A full operating description of the Remote Control.
The RC is a portable, hand-held unit used by the patient to change stimulation parameters. The patient can use the RC to turn stimulation on/off, change the area being stimulated, switch between different therapy programs, and increase/ decrease stimulation amplitude, and other parameters as set by the physician.

Microprocessor
The microprocessor is the system controller that has two crystal oscillators. The microprocessor core logic runs off a 6 MHz clock generated by the 6 MHz crystal oscillator. The processor also uses a 32.678 kHz clock for watchdog timer generated by the 32.678 kHz crystal oscillator.

Telemetry System
The telemetry system is a short range, magnetically coupled system. It is a 2 level Frequency Shift Keying (FSK) transceiver operating at 125 kHz. The data rate is 4115 bits per second and uses $\pm$ 4 kHz of deviation. The transmitted bandwidth is 12 kHz. This magnetically coupled system does not transmit RF power per se. The transmitter generates 100 mA of current in a parallel resonant circuit tuned to 125 kHz which generates a magnetic field strength of 98 µA/m at 3 meters. The device does not intentionally generate an E field. The receiver mixes the incoming 125 kHz signal with a 330 kHz local oscillator to create a 455 kHz IF frequency. Filtering and FM demodulation are done at 455 kHz.

Direct Digital Synthesizer
The local oscillator used by the telemetry system is the output from a Direct Digital Synthesizer (DDS). It runs off the 6 MHz clock off the microprocessor its output frequency is controlled by a 32 bit programming word. While transmitting, the DDS is programmed to output either 242 kHz or 258 kHz which is controlled by a frequency select control pin. The output is divided by 2 to give 121 kHz or 129 kHz. The frequency select pin is driven by the data coming from the microprocessor's Universal Asynchronous Receiver/Transmitter (UART). While receiving, the DDS is programmed for 660 kHz which is divided by 2 to give the 330 kHz used by the mixer. Frequency stability for the system is determined by the 6 MHz crystal and is $\pm$ 50 PPM.

Antenna
Since far field signals are not intentionally generated, the "antenna" is a magnetic pick-up coil, not an antenna in the traditional sense. It is a 42 turn air wound coil, rectangular in shape, approximately 4.5 cm x 8.6 cm in size. The coil is parallel tuned to resonate at 125 kHz.

Power Supply Module
The Remote Control runs off 3 AAA batteries. All of the circuitry runs off a regulated 3.3 Volts, except for the IRDA module and the transmitter amplifier which are supplied directly from the battery.

IRDA Module
The main communication link to Clinicians Programmer and test systems.

Display Module
Custom made dot matrix graphics LCD.

Key Pad
A push button, dome switch for commands and menu selections.