

ABSTRACT

Conducting Research on the International Space Station using the EXPRESS Rack Facilities. Sean W. Thompson and Robert E. Lake. NASA Marshall Space Flight Center, Huntsville, AL, USA.

Eight “Expedite the Processing of Experiments to Space Station” (EXPRESS) Rack facilities are located within the International Space Station (ISS) laboratories to provide standard resources and interfaces for the simultaneous and independent operation of multiple experiments within each rack. Each EXPRESS Rack provides eight Middeck Locker Equivalent locations and two drawer locations for powered experiment equipment, also referred to as sub-rack payloads. Payload developers may provide their own structure to occupy the equivalent volume of one, two, or four lockers as a single unit. Resources provided for each location include power (28 Vdc, 0-500 W), command and data handling (Ethernet, RS-422, 5 Vdc discrete, +/- 5 Vdc analog), video (NTSC/RS 170A), and air cooling (0-200 W). Each rack also provides water cooling (500 W) for two locations, one vacuum exhaust interface, and one gaseous nitrogen interface. Standard interfacing cables and hoses are provided on-orbit. One laptop computer is provided with each rack to control the rack and to accommodate payload application software. Four of the racks are equipped with the Active Rack Isolation System to reduce vibration between the ISS and the rack. EXPRESS Racks are operated by the Payload Operations Integration Center at Marshall Space Flight Center and the sub-rack experiments are operated remotely by the investigating organization. Payload Integration Managers serve as a focal to assist organizations developing payloads for an EXPRESS Rack. NASA provides EXPRESS Rack simulator software for payload developers to checkout payload command and data handling at the development site before integrating the payload with the EXPRESS Functional Checkout Unit for an end-to-end test before flight. EXPRESS Racks began supporting investigations onboard ISS on April 24, 2001 and will continue through the life of the ISS.