INTEGRATED EQUIPMENT ASSEMBLY

Payload Bay

17,000 pounds

Overview

The Integrated Equipment Assembly measures 16 x 16 x 16 feet, weighs nearly 17,000 pounds and is designed to condition and store the electrical power collected by the photovoltaic arrays for use on board the Station.

The IEA integrates the energy storage subsystem, the electrical equipment, the thermal control system, structural framework and the Solar Array Rotary Joint (SARJ). The IEA consist of three major elements:

1. The power system electronics consisting of the Direct Current Switching Unit (DCSU) used for primary power distribution; the Direct Current to Direct Current Control Unit (DDCU) used to produce regulated secondary power; the Battery Charge/Discharge Unit (BCDU) used to control the charging and discharging of the storage batteries; and the batteries used to store power.

2. The Photovoltaic Thermal Control System consisting of: the coldplate subassembly used to transfer heat from an electronic box to the coolant; the Pump Flow Control System (PFCS) used to pump and control the ammonia coolant; and the Photovoltaic Radiator (PVR) used to dissipate the heat into deep space.

3. The computers used to control the P6 module.

The IEA power system is divided into two independent and nearly identical channels. Each channel is capable of control (fine regulation), storage and distribution of power to the ISS. The PVAA is attached to one end of the IEA and the LS to the other.

Power received from each PVAA is fed directly into the appropriate Direct Current Switching Unit (DCSU). The DCSU is a high-power, multi-path remotely controlled unit that is used for primary and secondary power distribution, protection and fault isolation within the IEA. It also distributes primary power to the ISS. During periods of insolation, the DCSU routes primary power directly to the ISS from its PVAA and also routes power to the power storage system for battery charging. During periods of eclipse the DCSU routes power from the power storage system to the ISS. The DCSU measures 28” by 40” by 12” and weighs 235 pounds.

Primary power from the DCSU is also distributed to the Direct Current to Direct Current Converter Unit (DDCU). The DDCU is a power processing system that conditions the coarsely regulated power from the PVAA to 123 +/- 2 VDC. It has a maximum power output of 6.25 kW. This power is used for all P6 operations employing secondary power.

Primary power from the DCSU is also distributed to the three power storage systems located within each channel of the IEA. The power storage system consists of a Battery Charge/Discharge Unit (BCDU) and two battery assemblies.

The BCDU serves a dual function of charging the batteries during solar collection periods, and providing conditioned battery power to the primary power busses (via the DCSU) during eclipse periods. The BCDU has a battery charging capability of 8.4 kW and a discharge capability of 6.6 kW. The BCDU also includes provisions for battery status monitoring and protection from power circuit faults. Commanding of the BCDU is from the IEA computer.

Each battery assembly consist of 38 lightweight Nickel Hydrogen cells and associated electrical and mechanical equipment. Two battery assemblies connected in series are capable of storing a total of 8 kW of electrical power. This power is fed to the ISS via the BCDU and DCSU respectively. The batteries have a design life of 6.5 years and can exceed 38,000 charge/discharge cycles at 35% depth of discharge. Each battery measures 40” by 36” by 18” and weighs 375 pounds.

In order to maintain the IEA electronics at safe operating temperatures in the harsh space environments, they are conditioned by the Photovoltaic Thermal Control System (PVTCS). The PVTCS consist of ammonia coolant, eight coldplates, two Pump Flow Control Systems (PFCS) and one Photovoltaic Radiator (PVR).

The coldplate subassemblies are an integral part of IEA structural framework. Heat is transferred from the IEA orbital replacement unit (ORU) electronic boxes to the coldplates via fine interweaving fins located on both the coldplate and the electronic boxes. The fins add lateral structural stiffness to the coldplates in addition to increasing the available heat transfer area.

The PFCS is the heart of the thermal system. It consists of all the pumping capacity, valves and controls required to pump the heat transfer fluid to the heat exchanges and radiator, and regulate the temperature of the thermal control system ammonia coolant. The PVTCS is designed to dissipate 6,000 Watts of heat per orbit on average and is commanded by the IEA computer

Each PFCS consumes 275 Watts during normal operations and measures approximately 40 x 29 x 19 inches, weighing 235 pounds

The PVR – the radiator – is deployable on orbit and comprised of two separate flow paths through seven panels. Each flow path is independent and is connected to one of the two PFCSs on the IEA. In total, the PVR can reject up to 14 kW of heat into deep space.

The PVR weighs 1,600 pounds and when deployed measures 4 x 12 x 7 inches.
