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ELE 482
Abstract
Spinal Fusion Stimulators

The concept of using electrical stimulation to affect bone began with two researchers, Joule and Wolff, more than 100 years ago. Over seventy years later, much research into electrical characteristics and the response of bone led to Dwyer's development of the first implantable bone growth stimulator for lumbosacral fusion. Studies conclusively demonstrate the efficacy of direct current stimulation improving the rate of successful spinal fusions.

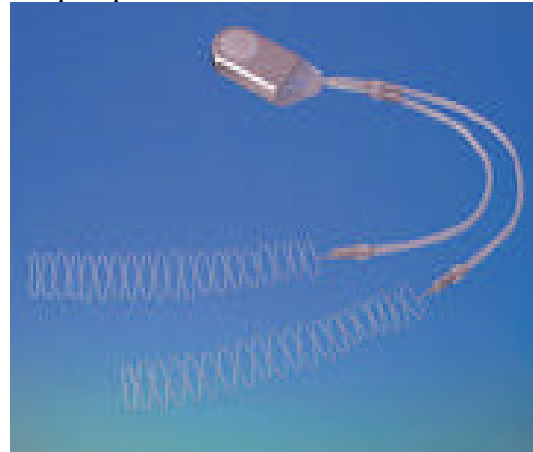
The SpF is a solid-state constant current generator producing a constant current of 40 microamperes. The stimulator is powered by one lithium manganese dioxide battery. The electronics and power source are hermetically sealed within a titanium generator case; an area of approximately 400 mm² and is platinum coated and functions as the anode.

The SpF lead wires consist of two leads of drawn braided strand (DBS) wire, 15 cm long, covered with silicone tubing and connected to the generator by a titanium connector. Each lead is terminated in a 24-cm length of uninsulated triple strand titanium wire which acts as a cathode and is connected to the insulated DBS lead by a titanium connector. The cathodes are in a preformed wave or mesh configuration. The mesh cathode consists of two strands of titanium wire woven into a flexible grid with nominal dimensions of 1 cm by 8 cm.

The generator case is made from medical grade titanium. The power source is a lithium battery. The electronics are designed to maintain a constant current

between the anode and cathode that compensate for wide variations of bone or tissue resistance. When the device is implanted prior to the use before date, full rated current will be delivered for approximately 26 weeks.

How will this device help spinal fusion? Small electrical charges are constantly emitted throughout the body. Scientists have known for many years that when osteogenesis occurs—in the course of fracture healing, for example—a natural electrical charge exists at the site where new bone is made. The SpF delivers the same kind of charge to the site where your doctor wants new bone to grow, stimulating bone growth and improving the prospects for a solid fusion.



- **Whitfield JF, Morley P, Willick GE., Bone Growth Stimulators, Vitam Horm. 2002;65:1-80. (Pubmed)**
- **Svorkdal N, Treatment with Spinal Stimulators, Semin Cardiothorac Vasc Anesth. 2004 Mar;8(1):43-58. (Pubmed)**
- **Alexa O., Electrically induced osteogenesis. II. Experimental studies, Rev Med Chir Soc Med Nat Iasi. 1996 Jan-Jun;100(1-2):62-5**