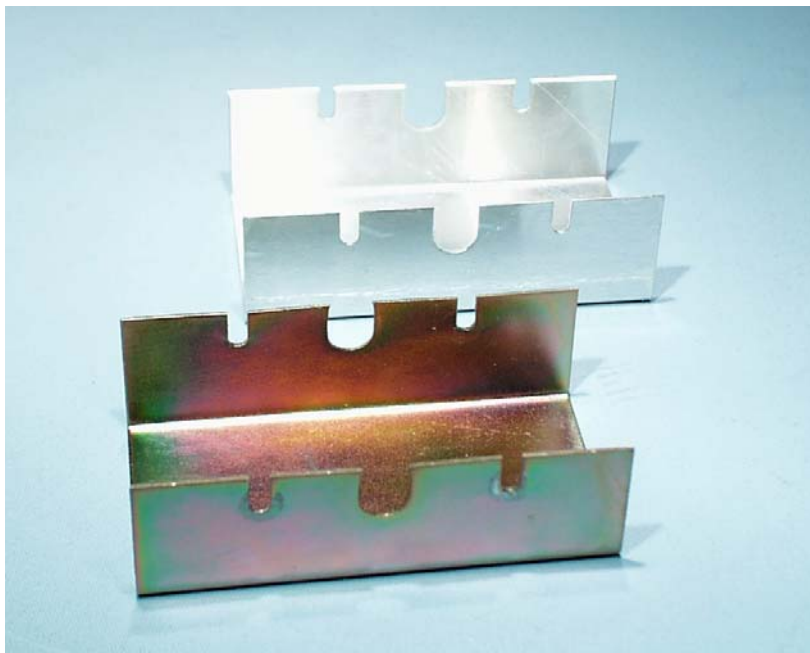


Our latest model Van De Graaffe uses the new style comb and 'O'ring with the comb strapped to a short horizontal pillar. The image below shows the pillar with comb fitted.



The new comb can be used as a long mounting or a short mounting type and it can be glued or clipped to any old comb system. This feature makes it quite 'universal'. The plated copper surface is on both sides so it does not matter which way around it is mounted. The sharp points are on both sides of the comb so that the number of static charge collectors is doubled.

MOTOR MOUNT: On many of our early model Van De Graaffs, we mounted the motor in a steel 'U' shaped frame. This unfortunately had the effect of reducing the motor's torque by forming a "magnetic shunt". When our belts became a little thicker, these motors had trouble turning the new belt. When replaced with an aluminium frame all is well and the motor torque rises by about 25%. We supply aluminium frames free of charge.



We hope this information assists in improvements to your Van De Graaffe.

Bernard Hodson

Managing Director Industrial Equipment & Control Pty. Ltd.