During this period special attention has been paid to tasks numbered 3, 4, 5, 6, 7 and 8 as cited in the proposed statement of work. While the water cooling and power feed to the heaters and the primary and secondary electrodes has been completed and are functional, a vacuum leak developed during testing of the system. The stress crack which appeared in a second observation window has been corrected but the small vacuum leak has caused additional delay in system assembly. As a result, task No. 8 and the relevant changes in tasks numbered 3, 4, 5, and 6 have occupied more than 90% of the time.

**Task No.1 Heat Pipe Construction:**

Objective: Finalize the design, construct and test the five heat pipes required to provide the stable thermal environment for the crystal growth system.

Progress: Three of the special BORALECTRIC heaters for the thermal levelers have had their final testing completed. The assembly and installation of the new heater power supplies has been completed. The performance requirements for the new heater power supplies have been confirmed. Thermal monitoring and feedback control will await further system testing.

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Task No. 2 Heat Pipe Heater and Heat Extraction System:
Objective: Provide the heaters and controls for maintaining the preset heat pipe temperature and controlled heat extraction.

Progress: The new system has been installed. The initial testing has been successfully completed. Final performance will be evaluated as Task No. 8 nears completion.

Task No. 3 Optical Temperature Monitoring System
Objective: Integrate the several optical sensors for temperature monitoring with the optical sensing of the solid-melt growth interface.

Progress: The multiplexing network previously built for the germanium photodiode array is being used for testing the new units. It has been decided that a second multiplexer will not be constructed. Water cooling for the photodiodes has been completed but in this quarter the system was completely retested for vacuum leaks. The signal feedthru was reconstructed and tested for leaks. A panel mount for the multiplexing network was completed. No other development on this task was made in this quarter.

Task No. 4 Replenishment Source Development:
Objective: Finalize the design, assemble and test the RF heater coil, coupling network and ancillary heater to provide the controlled replenishment of the melt.

Progress: The two kilowatt, 13.56 MHz, RF generator with its matching network has passed the preliminary tests. The overall configuration of the system requires a bottom-up construction. Several precautions were required to avoid extensive system damage during the early testing. Additional tests with the preheater in place, the chamber at or above atmospheric pressure and the thermal levelers operating, have been conducted. Tests of the three element heater assembly below the melt zone were successful. The window for the observation of the nucleating tip from the edge has been replaced with an optical system to obtain a magnified image for visual or electronic monitoring. The final replenishment heater tests will be rescheduled when the system is adequately vacuum tight. The drive mechanism for controlling the displacement of the replenishment source is not yet assembled. The melt thickness monitor remains to be completed and tested.
Task No. 5 RF Electrode Assembly:
Objective: This task is to assemble the RF electrode ensemble to assure that the spacing, dielectric coupling, thermal and mechanical stability and correct geometrical properties are secured.

Progress: Test depositions of alumina on molybdenum and silicon proved to be unsuitable. The properties of silicon nitride appear to be very favorable for the formation of the dielectric layer and also provide desirable features for other applications within the system. Silicon nitride for the dielectric layer has been deposited on six four inch wafers coated and are being prepared for electrode assembly. The performance of the coatings at temperature has been delayed. Final electrode assembly should be completed early in the first quarter of 1996.

Task No. 6 Solid-Liquid Interface Monitors:
Objective: Complete the development of the optical sensors required to sense the three principal solid-liquid interfaces: a) The sloping growth interface, b) the nucleating edge and c) the growth termination edge.

Progress: An optical system for magnifying and monitoring the sloping solid-liquid interface has been constructed and tested. The analysis of an alternate system for monitoring the horizontal growth termination edge has been completed and the system is under construction. This system should complement the current optical system being considered for monitoring the horizontal nucleating edge. Further work on this task remains scheduled for the first quarter of 1996.

Task No. 7 Ribbon Seed Preparation (Proprietary)
Objective: The Task is to acquire, clean and etch the crystal seed for the initial ribbon growth.

Progress: Some suitable three inch wafers have been made available for ribbon seed preparation. Apparatus designed for the prototype shaping of a three inch crystal wafer has been constructed and tested. Several additional samples are being prepared for testing. Analysis of the system has been completed and will be verified with the initial seed-melt stability tests. Construction of secondary electrode power supply and the associated feedthru has been completed and incorporated into the system. However, the tests of the seed-melt stability has been further postponed by
undiscovered vacuum leaks. The seed-melt stability tests are scheduled for the first quarter 1996.

**Task No. 8 Overall System Assembly**

**Objective:** The task includes the overall assembly and testing of the growth processor.

**Progress:** All feed-through connections have been tested. Water cooled shielding has been installed below the seed ribbon. Installation of the heat sinks has been completed. A stubborn vacuum leak has persisted which has resulted in a nearly complete disassembly of the system. When the leak is discovered and repaired the placement of the several heaters, thermal levelers, primary electrodes and the crystal ribbon seed will be reestablished. Installation of the secondary electrode system will follow. New tests are scheduled for the first quarter of 1996 leading to the silicon melt stability tests. Some of the photodiodes and specially shielded Pt-Pt(10% Rh) thermocouples have been positioned but the testing has been postponed. The installation of the upper heat shields awaits the assembly of the drive for the replenishment supply. Next quarter testing will continue to evaluate the performance of all the components of the system as they are being assembled.