2. Thermoelectric Converter

The thermoelectric converter consists of six modules each of which bears against one of the flat faces of the heat shield. The modules are complete conversion assemblies of thermoelectric couples (fifteen), insulation, interconnecting electrical conductors (straps) and cold end hardware which provides loading force between the housing and heat shield. Assembly of the module occurs by insertion of the couples into pre-formed holes in the Min-K insulation, packing the space between thermoelectric material and Min-K with fibrous microquartz, and completion of the electrical path by soldering of copper straps to form a two couple parallel arrangement. The cold end hardware subassembly contains the springs and pistons which provide a compressive force to each thermoelectric element. Figure III-3 shows one module configuration with particular emphasis on the cold end hardware. One additional component (not shown) used in the placement of module against the heat shield is a 0.010 inch thick sheet of phlogopite mica to provide high temperature electrical insulation.

The construction of the 90 TAGS 85/2N thermoelectric couples in the SNAP 19 generator is illustrated in Fig. III-4. Each couple is 1.03 inches long, 0.5 inch wide, and 0.578 inch high. It consists of a 50 mil thick nickel 200 hot shoe, two braze wafers, two high purity iron cups, a tin telluride segment and a bonding wafer (P-side only), a TAGS-85 P-leg and a 2N N-leg, a bonding wafer (P-side only), two high purity iron cold shoes, two lead indium (85-15) solder discs and two oxygen free copper connector straps. The TAGS-85 part of the P-leg is 0.270 inch diameter and 0.395 inch long and the tin telluride segment (hot side) is 0.270 inch diameter and 0.100 inch long. The 3M-TEGS-2N N-leg is 0.377 inch diameter and 0.495 inch long.

A view of the electrical interconnection of the modules is illustrated in Fig. III-5. Shown is one of the two crimp-connection points of each module with the stranded oxygen free copper wires joined with an oval splice. A similar connection exists at the other end of the modules. In addition to these crimp connections, another connection is made by soldering a short length of copper wire to terminals located inside the envelope of Min-K insulation. This somewhat complicated interconnection scheme was necessitated by the odd number of couples in each module (15) and the desired arrangement of paralleled pairs of couples. Figure III-6 shows the magnetic compensation loop joined by routing the output wires in a channel at the end of the RTG before attachment to the connector receptacle pins.