

**Power Generation and
Distribution**

WINTER '99 REVIEW

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Team Leader**

PGD TEAM

- **MENTOR: Dr. Hal Tharp (ECE)**
 - LEADER: Chieh-Kuen Woo
 - MEMBER: Kwanduck Kim, Kok-Hian Tan
- **Solar Panels design: Kwanduck Kim,
Chieh-Kuen Woo**
- **Power Subsystem design: Kok-Hian Tan,
Chieh-Kuen Woo**

Areas of Investigation

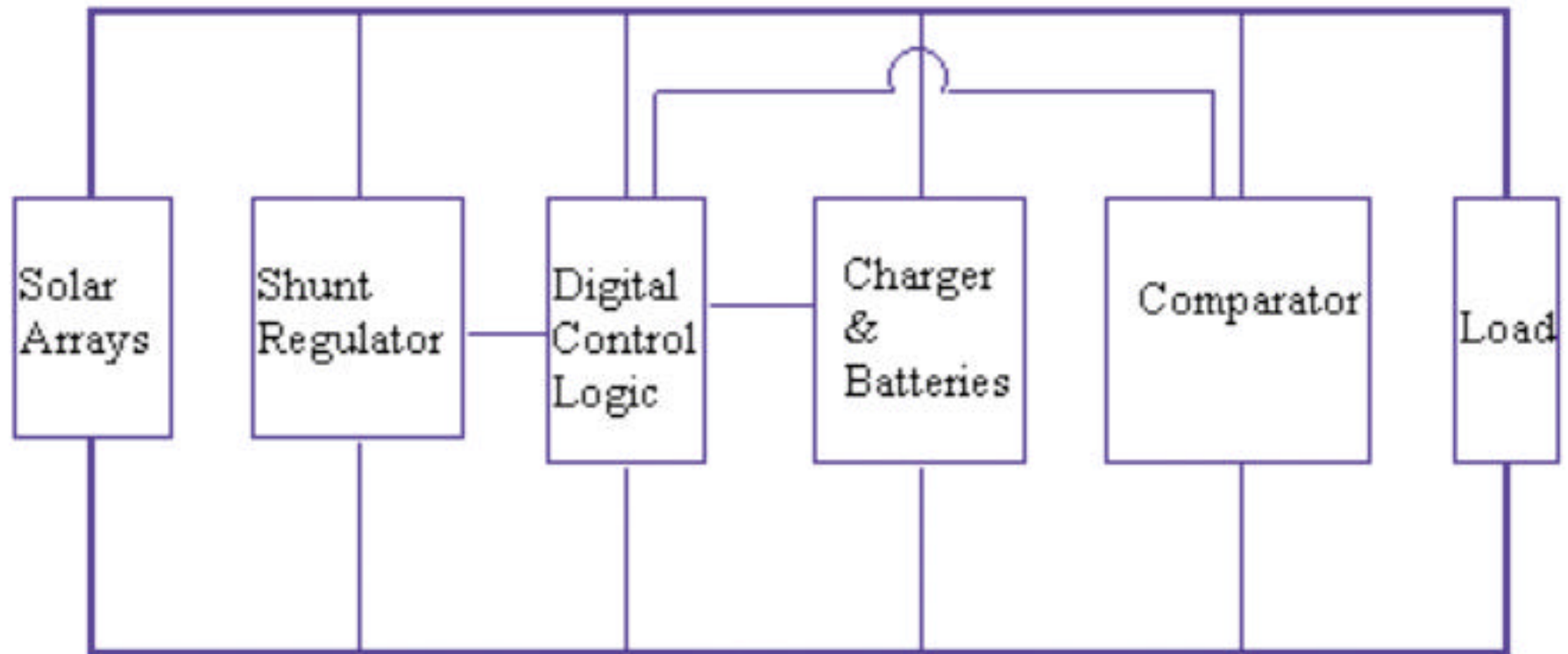
- **Power Subsystem – Direct Energy Transfer (DET)**
- **Power Source – Power from Solar Panels (Body Mounted) with different satellite surface area**

Power Subsystem

DET System

- **Shunt Regulator** : Shunt Drivers (transistors) and Shunt Resistors
- **Charger and Batteries**
- **Voltage Comparator**: Compare load voltage with preset voltage, and send error signal to Digital Control Logic if the load voltage is 1% less than preset voltage.
- **Digital Control Logic**:
 - Will control over: - Shunt Regulator: - on/off the transistors
 - Charger: - charge or discharge

DET Block Diagram



Solar Panels

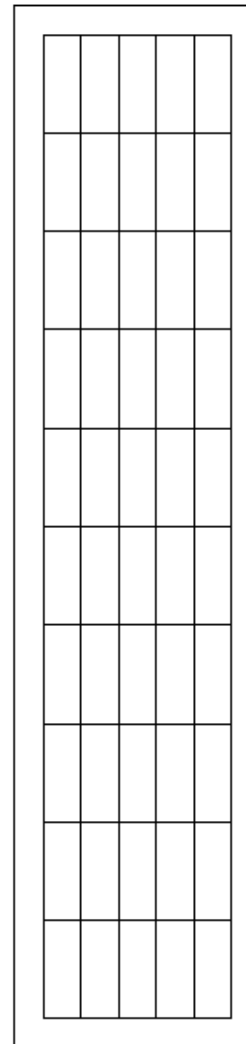
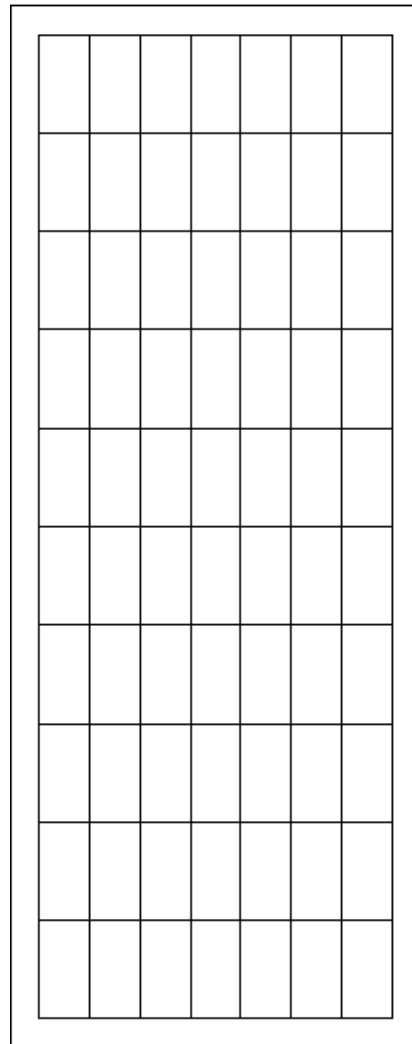
- Body mounted solar cells : Gallium Arsenide (GaAs) cells
- Ratio of solar cells area to satellite area (one side)
 - 6 sided, 8 sided, and 12 sided had been studied.
 - Larger area of each side (6 sides) has higher ratio than the small area (12 sides)
 - %: $(\text{Area of Cell arrays mounted on one side}) / (\text{Area of satellite [one side]})$

Student Satellite Project

Solar Arrays Mounted on One Side

8-SIDED

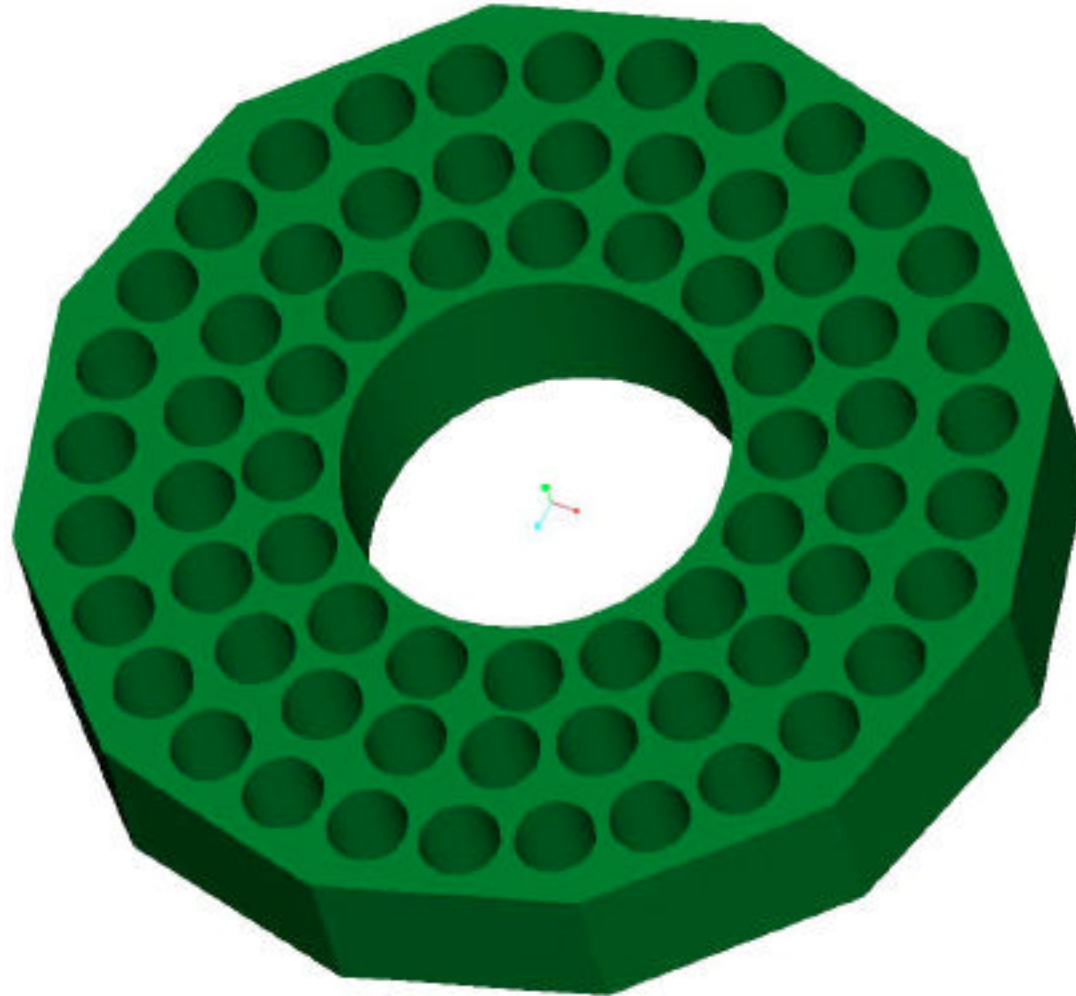
12-SIDED



Solar Panels (cont.)

- Power output from designed area
 - >> Power calculation with (2cm * 4cm) GaAs cells:
 - 12 sided : 36W
 - 8 sides: 38W
 - 6 sides: 33W

Battery Pressure Vessel



What needs to be done in Spring'99?

- Prototyping the subsystem
 - Comparator circuit
 - Power source
 - Basic model of DET system
- Further investigation on the subsystem
 - Digital Control Logic