

Van De Graaff - Upgrade Kit



PA4140-020

Upgrade Kit for the 'Van De Graaff' Generator:

This kit is used to upgrade an old model Van De Graaff electrostatic generator, which has the ball divided into two halves, to a new style.

Contents:

- 1x Top pulley (with ball races) and bracket assembly.
- 1x Large moulded plastic collar for bracket assembly.
- 1x Top comb to receive charge from belt (fitted to bracket).
- 1x Rubber belt (joinless).

Installation Instructions:

1. Unplug machine from power source, remove the upper half ball and invert the machine on the table. Remove the bottom cover plate/plug for access to the lower pulley, belt and bottom comb. Stand the machine upright again.
2. Grasp the top pulley and, whilst holding the pulley holder down, firmly pull the pulley up so it disengages from the holder. Hold the belt, remove the pulley and allow the belt to fall down the insulating tube. Remove the pulley holder. Some models have small screws that must be removed before removing the holder.

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1



3. Remove the lower half ball and pull the plastic tube from the base. NOTE: On some very old models the tube is not removable. Invert the machine and slide the belt from the bottom pulley so that it falls from the machine. Discard this belt, the top pulley and the pulley holder. Thoroughly clean the plastic tube inside and out and all other components with a clean dry cloth. The ball must be smooth and free from deep scratches.
4. Open the 'Upgrade Kit' and check the contents. Remove the top pulley from the metal bracket by spreading the two legs slightly.
5. With the machine inverted, clean the bottom pulley with a piece of clean cloth just damp with methylated spirits, then slide the new belt on to the bottom pulley taking care to pass it under the comb and also not to bend nor spoil the comb. Allow the belt to fall and hang through the hole into which the plastic tube fits.
6. With the machine still inverted, pass the clean plastic tube up over the belt so that it enters into its hole. With your hand, reach up into the tube and grasp the belt and stretch it to draw it out the mouth of the tube. Invert the unit with the belt in your grasp.
7. Pass the stretched belt through the lower half ball and fit the half ball to the top of the tube without releasing the belt. Then pass the belt through the large plastic collar and position the collar on the centre section of the lower half ball.
8. Pass the new pulley through the belt and locate the ends of the shaft into the two holes provided in the metal bracket. Locate and press the two legs of the metal bracket into the two receptacles in the large plastic collar. Press in firmly. The new belt should be very free to turn between the two pulleys.
9. Swing the top comb (clipped to its support rod) until it ALMOST touches the belt. NOTE: Check that it is on the same side of the belt as the lower comb. If not, unclip the comb and reverse it. Both combs should be on the front side of the machine when looking at the front panel. When the machine is running, the lower comb should be close to the belt as the belt is leaving the lower pulley and the upper comb should be close to the belt BEFORE the belt reaches the upper pulley.
10. Invert the machine and check the positioning of the lower comb by viewing through the inspection hole. If the lower comb is the rubber type, it should be just grazing the belt as it passes around the pulley with the foil metal surface AWAY from the belt. This model comb was positioned in various places around the lower pulley depending on year of manufacture. Its exact position is not critical. It is important that the foil is in good condition right up to the edge of the comb. If the foil has been burned away at the edge, cut a new edge with scissors and bend the support strip a little so the rubber side of the comb again just brushes against the belt as it passes around the lower pulley. If this is not possible, adhere very thin aluminium foil on top of the existing foil to reach the edge of the rubber.
11. If the comb is the metal strip type, it should be positioned so that the edge is very close to the belt but NOT TOUCHING it. It should have a slight curve in the comb so that its edge is the same distance away from the belt along the curved surface of the pulley. The position of the edge of the lower comb should be just as the belt is separating from the surface of the lower pulley. It is the corner of the edge of the metal strip that attracts the charge, so the angle of the strip itself is of no importance. When the lower comb is correct, fit the cover over the inspection hole.

THE DRAWINGS ON LAST PAGE OF THIS INSTRUCTION SHEET SHOW COMB POSITIONS.



12. Stand the machine on the bench with the upper half ball not fitted and connect to the power. The belt should turn freely and quietly providing the combs are not positioned poorly. Check comb positions relevant to the belt direction (see point 9).
13. Test performance: When turned on, a slight general 'crackling' should be heard down the tube. Place your finger near the top pulley's metal bracket. If the machine is performing well, a small, very fast repetitive spark should jump from the bracket to your finger tip (this will not hurt you). The spark should be about 10 to 15mm long.

NOTE: When turned on the first time, it may take a minute or two for charging to take place due to residual surface conditions of the belt and pulleys.

14. Turn off the machine and replace the upper half ball. Be sure the discharge ball is also very clean, smooth and has no deep scratches or bad dints. Attach the earth wire between the base housing and the discharge ball and turn the unit on. A fast discharge at about 100mm gap indicates a good performance. A maximum discharge gap of say 150mm should be possible providing the machine is positioned on the bench well away from walls, metal light fittings or any sharp or earthed objects.

General:

The discharge from a Van De Graaff will always try to 'leak' from a sharp corner or from dust on the balls and tube. The principle is that the charge builds up with minimal leakage until it must jump suddenly between balls. Dirt on the balls or the insulating tube, moisture in the air, close proximity to earthed objects and proximity to sharp cornered objects all reduce the ability of a static generator to build up charge.

The cleanliness of the pulleys and the belt is essential for a generator to create charge rapidly. A good gum rubber belt should exhibit a static crackling if simply slightly stretched and pulled through the fingers. If it is perished or contaminated on its surface, this tendency to easily generate a static charge will diminish.

To avoid the perishing of the rubber belt, keep the machine stored away from direct sunlight.

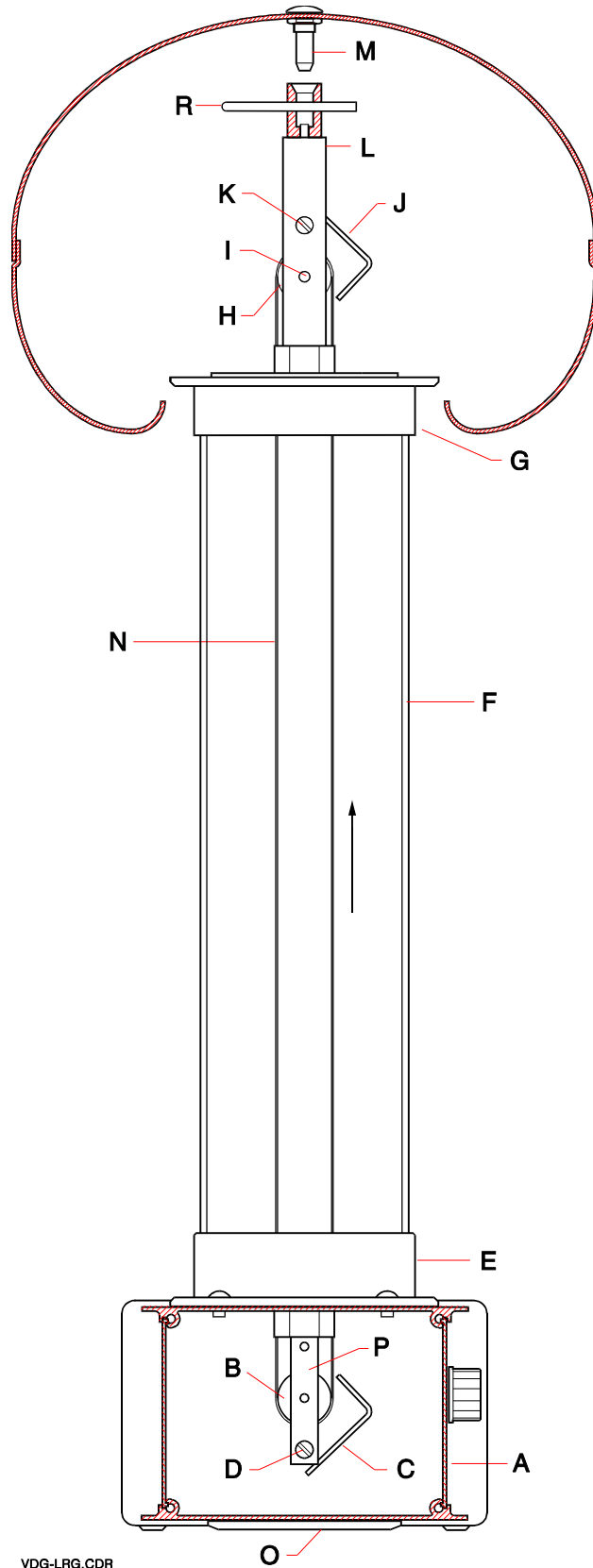
Note:

The next page shows the view of an assembled Van De Graaf generator of a later model. Notice that the ball is one piece and is held to the frame **L** with a pin **M** and a socket with a spring 'R clip' **R** to tightly hold the pin. In the latest models, the one piece top ball is held to the machine magnetically.

The 'combs' shown are the metal angle style and they can be improved by filing nicks into them to create a serrated edge rather than a smooth edge. With serrated or toothed combs the machine will charge more efficiently.

The combs **C** and **J** can be seen positioned relative to the belt **N**. In still later models we have the combs at the underside of the bottom pulley and at the top side of the upper pulley. The exact position of the comb around the pulleys is not very important but they need to be adjusted to be as close as possible to the belt surface without actually touching.

For more information on the latest PCB (Printed Circuit Board) combs that can be attached to the older angle metal combs, please refer to the PDF file on the "Technical Talk" page of the IEC website (www.iecpl.com.au)



Designed and manufactured in Australia

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