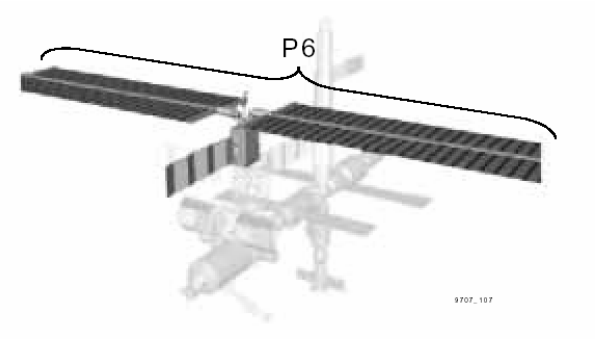
Electrical Power System

The electrical power system is comprised of solar arrays, storage batteries and power load components. The space station requires electrical power for all functions such as life support, heating and cooling, navigation, lighting, and research stations. All primary power is provided by the P6 photovoltaic module.



Power Load Components

There are five components which use 100% of the power. The relative percentage that each uses is listed here along with a description of the component.

1. Command and Data Handling (C&DH-12% or 2.94 kW/hr)

- Over 100 different computer systems, which control many essential functions
- Linked to practically all other systems
- Used to collect data from onboard systems and payloads; process that data with various types of software; and distribute commands to the right equipment.
- Power to these systems should never drop below 10% (2.45 kW), except as directed by Mission Control in an emergency.

2. Communication and Tracking (CTS-14%)

- Includes communications and Guidance (navigation) systems that link with ground control to exchange data and positioning information
- Communication is a very important component: Communication with the ground ensures safety, reliability, and stable operations.
- Power to these systems should never drop below 5% (1.23 kW), except as directed by Mission Control in an emergency.

3. Environmental Control and Life Support Systems (ECLSS-28%)

- Monitors all life support systems (air quality, temperature, water, atmospheric pressure, Oxygen, Nitrogen, Carbon Dioxide) and continually keeps all systems in proper balance.
- Maintains a pressurized habitable environment, provides water recovery and storage, and provides fire detection and suppression.
- Power to these systems is of the utmost priority. However, it is possible to cut major portions of life support systems if astronaut comfort and safety are very closely monitored. In general, if power is cut below 14% (3.43 kW), then air quality needs to be very closely monitored. Astronauts may use battery-powered life support measures as described in the Life Support Reference Guide.

4. Flight Crew System (FCS-12%)

- FCS electrical needs consist of: lighting, personal hygiene, waste collection, kitchen area and food system, equipment for extravehicular activities, portable emergency provisions (such as the portable breathing apparatus), trash management, and recreational equipment.
- Includes the Crew Health Care System:
    - monitors long-term crew health
    - provides physiological countermeasures for health maintenance (exercise equipment),
    - provides environmental monitoring: air and water quality for chemical and microbial contaminants, radiation levels, and surface microbial contaminants
- Power to these systems should never drop below 3% (0.74 kW), except as directed by Mission Control in an emergency.

5. Thermal Control Systems (TCS-34%)

- Maintains space station equipment and payloads within their required temperature ranges. For instance, experiments and equipment generate heat that must be removed.
- Includes cooling "radiators" (see figure) for the solar arrays and battery compartments.

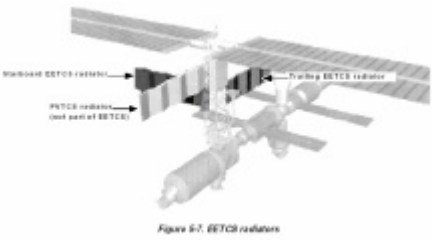


Figure 9-7. EETCS radiators

- Includes the Active Thermal Control System which uses a mechanically-pumped fluid to perform heat transfer from areas of low heat to areas of high heat and vice-versa.
- Power to these systems should never drop below 15% (3.68 kW), except as directed by Mission Control in an emergency.