

### **Description of Receiver Operation (Brief).**

The receiver electronics are part of a weight bearing shoe product that receives RF bursts of information at a rate of 20 per second. The receiver uses this information to display the weight on a numeric LED display, and in a variety of different sensory forms. The outputs make the patient aware of how much weight is being applied to their lower extremity. The output forms are LED's for upper (Orange) and lower (Green) limits, and a blinking (Yellow) LED for low battery indications for both the transmitters and the receiver, a speaker with volume control for an audio alarm of the upper limit, and a vibrating motor for a sensory alarm of the upper limit. The LED display is used to view numeric values for weights, and to set the shoe address, upper and lower weight limits, and to use some calculation functions provided for patient rehabilitation.

### **Moderately Detailed Circuit Description.**

Power is applied via a switch and in the form of 2x1.5 Volt AA batteries i.e. (a voltage that ranges from less than 1.6 to about 3.3 Volts). This in turn supplies a DC to DC converter, which generates a stable 3.3 Volts. This voltage then supplies power to the microcontroller, which then begins the start up process. It then collects data stored in memory in which it reads the user controlled shoe address, and the user controlled settings for upper and lower limit data. The program then goes into operation mode. The receiving chip constantly looks for a signal from one of the supplied shoe transmitters. The microcontroller receives a digital word that contains the shoe address, Hi/Lo battery indicating bit, the corrected 8 bit digital word for the weight, and error code correction. When a signal is received the microcontroller looks to see if the shoe address matches. If the shoe address is incorrect, the microcontroller disregards the rest of the information in that burst, and waits for another burst. When a signal has a matching address, the microcontroller accepts the data for interpretation. The microcontroller then compares the information with the onboard user preset values for upper and lower weight limits to send a signal to the different forms of alarms selected by the user. The yellow LED indicates low battery for both the receiver and transmitter. A slow blinking yellow LED indicates the transmitter battery is low and faster blinking yellow LED indicates the receiver battery is low. The green LED indicates the lower weight threshold has been exceeded. The orange LED indicates the upper weight threshold has been exceeded. The yellow, green, and orange LED's are not user controlled in that they always will operate when the user set levels have been met. The user can control the threshold level of the green and orange LED's, but that's it. There are 4 forms of output: LEDS, Speaker, Vibrator, and LED display. A 3-way switch controls the LED's, Speaker, and Vibrator. (Position 1) LED's only (meaning green and orange LED's), (Position 2) LED's and speaker only, and (Position 3) LED's and vibrator only. The speaker has a volume control knob for a low tone to high tone output. The LED display operates separately from the 3 settings of the 3-position switch. The LED display is controlled by 2 buttons one for the mode of display, and the second button to adjust the selected mode. The modes of operation are as follows, blank display, Shoe address, upper limit, lower limit, count mode, and peak and hold in that order. The mode button will cycle through this list again and again. The blank display mode saves battery power. Upper and lower limit modes can be adjusted in 5 Lbs. increments (upper ranges from 40 to 220 Lbs.) and (lower ranges from 25 to 215 Lbs.). The count mode counts the number of steps, the number of good steps, and displays the percentage of good steps over total steps. A correct step is determined between the lower limit and 15 Lbs. above the upper limit. The count mode can be cycled to the different output data formats by using the select button to go from count to the number of correct steps to the percentage of good steps and back again. The peak mode allows the user to view the amount of weight they loaded on the shoe in 1 Lbs. increments from 10 to 254 Lbs. The select button resets the mode to zero. Holding the button for 5 seconds will put the display in a mode of a free running scale. The peak mode will also reset and run another reading when the user steps down again. Pressing the mode button again will put the receiver back into the blank display mode. The display will also fall asleep after a few minutes of inactivity to save battery power, and then will wake up in the same place again as soon as it detects activity. The address, upper limit, and lower limit can be locked by pressing the select button for 5 seconds in the blank display mode, so the user can't accidentally change the setting preset by the user. The product unit is to be sold as 3 size shoes, small, medium, and large i.e. (3 transmitters operating identically in the same fashion as described in the transmitter description only with a different shoe address for the different shoe sizes), and a receiver. In some instances it may be required of us to provide up to as many as 32 shoes/shoe

addresses per receiver. The data transfer rate is 9600 baud with a burst duration of about 8.5 ms, 20 times per second at a carrier frequency of 418Mhz.