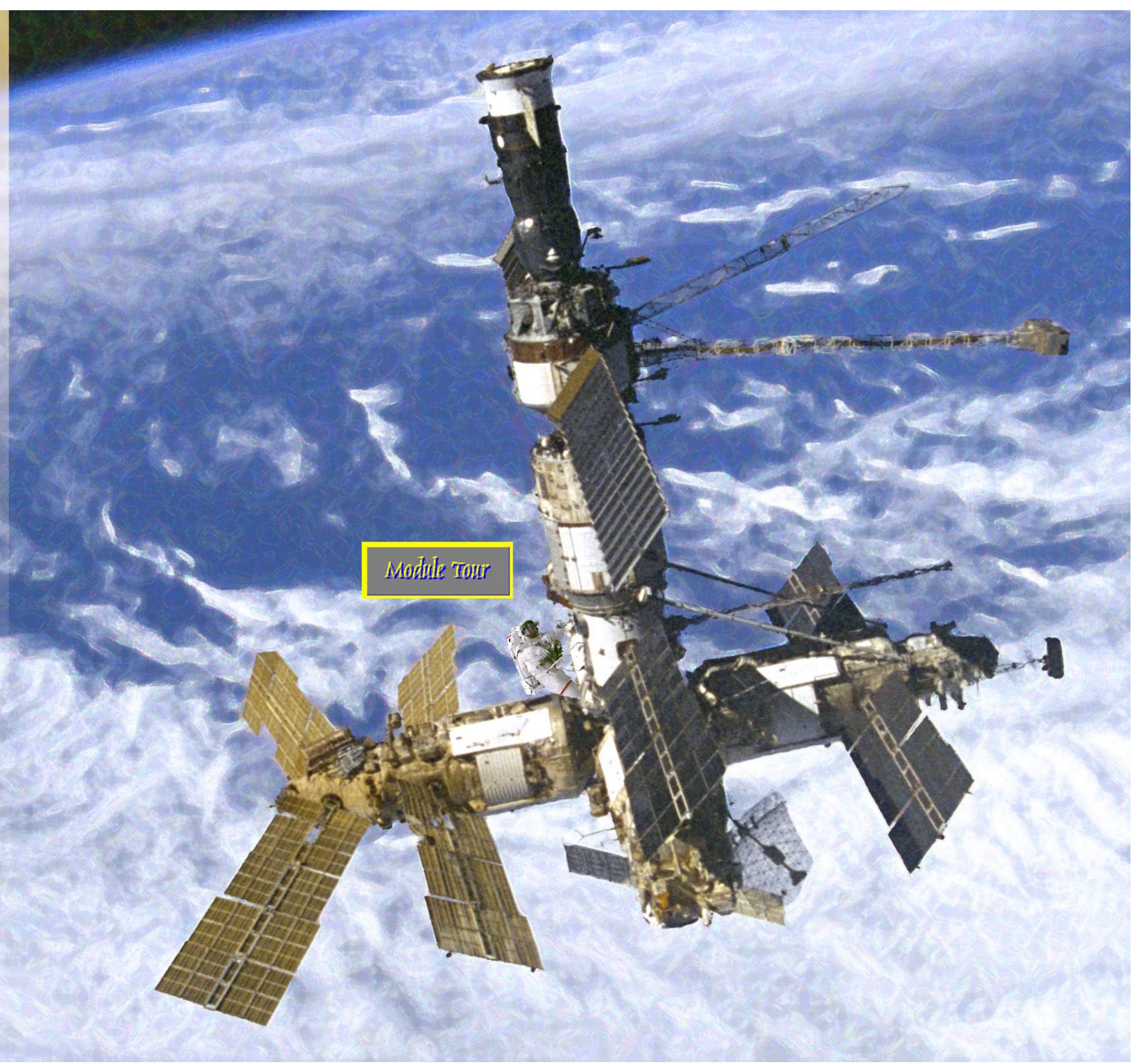
Phase 1:
A Journey to Mir
1994-1998



Module Tour

List of Experiments

List of Experiments by Increment

Bar Code Readers (BCR): Inventory Management System

EXPERIMENT DESCRIPTION

This experiment uses a Bar Code Reader (BCR), BCR labels, and IMS software to evaluate proposed International Space Station equipment inventory management concepts. For this experiment, Shuttle astronauts scan BCR labels that have been attached to equipment transfer bags during docked Mir/Shuttle missions. The scanning occurs in the Shuttle and the Mir Space Station while the transfer of equipment is taking place. The NASA astronaut left on the Mir Space Station attaches the BCR labels to U.S. stowage lockers on the Priroda module. Scanned data is stored on experiment PCMCIA cards located in the BCR. These cards are removed from the BCR and stowed on the Shuttle for return to the ground.

S97-17591

Figure OPS-2 Bar Code Readers with Extra Battery Packs

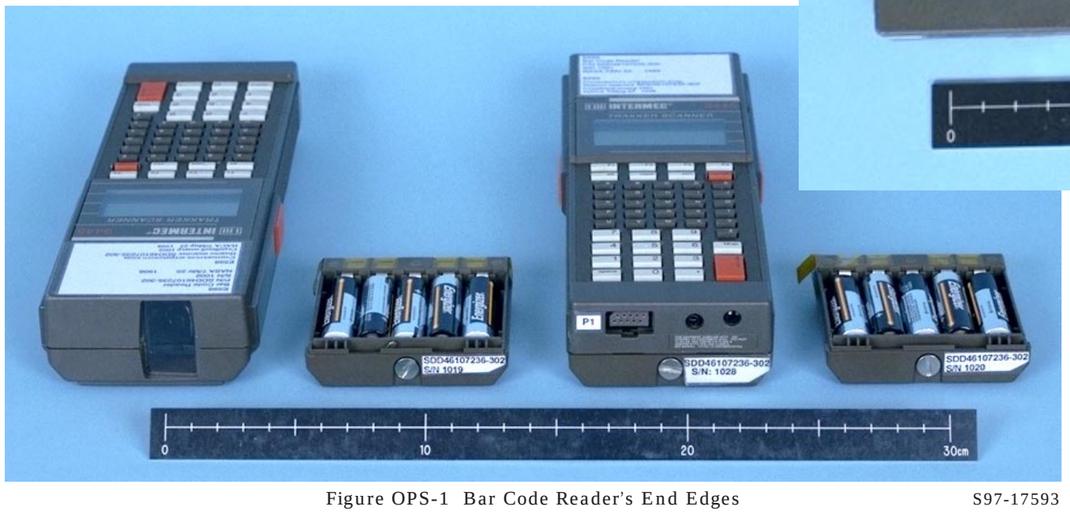


Figure OPS-1 Bar Code Reader's End Edges S97-17593

HARDWARE DESCRIPTION

The hardware components used with this experiment are:

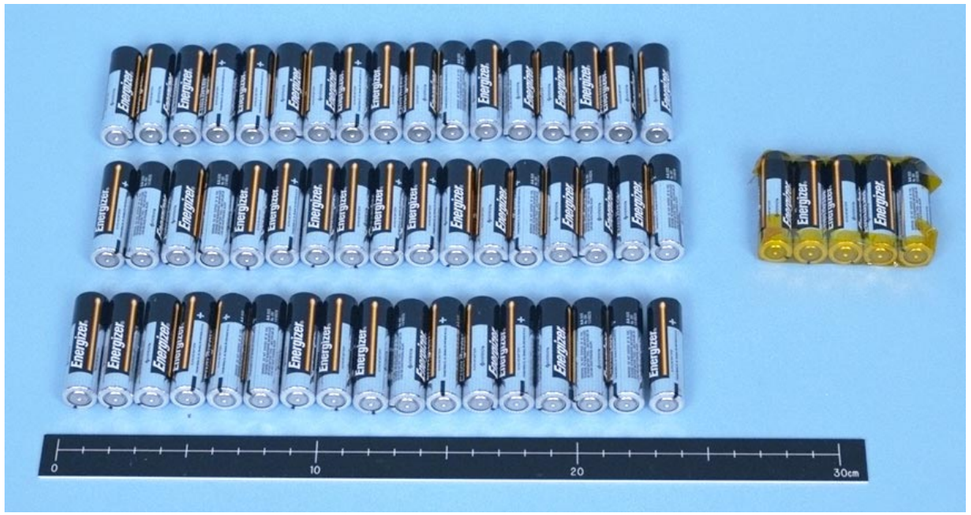
Bar Code and Data Logger Assembly

Bar Code and Data Logger Assembly Batteries (2)

IMS PCMCIA Cards (2) containing software for the BCR

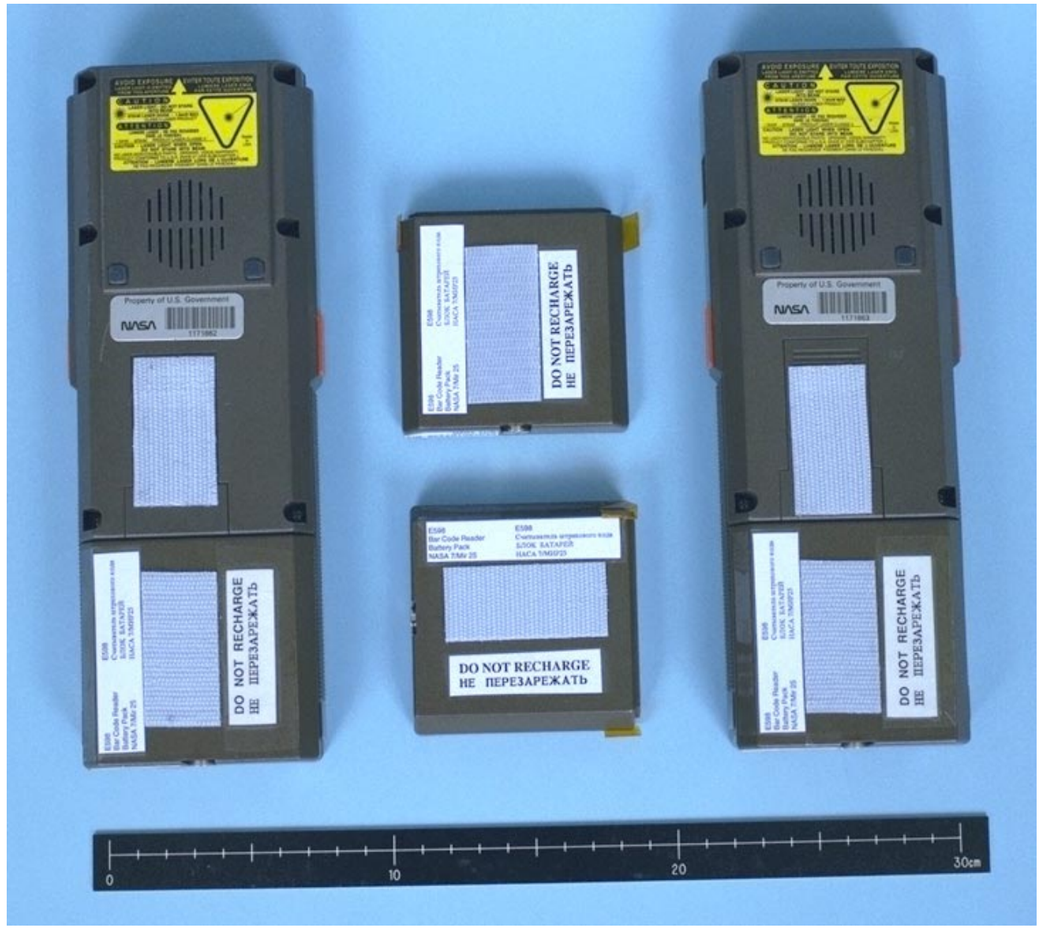
Transfer Reference Card

IMS Bar Code Labels



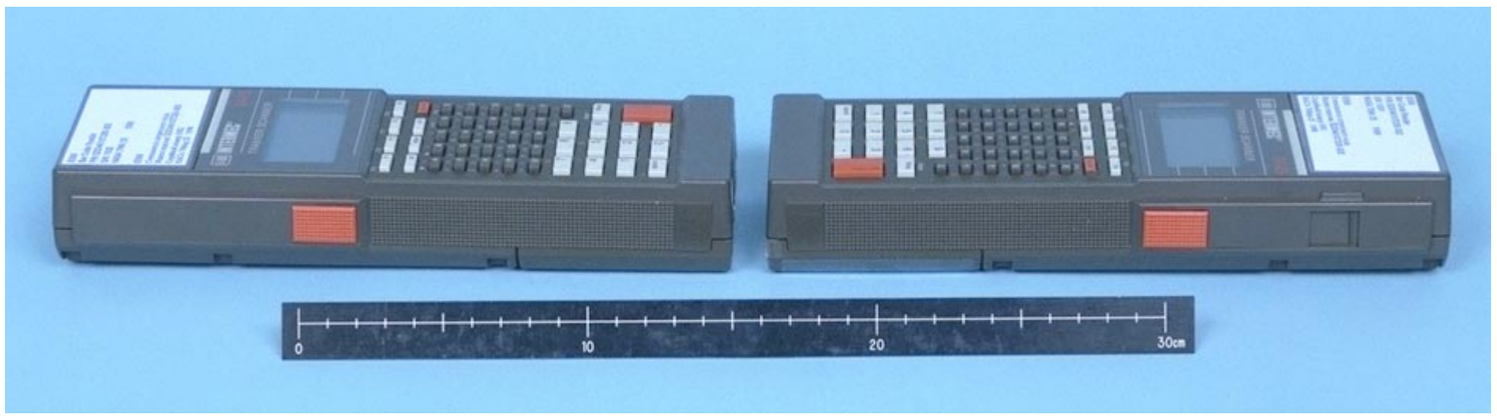
S97-17595

Figure OPS-3 BCR Batteries (AA)



S97-17592

Figure OPS-5 Bar Code Readers' Bottom Sides



S97-17594

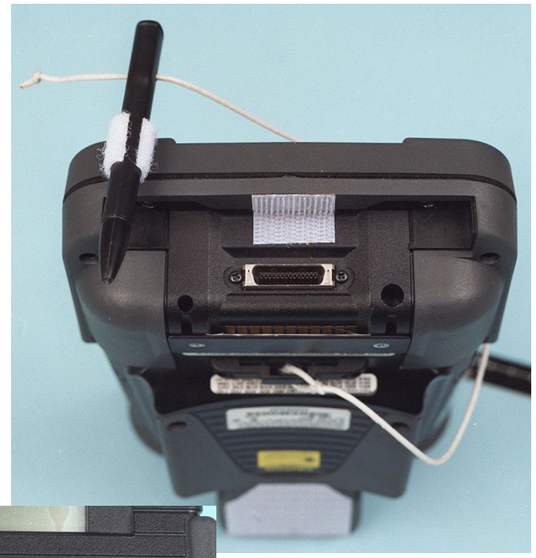
Figure OPS-4 Bar Code Reader Length Side View

S97-01034

Figure OPS-6 BDL

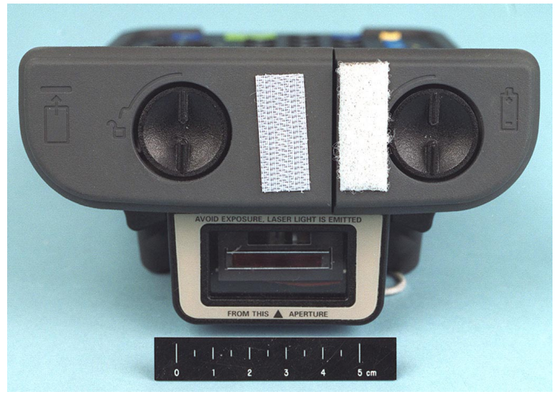
S97-01023

Figure OPS-7 BDL Keypad



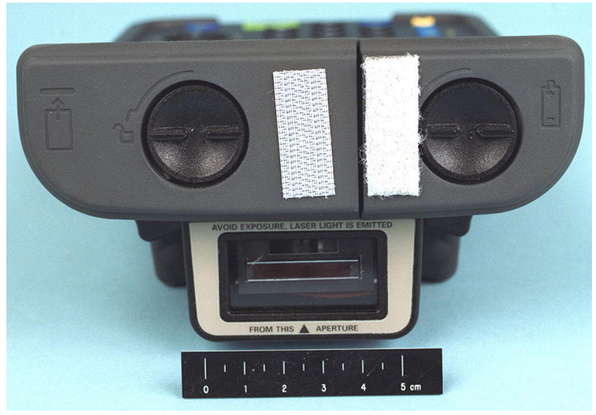
S97-01025

Figure OPS-8 BDL Base with Stylus and Data Cable Connection



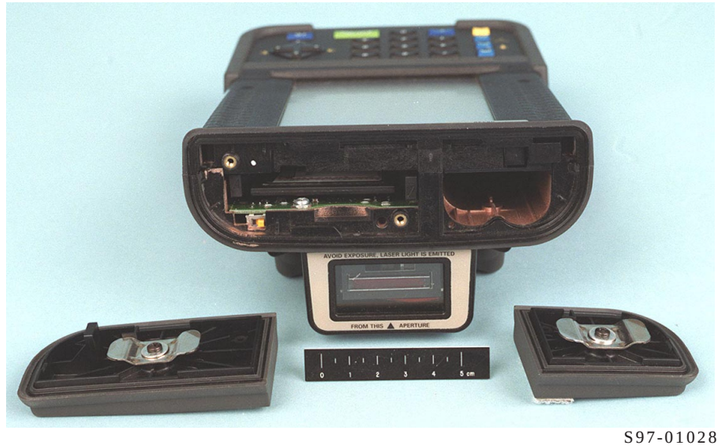
S97-01026

Figure OPS-9 BDL Covers Locked



S97-01027

Figure OPS-10 BDL Covers Unlocked



S97-01028

Figure OPS-11 BDL Covers Removed

BDL: Inventory Management System (IMS)

HARDWARE DESCRIPTION

BARCODE AND DATA LOGGER ASSEMBLY (BDL)

Mechanical Characteristics

The mechanical properties are limited to the numeric keypad, a RS-232 interface utilizing a 25 pin mini-Centronics connector and two removable panels using 'quarter-turn latches'.

Electrical Characteristics

The Bar Code and Data Logger is a Norand Penkey 6350 palm top data storage tool, utilized to record specific activities of a crewmember during a mission support of various experiments. The Penkey provides a VGA touch screen display, 320 x 480 pixels. The display provides a power managed backlight. The Penkey provides a tactile 21-key pad. The Bar Code and Data Logger uses a 486SL 50MHz microprocessor which is powered by a 7.2 volt rechargeable NiCd battery pack. A nine-volt alkaline battery provides a backup power supply.

The BDL has 12 MB of Dynamic Random Access Memory (DRAM) memory and has space for two type II PCMCIA cards or one type III PCMCIA card. The primary BDL software includes DOS 5.0, Windows 3.1, and Visual Basic 4.0 executable programs. The Barcode and Data Logger is 225 x 145 x 94 mm and weighs 1.41 kg with battery installed. The 12 MB of RAM and 170 MB hard drive give the BDL move versatility over its predecessor, the Bar Code Reader. Now, the hard drive of the BDL need only to be replaced each mission as compared to swapping the entire BCR.

The Bar Code and Data Logger utilizes a laser diode. This emits red light in the visible spectrum (670 nm) at a maximum of 1 mW. A scanning mirror that

D.I.D.

Bar Code and Data Logger

BAR CODE AND DATA LOGGER

P/N:	SED46113511-301
Qty:	2
Power:	Battery
Mass:	2.82 kg
x,y,z:	22.00 x 14.50 x 9.40 cm

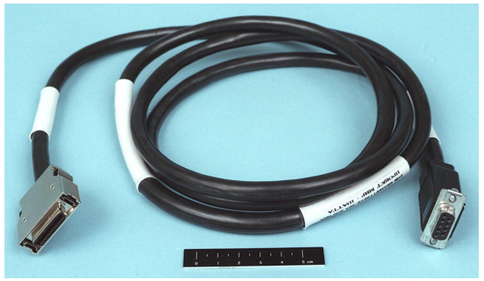
BDL CARD

P/N:	SED46113518-303
Qty.:	3
Mass:	1.86 kg
Power:	None
x,y,z:	5.40 x 8.60 x 1.10 cm
Loc.:	Spektr

S97-01044

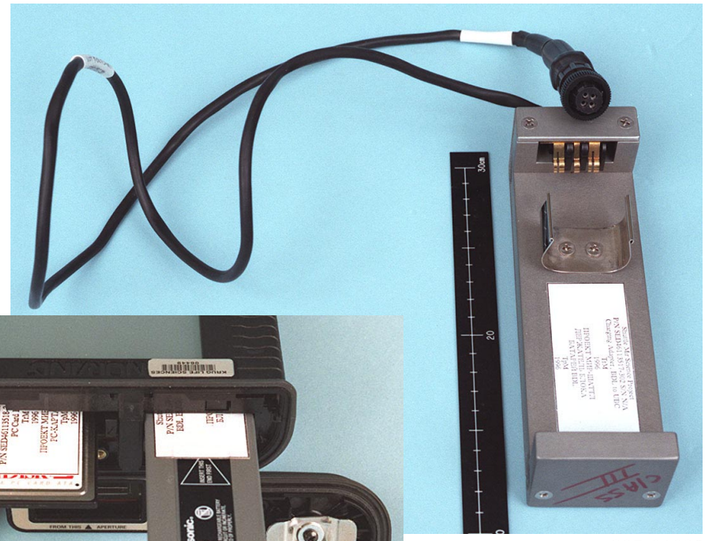
Figure OPS-12 BDL Face Screen at Boot-up Before Launching Windows

continuously changes the beam path, coupled with the low power output and duration of a scan, all reduce the risk of damage due to laser exposure. This laser is incapable of causing eye damage within the duration of a blink (or aversion response). Therefore, a hazard can only exist if a person can overcome the natural tendency to blink and stare directly into the beam. However, this is impossible with the Bar Code and Data Logger since the scanning mirror is constantly changing the beam path. Thus one cannot stare into a fixed beam; but rather at an oscillation source that moves much faster than the eye can track. The scanning mirror limits the exposure time to the eye to a very short period during each sweep; much shorter that the 0.25 second continuous exposure limit. The integrated laser scanner is easily accessible and scans bar code from 15 to 45 cm. The scanner allows large variance in scanning orientation. The scanner will even correctly scan an upside-down bar code.



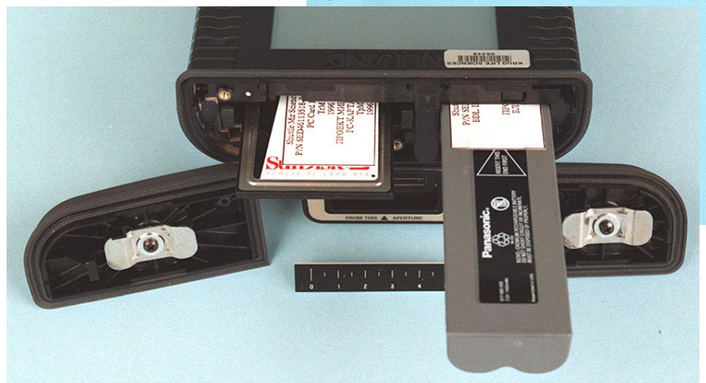
S97-01033

Figure OPS-14 BDL/MIPS Interface Cable



S97-01032

Figure OPS-16 Battery Adapter for Recharging Using UBC



S97-01042

Figure OPS-15 BDL with Battery and PC Card Partially Inserted

Data Interface Characteristics

The data recorded on the Bar Code and Data Logger can be transferred to the MIPS-2L for the purpose of magneto-optical data storage or telemetry. This is accomplished by using the BDL RS-232 Interface Cable.

User Interface Characteristics

The user of the Bar Code and Data Logger will be working in a 'Windows' environment. To take full advantage of this environment, the user must use a mouse. The user can use either the keypad or touch screen. All mouse functions are performed by touching the screen; either with one's finger or the tethered stylus (anything can be used as a stylus as long as it has a dull point as not to scratch the screen). To activate an icon tap the icon twice or push the "ent/yes" button. To drag an object, touch the icon and drag to its destination before removing the stylus or finger from the display. To select the appropriate response, simply tap the icon once.

S97-01031

Figure OPS-13 BDL Accessory Kit

BDL ACCESSORY KIT

The BDL Accessory Kit is a pack made of Nomex material

S96-19421

Figure OPS-17 BDL PC Cards

S97-01041

Figure OPS-18 BDL Battery and PC Card

MIR CENTRIFUGE

HARDWARE DESCRIPTIONS

CENTRIFUGE CASE

This centrifuge is new hardware to replace the one in Spektr. It may be powered by an RBS-U or the PUP.

The case of the Centrifuge is fabricated from 6061-T6 type aluminum.

- Opening the Lid:

  There are two latches on the case of the centrifuge, one on each side. To open the lid, first open the latches by twisting the key in the clockwise direction. The lid may now be opened by lifting the front of the lid.

- Closing the Lid:

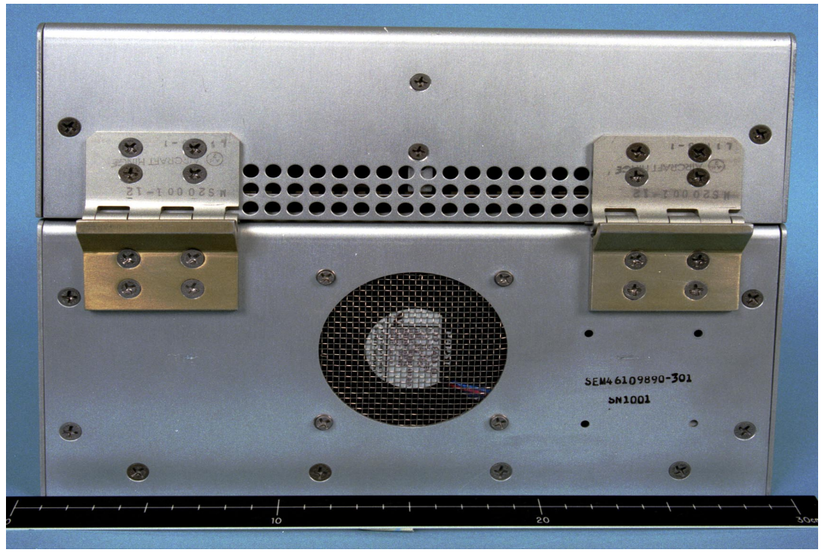
  To close the lid, push down on the front of the lid until it touches the base of the centrifuge. Lock the latches by turning the key in the counterclockwise direction.

- On-Off Circuit Breaker — On-Off Switch:

  Facing the Centrifuge, there is an on-off circuit breaker on the left side of the case. This also is the on-off switch. It is protected from accidental movement by a switch guard.

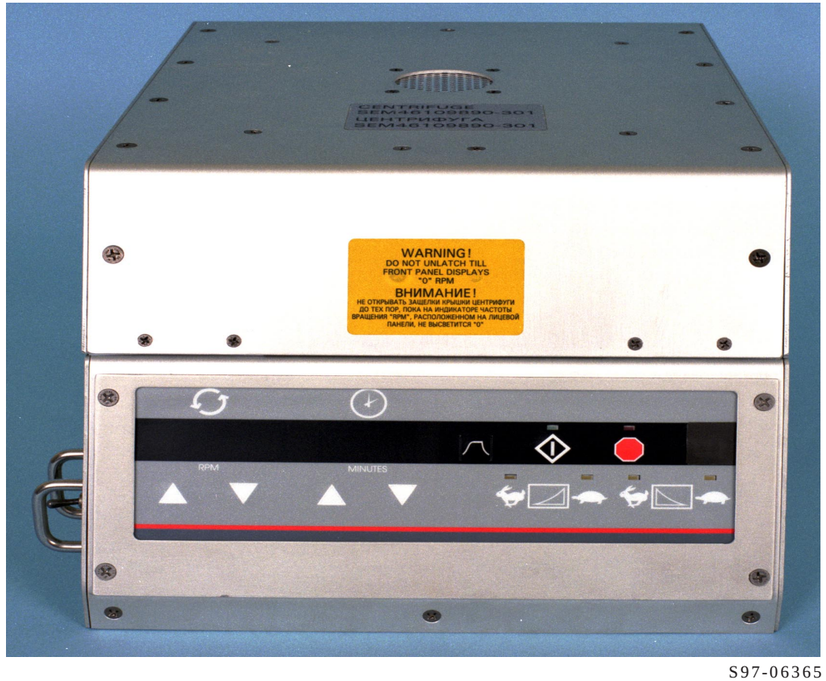
POWER CONNECTOR

Facing the Centrifuge, there is a power cable connector, J1, on the left side of the case toward the back.



S97-06362

Figure OPS-19 Centrifuge, Rear View



S97-06365

Figure OPS-20 Mir Centrifuge Front Control Panel with Lid Closed, with the On/Off Switch on the Left Side

S97-06370

Figure OPS-21 Mir Centrifuge Front Control Panel with Lid Open

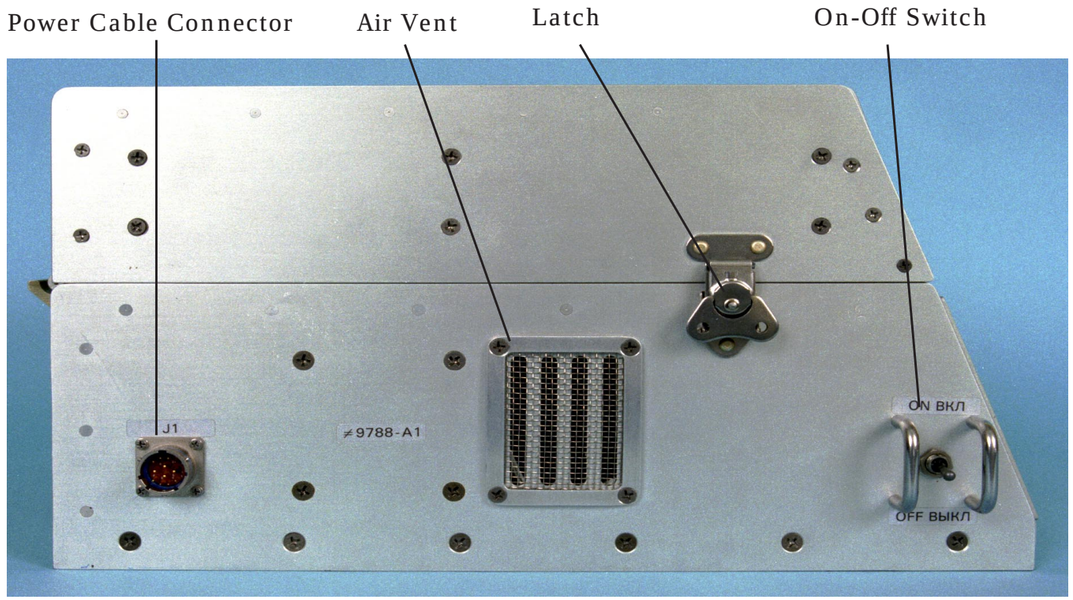
D.I.D.

Centrifuge

Principal Investigator:
Angie M. Lee
NASA/JSC/SM4
(281)483-7303

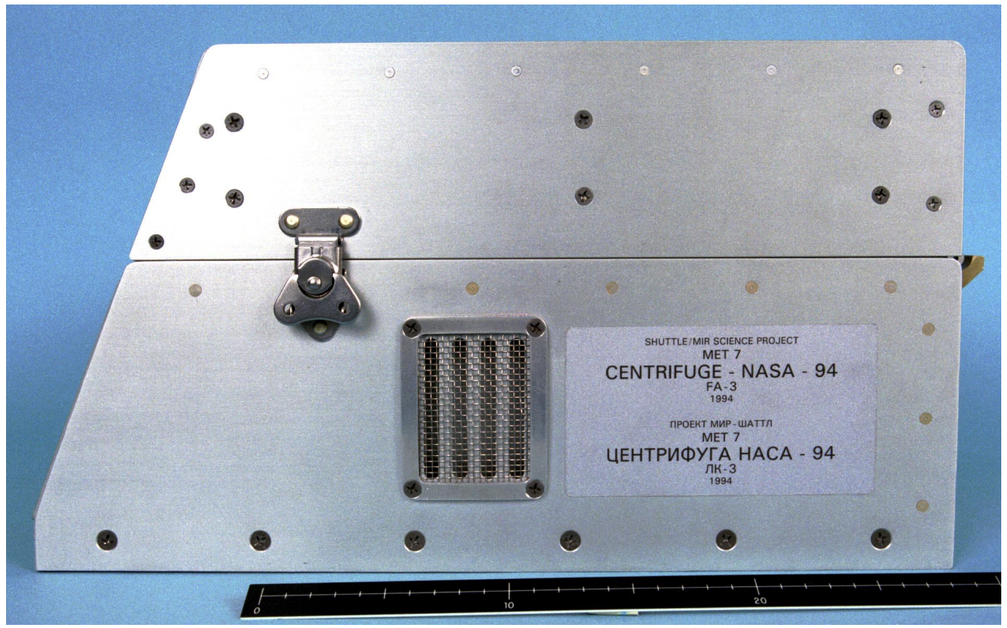
CENTRIFUGE NASA-94, FA-1 1994

P/N:	SEM46109890-301
Qty:	1
Mass:	18.00 kg
Power:	140 (Power off J1)
x,y,z:	39 x 51 x 31 cm
Loc:	Priroda
DID#:	SLM46110417



S97-06366

Figure OPS-22 Left Side of Centrifuge

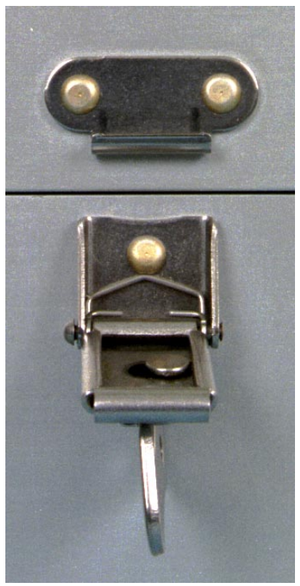


S97-06361

Figure OPS-23 Centrifuge, Right Side View

S97-06367

Figure OPS-24 Centrifuge, Top View



S97-06363

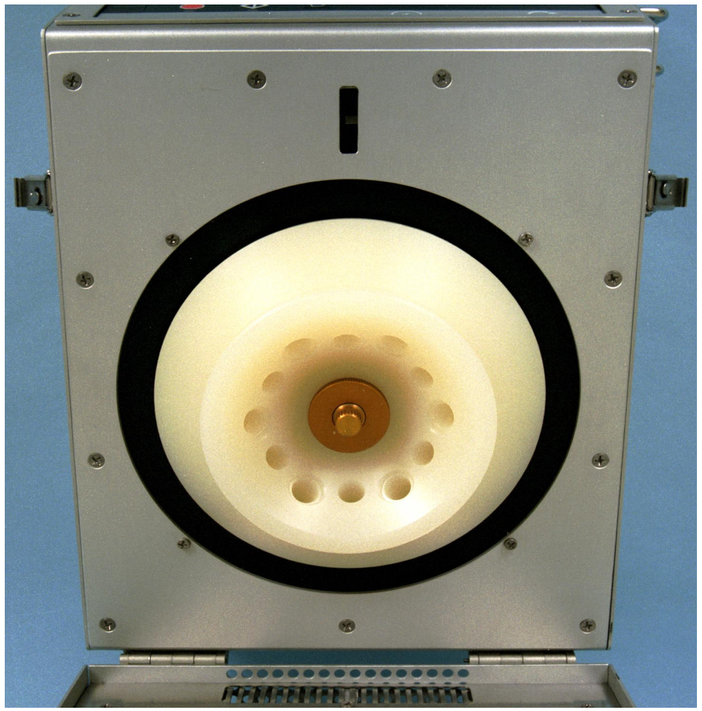
Figure OPS-25 Locking Latch Found on Both the Left and Right Side of Lid

MOTOR/INVERTER

The Centrifuge motor is a brushless design and is capable of speeds to 6100 rpm. This motor requires 115 Vac, 50-Hz power which is converted from 28-Vdc rack power by a 50-Hz static inverter. All of the electronics are powered from the inverter except for the cooling fan. The inverter has an internal fan for thermal overheat protection.

COOLING SYSTEM

For ventilation, the Centrifuge employs a cooling fan and has screened air vents on the lid and each of the two side panels. The cooling fan consists of an electronically controlled DC motor with a press-fitted impeller and runs directly from 28V DC power. The maximum airflow of this fan is 35 m^3/hour. For protection, the fan employs a 1-amp fuse. The fan is located at the back of the Centrifuge where it exhausts air from inside the Centrifuge.



S97-06368

Figure OPS-26 Combination Vial Installed in Centrifuge. Rotor is Secured by Hand-Tightened Collar in Center.

TABLE OPS.1
VIALS

Type of rotor	Number of vials	Dimensions of vials
5 mL (blood vial)	12, 5-mL vials	13 mm dia. x 75 mm
Combination (5 mL and 7 mL) blood vials	6, 5-mL vials and 6, 7-mL vials	13 mm dia. x 75 mm 13 mm dia. x 100 mm
Saliva vial	6, saliva vials	17 mm dia. x 94 mm

ROTOR

The Centrifuge employs removable polypropylene fixed-angle type rotors that can accommodate several well sizes allowing varying vial sizes to be used. There are three rotor types used with the centrifuge. These rotors and their capabilities shall conform to the vial types listed in Table OPS.1.

- Selection:

  To select the proper rotor, simply match the vial type with its corresponding rotor.

- 5-mL Blood:

  The 5-mL rotor holds twelve 5-mL blood vials. Each well is identical in size.

- Combination Blood:

  The Combination rotor holds six 7-mL blood vials and six 5-mL blood vials for a total of 12 vials. This rotor has two different well sizes.

- Saliva:

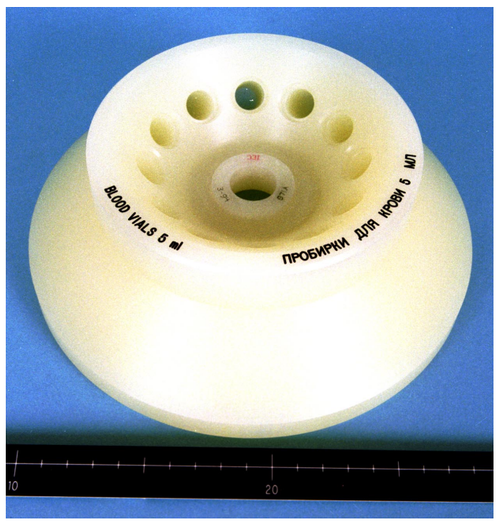
  The saliva rotor holds a total of six saliva vials. Each well is identical in size.

- Installation:

  Once the correct rotor has been selected, it is installed by first removing the collar on the motor shaft. Then place the rotor over the motor shaft and align the guide holes in the rotor with the positioning pins on the shaft. With the rotor in position, the collar is then hand tightened.

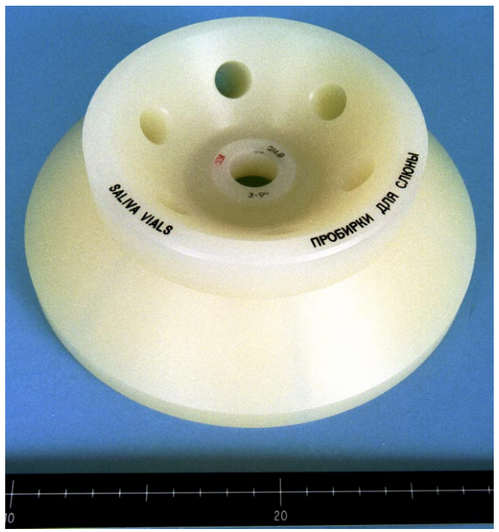
- Balancing the Rotor/Loading the Vials:

  Always load the rotor symmetrically. This is absolutely necessary to minimize vibration and bearing wear. ✺



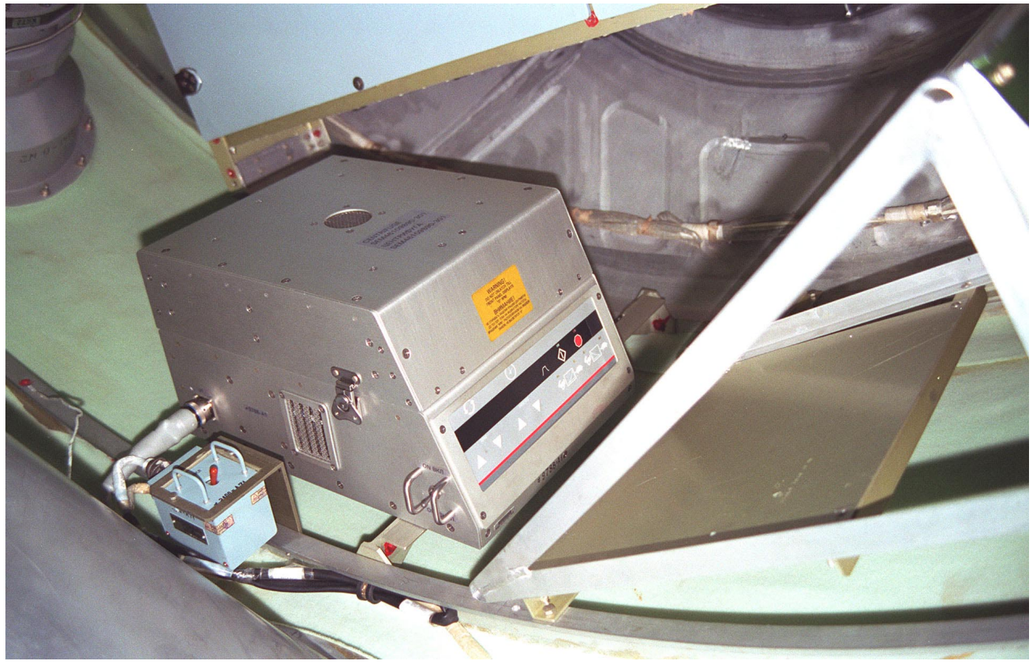
S97-06357

Figure OPS-27 Blood Vial Rotor



S97-06359

Figure OPS-28 Saliva Vial Rotor



S95-06815

Figure OPS-29 Front of the Mir Centrifuge Mounted in Spektr

Crew On-Orbit Support System (COSS)

Figure OPS-30 COSS Kit Contents

S96-18506

S96-18502

Figure OPS-31 COSS Hard Drives

S96-18505

Figure OPS-32 COSS CD Container

D.I.D.

COSS

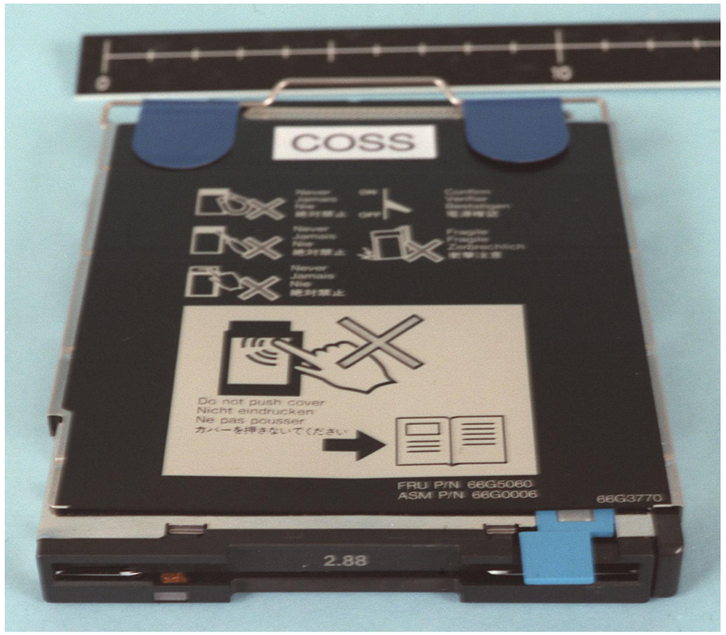
Principal Investigator:
Sean Kelly
NASA/JSC/DT
(281)244-7484

COSS HARD DRIVE

P/N: 29H8928
Qty: 2
Mass: .19 kg
Power: N/A
x,y,z: 11.5 x 7.2 x 1.4 cm
DID#: SLM46113628

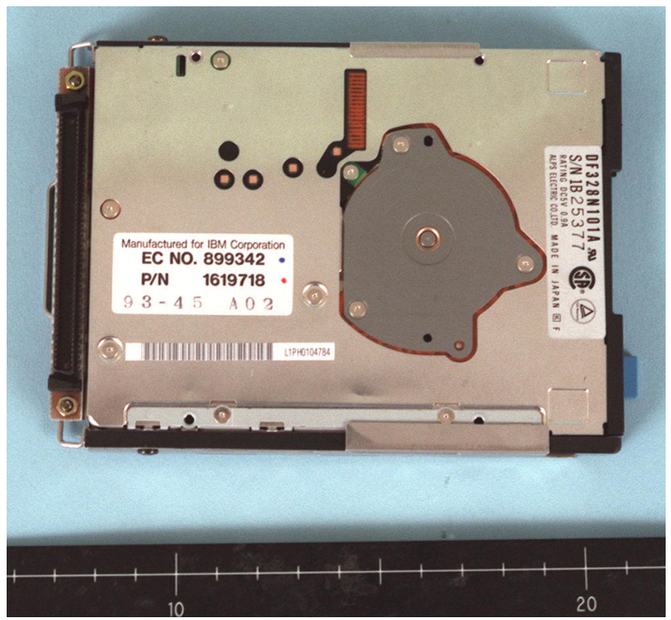
CD BOOK CASE

P/N: SDM46113803-701
Qty: 6 (subject to change)
Mass: .29 kg ea.
Power: N/A
x,y,z: 17.0 x 14.9 x 4.1 cm
Loc: Mir Core
DID#: SLM46113628



S96-18503

Figure OPS-33 Replaceable Floppy Drive for the COSS System



S96-18504

Figure OPS-34 COSS Replaceable Floppy Drive, Top

S96-18514

Figure OPS-36 SONY Discman, Side

S96-18501

Figure OPS-35 COSS Tapes

S96-18513

Figure OPS-37 SONY Discman, Opposite Side

S96-18512

Figure OPS-38 SONY Discman, Top

8mm VIDEO TAPE

P/N: SED33103757-303
Qty: 25
Mass: .08 kg ea.
Power: N/A
x,y,z: 10.2 x 6.8 x 2.0 cm
DID#: SLM46113628

COSS REPLACEABLE FLOPPY DISK (BLANK)

P/N: 1619718
Qty: 20
Mass: .44 kg
Power: N/A
x,y,z: 8.96 x 9.27 x 0.31 cm
DID#: SLM46113628

COSS REPLACEABLE FLOPPY DISK (RESTORE)

P/N: 1619718
Qty: 1
Mass: .02 kg
Power: N/A
x,y,z: 8.96 x 9.27 x 0.31 cm
DID#: SLM46113628

COSS REPLACEABLE FLOPPY DISK (SPINRITE)

P/N: 1619718
Qty: 1
Mass: .02 kg
Power: N/A
x,y,z: 8.96 x 9.27 x 0.31 cm
DID#: SLM46113628

Crew Utilization Printer System (CUPS)

HARDWARE DESCRIPTION

BUBBLE JET PRINTER

The Canon Bubble Jet Printer is a commercially available printer, model BJC-70, designed to provide printing capabilities for PC type computers. The printer has been modified by hard wiring a custom made power cable directly on to the circuit board, in order to provide a permanent connection. The boards, wires, and connectors inside the printer have also been conformally coated to meet Mir specifications. During use, the Printer will be secured to the module with Velcro located along the bottom of the printer. The Bubble Jet Printer power cable will mate with the Bubble Jet Power Supply J2 connector. The parallel data port will connect to the parallel printer data cable, which will connect to either the MIPS-2L laptop computer or the COSS laptop computer, which are both IBM 750C portable computers.

Electrical Characteristics

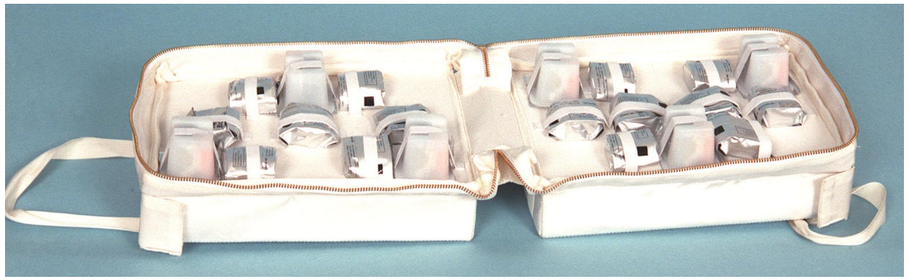
The Bubble Jet Printer receives electrical power from the BJPS. The printer requires 13.0 Vdc, and draws a maximum power consumption of 30 Watts while printing (5 Watts on stand-by), with a steady state current of 0.6 amps.

Data Interface Characteristics

The Bubble Jet Printer can be controlled by either the MIPS-2L or COSS laptop computers. These computer systems will have printer driver software installed on their hard drives, which will enable the computers to print documents and data from both DOS and Windows environments. The print command is sent from the computers, and the Bubble Jet Printer receives the print commands one line at a time in an 8-bit parallel data format over the Centrics type parallel data cable.

S96-13103

Figure OPS-39 CUPS Bubble Jet Printer Opened



S96-13104

Figure OPS-40 Printer Resupply Kit Showing 1 Ream of Paper

S96-13102

Figure OPS-41 CUPS Bubble Jet Printer

S96-13106

Figure OPS-42 CUPS Resupply Kit with Printer Cartridges

D.I.D.

Crew Utility Printer System

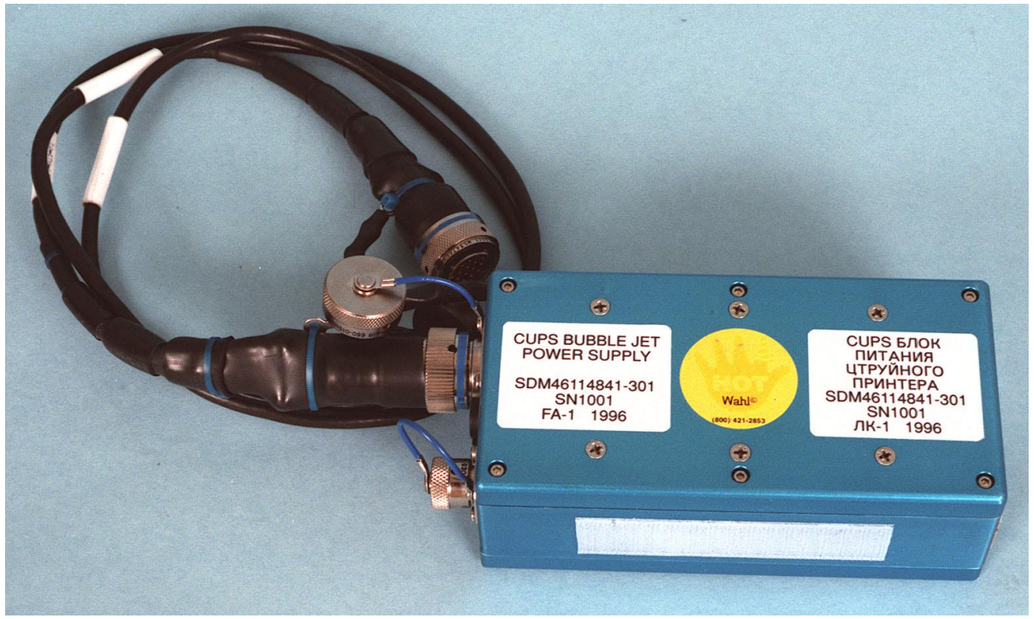
BUBBLE JET POWER SUPPLY (BJPS)

Mechanical Characteristics

The BJPS is a modified Camcorder Power Interface (CCPI) DC/DC Converter from Boeing. It has a power input connector (J1) and a power output connector (J2). During use, the BJPS is to be connected to the Mir module with Velcro located along the bottom of the BJPS.

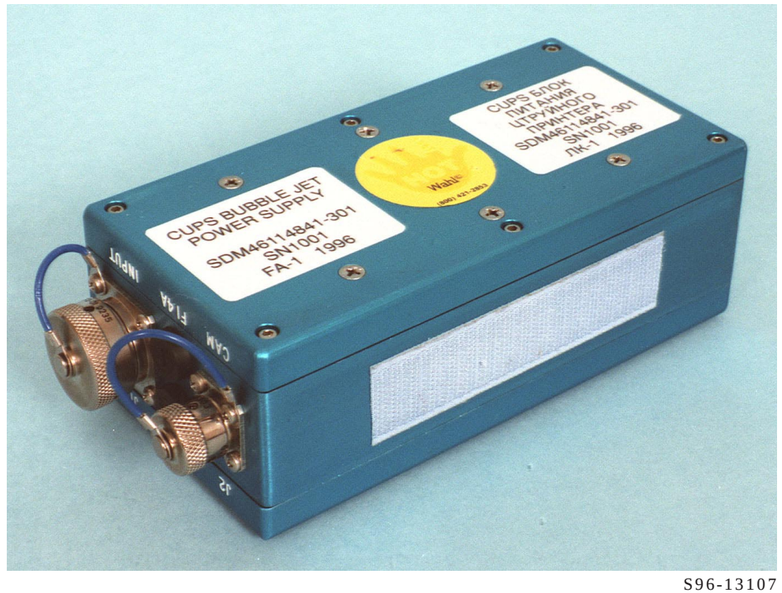
Electrical Characteristics

The BJPS provides power for the Bubble Jet Printer by receiving power from Payload Utility Panel (PUP) A, PUP B, or one of the module power outlets through the Camcorder power cable. The incoming power is at 23-32V DC. The BJPS has a 4-amp fuse for circuit protection. The BJPS steps the voltage down to 13.0V DC at the output connection (J2).



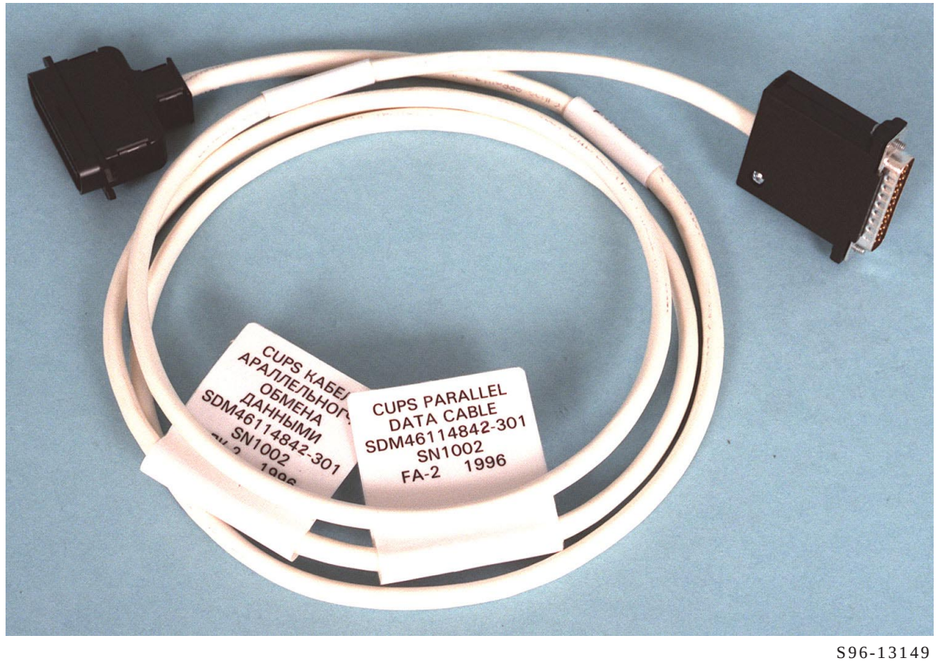
S96-13148

Figure OPS-44 CUPS Power Supply with Printer Power Cable Connector



S96-13107

Figure OPS-43 CUPS Data Cable



S96-13149

Figure OPS-45 CUPS Power Supply

PARALLEL DATA CABLE

The parallel data cable transfers data from the MIPS-2L or COSS computers to the Bubble Jet Printer. The Centrics type parallel data cable is 6 feet (1.83 meters) long. It connects between the parallel interface port on the back of the MIPS-2L or COSS portable computers and the parallel interface port on the back of the Bubble Jet Printer.

PRINTER ACCESSORIES KIT

The printer accessories kit bag holds 6 ink cartridges, 15 ink tanks, and 2 reams (500 sheets each) of paper.

HARDWARE TRANSFER

The CUPS was transported on Space Transportation System (STS)-81 and remains on Mir in Spektr.

Mir Interface to Payload Systems (MIPS)

HARDWARE DESCRIPTIONS

MIPS-1 SYSTEM

The MIPS-1 is no longer on Mir. The power supply burned out and the hardware was returned. The MIPS-1 provided Inter-Range Instrumentation Group (IRIG) time for experiments as well as download of experiment data and control of experiment hardware. The MIPS-1 provided data collection and timing control for the SAMS experiment. MIPS-1 also provided data collection and storage capabilities for other experiments on Mir.

An IBM ThinkPad laptop computer and docking station was used for interfacing to experiments that required data handling, data storage and processing software on the Mir.

MIPS-2 SYSTEM

The MIPS-2 System interfaces U.S. experiments with the Russian equipment on Mir. The MIPS-2 system consists of an I/O Controller Box (MIPS-2C), a MIPS-2L, and a Magneto-Optical Drive (MOD) storage unit Velcro-attached to the MIPS-2C. The MIPS-2C provides interfaces to the U.S. experiments that are similar to those available on Spacelab. The MIPS-2C interfaces with the Mir Telemetry Information System (TMS). Using the TMS interface, the Controller sends downlink data from the Magneto-Optical Disk (MOD) to the Mir Data System. The MIPS-2C is also capable of acquiring various parameters from the Mir Housekeeping system via the Environmental System Interface (ENV). The MIPS-2 system is used for directly acquiring and archiving data from different experiments as well as downloading experiment data from experiment hardware and archival on the MOD. The requirements for the MIPS-2C are based on experiments for the following disciplines: Cardiopulmonary, Neurosensory, Behavior and Performance, Radiation, Metabolic, and Microgravity.

The MIPS Controller is based on an Intel Single Board Computer (SBC). The SBC is used to control the various interfaces in the MIPS-2C. The MIPS-2C has a sheet metal chassis with various power and data connectors on the front panel. An internal power stack, Electromagnetic Interface (EMI) input filter, thermal cutoff switch and backup battery for the SBC memory are included in the chassis. A modified IBM 750C ThinkPad laptop computer (MIPS-2L) is connected to the MIPS-2C via the J1 RS-232 and J14 utility power connectors. This provides operator interface, data display, data download and data acquisition control. A Personal Computer Memory Card International Association (PCMCIA) PC hard drive is located on the right hand side of the chassis. The PC hard drive is used to load necessary information to the MIPS-2 system at power up.

MIPS-2C

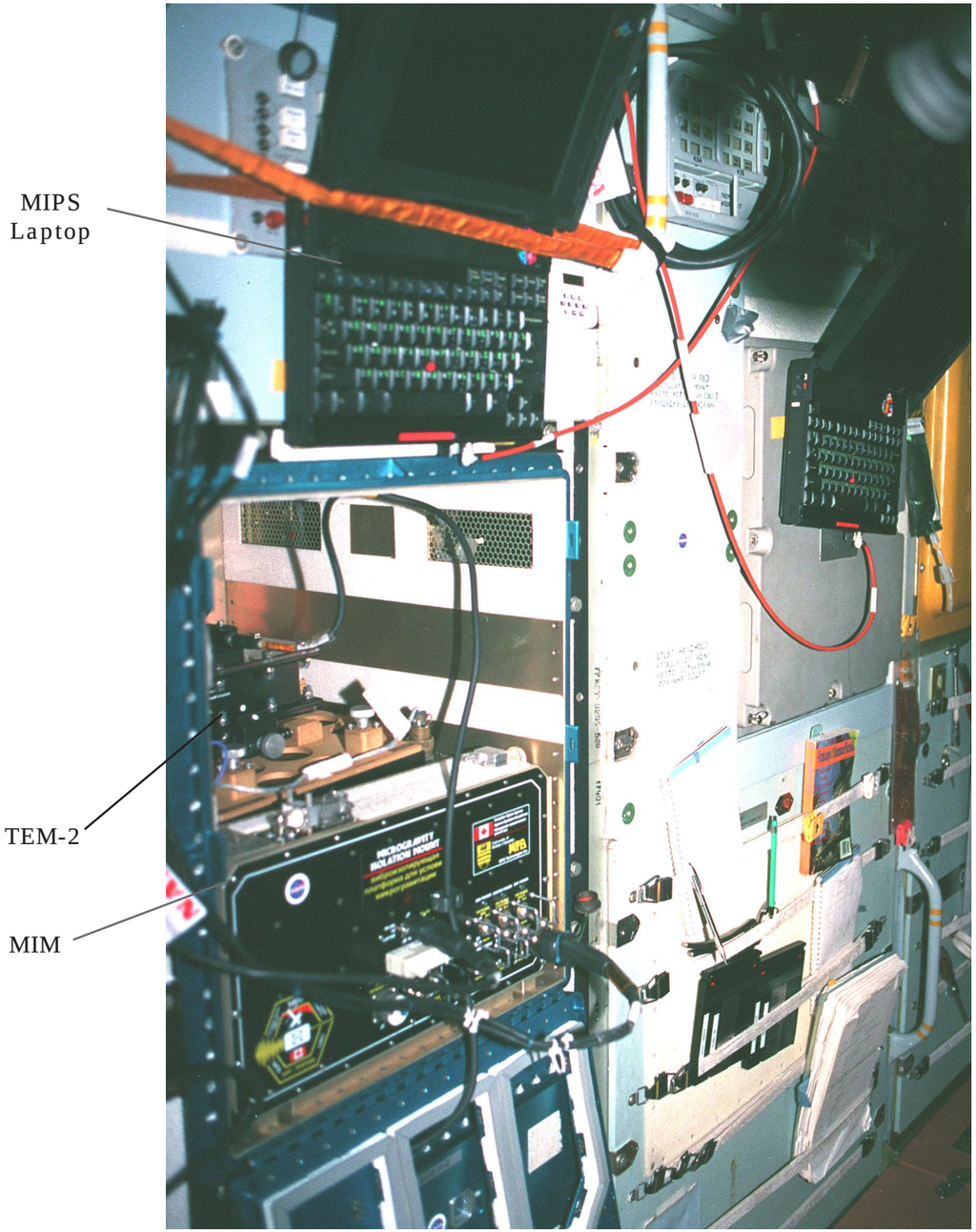
The MIPS-2C is a portable system (with restrictions) and is not permanently attached to any Core Module location. The MIPS-2C system is placed where it is needed by Velcro attachment to the sides of the Mir Core Module or Priroda Module.

MAGNETO OPTICAL DRIVE (MOD)

The MOD is a read/write optical drive with removable 1.2-gigabyte disk cartridges in a ruggedized enclosure. The MOD is connected to the MIPS-2C via the Small Computer System Interface (SCSI) connector (J5) and the J13 utility power connector on the MIPS-2C. The MOD is used for downlinking data and archiving experiment and housekeeping data from Mir.

MIPS-2L

The MIPS-2L is a modified IBM ThinkPad 750C laptop computer. The modification involves the Cyrillic engraving of the keys and the addition of a 28V DC to DC converter. The MIPS-2L, when used with the MIPS-2C, is connected through



NM21-384-016

Figure OPS-46 MIPS-2L Connected to the MIM

D.I.D.

Mir Interface to Payload Systems-2

POWER CABLE: MIPS-2C TP OPTICAL DISK DRIVE

P/N: SEM46110328-301
Qty: 1
Mass: .18 kg
Power: N/A
x, y, z: 107 x 15.2 x 2.8 cm

DATA CABLE: MIPS-2 TO OPTICAL DISK DRIVE

P/N: SEM46110327-301
Qty: 1
Mass: .47 kg
Power: N/A
x, y, z: 19.1 x 22.9 x 2.8 cm
Loc: Priroda, SIC3III-9

DATA CABLE: MIPS-2 TO LAPTOP COMPUTER

P/N: SEM46110325-301
Qty: 1
Mass: .30 kg
Power: N/A
x, y, z: 14.6 x 15.9 x 2.8 cm
Loc: Priroda, SIC3-III-9
DID# SLM46111327

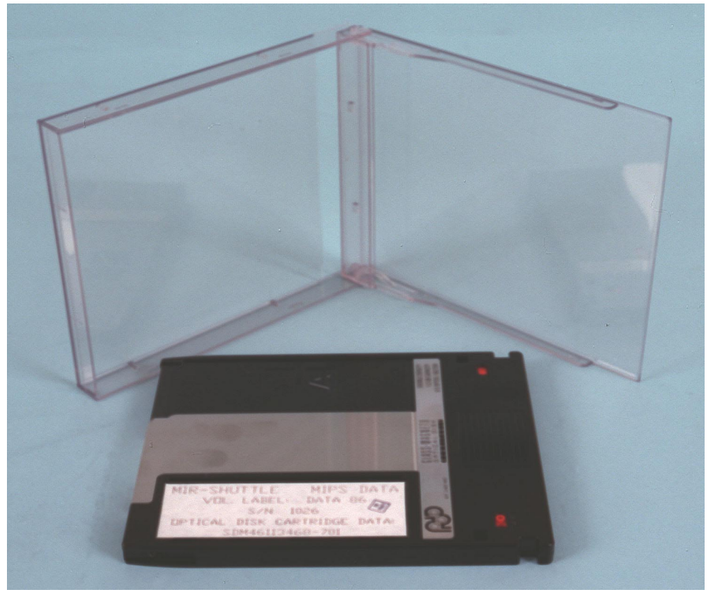
MIR-SHUTTLE MIPS-2L, LAPTOP COMPUTER, 1994

P/N: SDM46109796-301
Qty: 1
Mass: 3.5 kg
Power: 22 W
x, y, z: 30 x 22.2 x 5.1 cm
DID# SLM46109797

MIPS-2L HARD DRIVE

P/N: SDM46113465-709
Qty: 3
Mass: .208 kg
Power: 0
x, y, z: 11.7 x 7.5 x 1.9 cm
DID#: SLM46111327

the J1 RS-232 connector and the J14 utility power connector. The MIPS-2L is used to monitor and control the operation of the MIPS-2C. The MIPS-2L also serves as the command and control front end to numerous experiments. Many experiment-generated data files are first collected on the MIPS-2L then transferred through the MIPS-2C to the MOD, where the data is archived on removable optical disks.



S96-19760

Figure OPS-47 MIPS Optical Disk

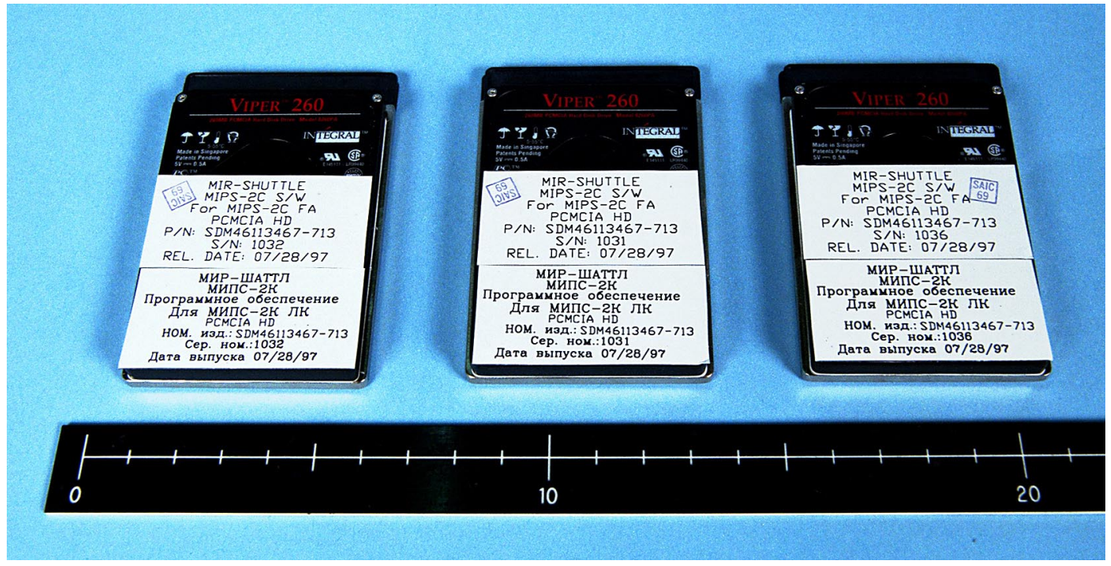


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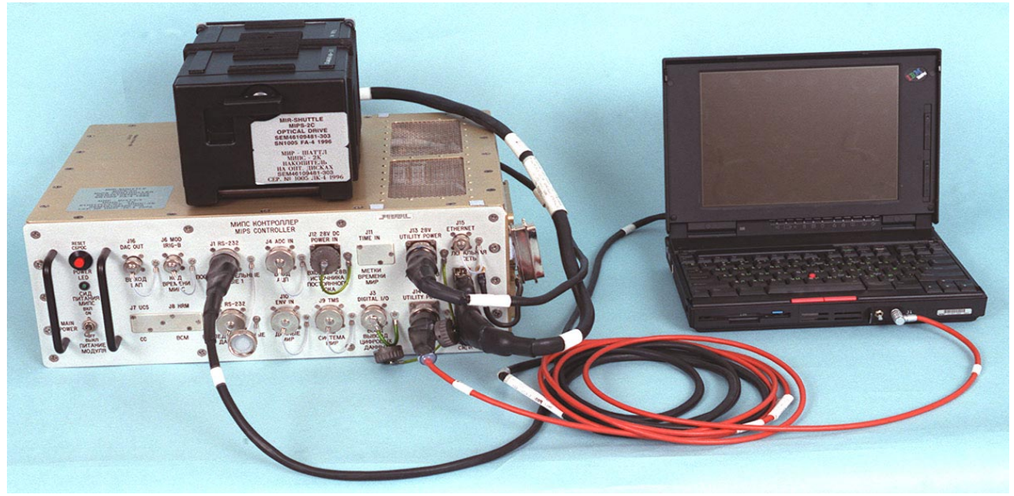
Figure OPS-48 MIPS PCMCIA Hard Drives



S96-12362

Figure OPS-49 MIPS-2 Controller, MIPS-2 Laptop, MIPS Optical Disk Drive Configuration

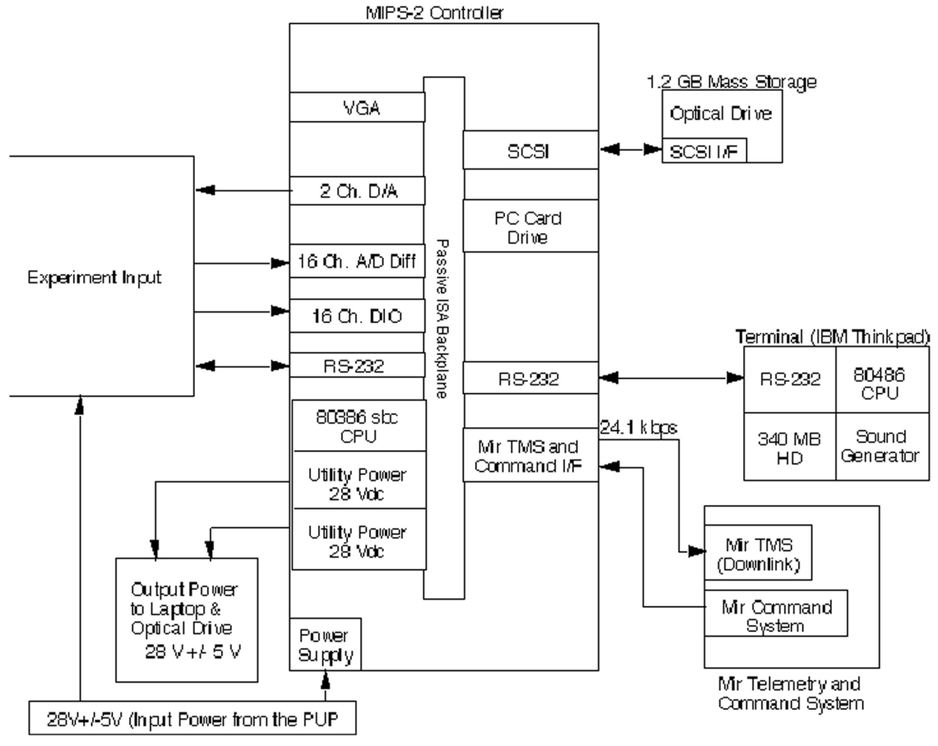


Figure OPS-50 MIPS Architecture

POWER CABLE: MIPS-2 CONTROLLER TO OPTICAL DISK

P/N: SEM46110328-301
Qty: 1
Mass: .26 kg
Power: N/A
x, y, z: 15.2 x 15.2 x 2.8 cm
Loc: Priroda, SIC3-III-9

PCMCIA CARDS

P/N: MIPS-2C S/W v1.3
Qty: 2
Mass: 0.12 kg
Power: N/A
x, y, z: 5.1 x 0.33 x 8.4 cm
Loc: Priroda, SIC3-III-9

MIPS CONTROLLER SOFTWARE

P/N: SDM46113467-717
Qty: 1
Mass: 0.16 kg
Power: N/A
x, y, z: 8.5 x 5.4 x 1 cm
Loc: Spektr

MIPS CONTROLLER SOFTWARE (PCMCIA HARD DRIVES)

P/N: SDM46113467-TBD
Qty: 4
Mass: 0.32 kg
Power: N/A
x, y, z: 5.4 x 1.04 x 8.5 cm
Loc: Spektr
DID#: SLM46111327

MIPS 2C CONTROLLER

P/N: SEM46109466-301
Qty: 1
Mass: 10.73 kg
Power: 75 W
x, y, z: 39.7 x ‘45.7 x 16.7 cm
Loc: Priroda, SIC3-III-8

MIPS-2 CONTROLLER

P/N: SEM46109466-305
Qty: 1
Mass: 10.73 kg
Power: 76 W
x, y, z: 45.7 x 39.7 x 16.7 cm

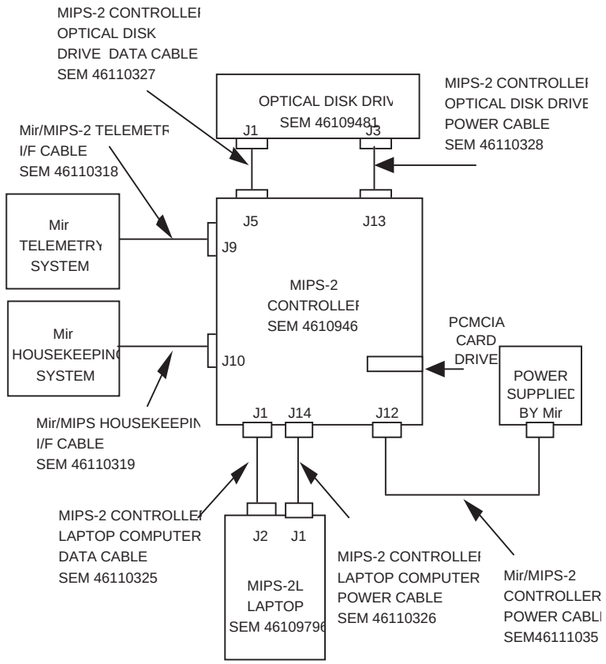


Figure OPS-51 MIPS-2 System Operational Block Diagram

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Figure OPS-52 MIPS PCMCIA Card Slot Location

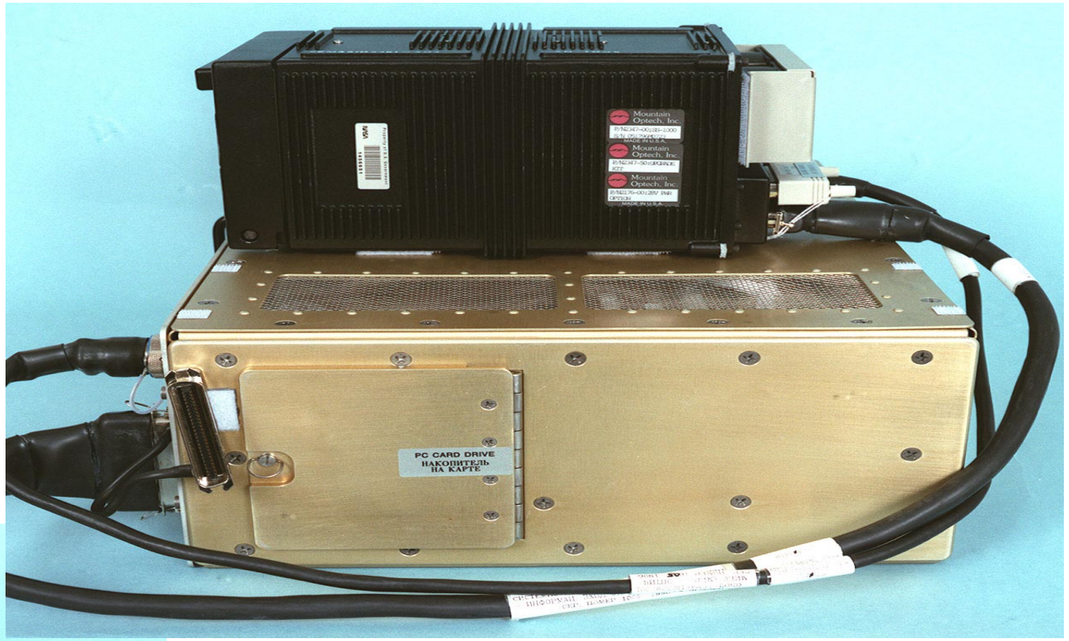

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Figure OPS-53 MIPS-2 Optical Drive and Controller

S95-20334

Figure OPS-54 MIPS-2 Controller and Optical Disk Drive

OPTICAL DISK DRIVE

P/N: SEM46109481-301
Qty: 1
Mass: 6.97 kg
Power: 42.5 W
x, y, z: 31.6 x 17.8 x 15.4 cm
Loc: Priroda, SIC3-III-9

OPTICAL DISK DRIVE

P/N: SEM46109481-302, 303
Qty: 2
Mass: 6.97 kg
Power: 42.5
x, y, z: 30.5 x 17.8 x 14.6 cm
DID#: SLM46111327

S96-12341

Figure OPS-55 MIPS ThinkPad with Keyboard Raised

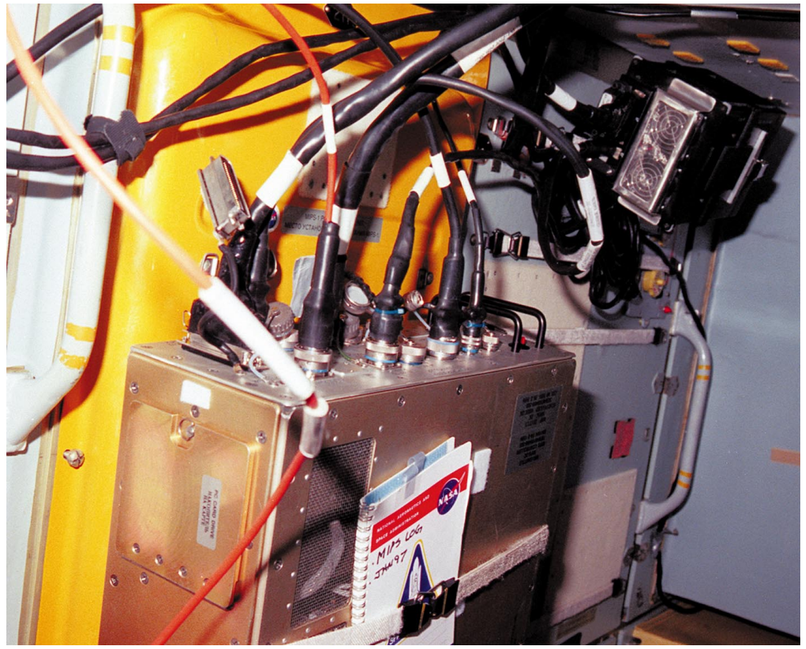

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Figure OPS-56 MIPS Controller in Priroda

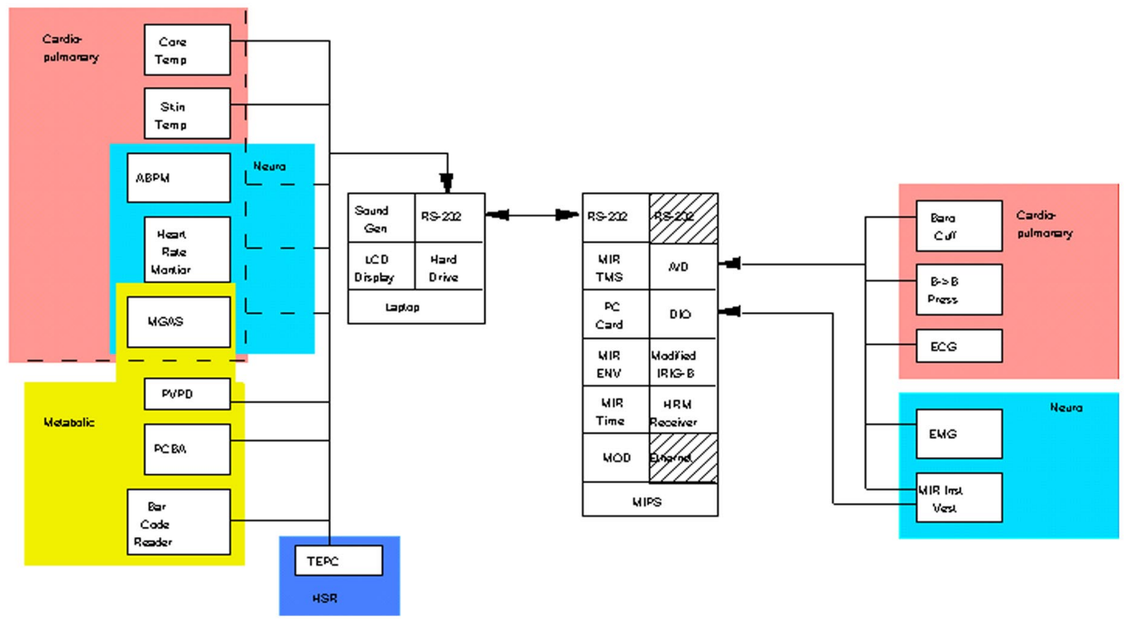

Figure OPS-57 MIPS-2/3 Architecture Block Diagram

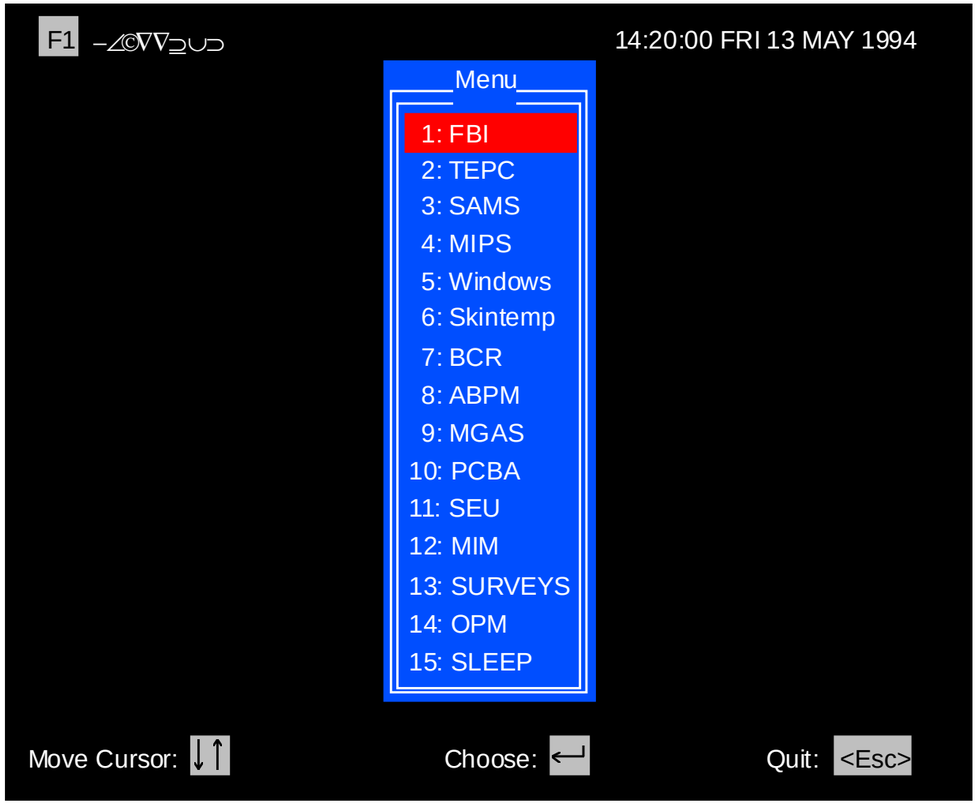

Figure OPS-58 MIPS Menu Screen

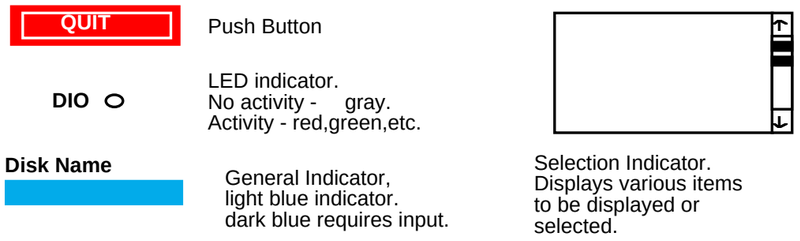

Figure OPS-59 MIPS Controller Software Selection Screen

NM23-018-36

Figure OPS-60 Mir Laptop Computer

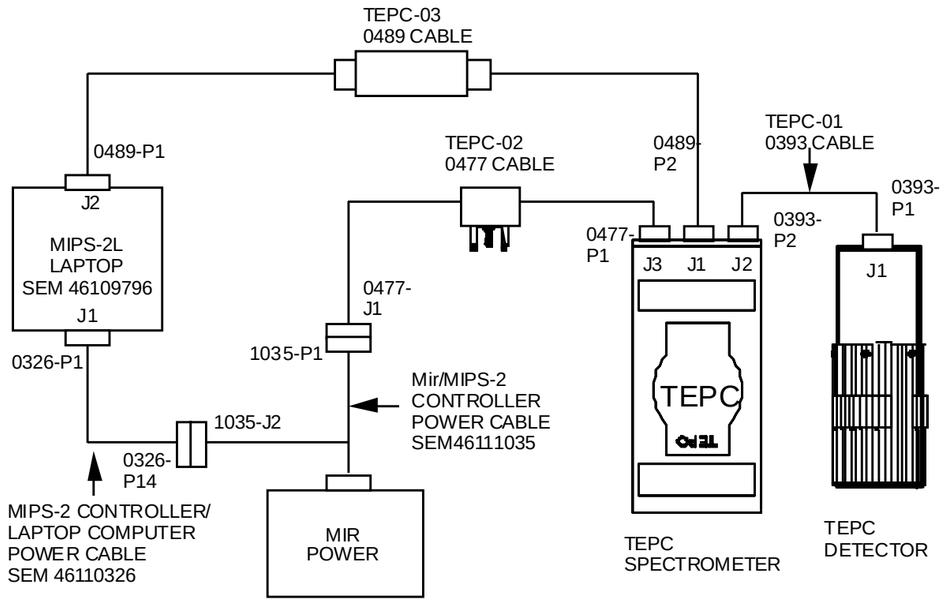

Figure OPS-61 MIPS-2 System with TEPC Hardware

TEPC: See SMP Radiation Monitoring

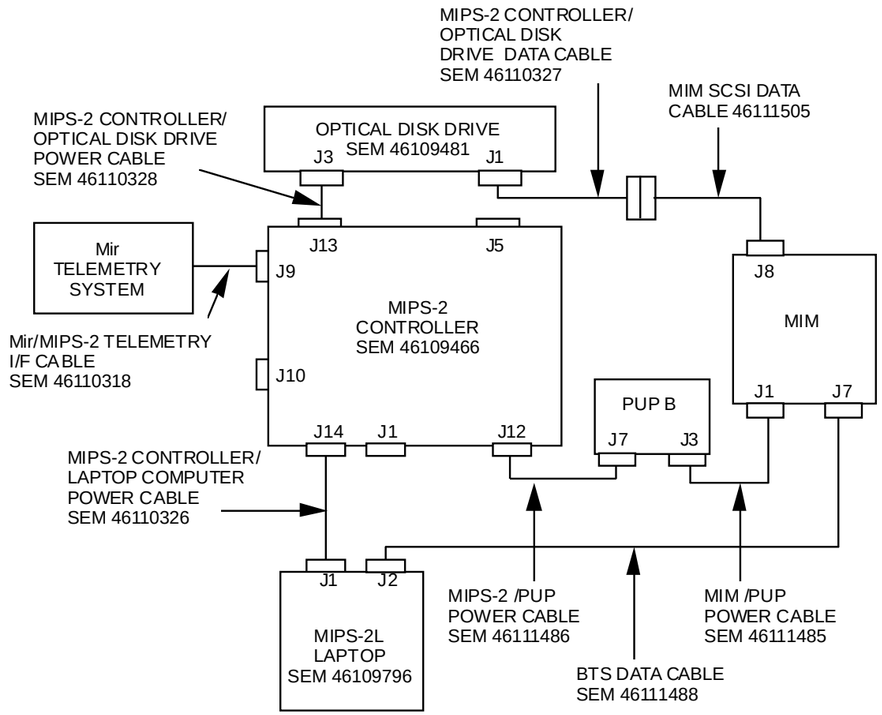

Figure OPS-63 MIPS-2 System with MIM Hardware

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Figure OPS-62 MIPS Hard Drives

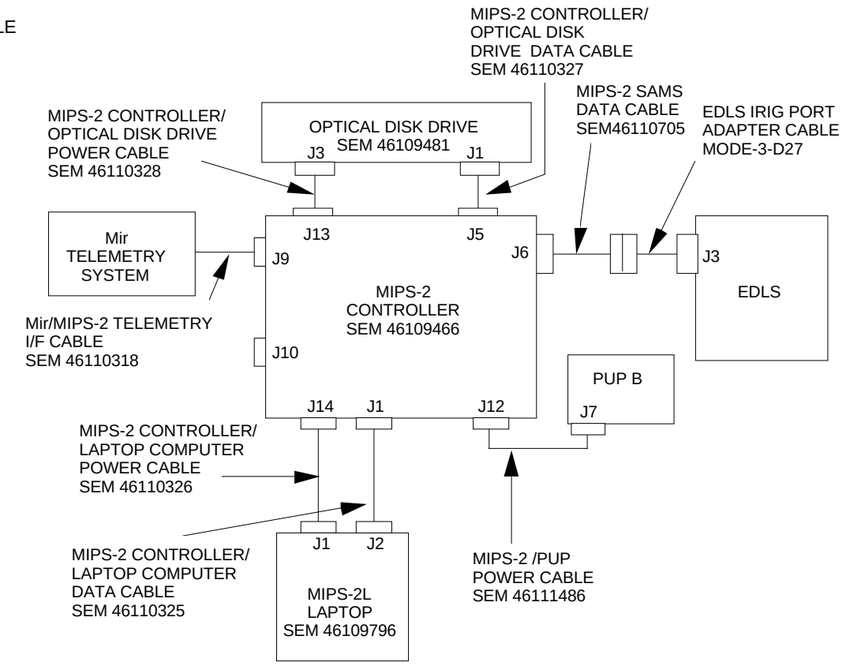

Figure OPS-64 MIPS-2 System with EDLS Hardware
(EDLS not activated during Increment 7)

PHOTO/VIDEO: CANON L2 CAMCORDER SYSTEM

HARDWARE DESCRIPTION

The camcorder system includes NASA-modified Commercial Off-The-Shelf (COTS) hardware and NASA/JSC-constructed video recording, physical interface, and power-supply components. All have been certified for flight by NASA and have been flown and utilized on numerous Space Shuttle missions. As part of NASA's Class I flight inventory, these components are routinely maintained and calibrated by qualified personnel to sustain their fligh-ready status.

The camcorder hardware consists of an Hi-8mm-format video camera and recorder, two lenses, a headset-to-monitor audio recording in the camcorder, a camcorder power interface (CCPI) and related cabling, and Hi-8mm video cassette tapes. Additionally, a multiuse bracket will connect to a multiuse clamp which fastens to an anchored surface in the spacecraft to hold the camcorder in a fixed position for extended photography sessions.

S97-10748

Figure OPS-65 Canon L2 Hardware That Went up on STS-86

CANON L2 CAMCORDER

The camcorder is a COTS Hi-band 8mm. Features include auto-focus, auto-exposure, power zoom, and macro focusing. This camera requires minimum illumination of 0.5 lux (using SLOW SHUTTER feature).

The camcorder system hardware interfaces electrically to the Payload Utility Panel (PUP) J10 in the Priroda Module and to 28V DC power outlets in other modules.

The camcorder interfaces physically to spacecraft handrails and other permanent devices with the use of the provided Multiuse Clamp and Bracket which, when assembled, attaches to a fixed location in the module.

TABLE OPS.2
CAMCORDER SYSTEM HARDWARE

HARDWARE	DESCRIPTION
Canon L2 Camcorder	SED33104772-302
3X Lens	SED33104774-301
15X Lens	SED33104773-301
L1A Microphone	SED33104775-301
CCPI	SED33104920-303
CCPI Fuse Kit	SED33105384-303
CCPI Power Cable	SEM46111797
CC Video/Power Cable	SED39122893-303
Hi-8mm Tapes	SED33103757-303
Camcorder Flight Bag	SED33102534-310
Multiuse Bracket	SED33104076-303
Multiuse Clamp	SED33104844-303
Headsets	MDR14L

Principal Investigator:
Glynda Robbins
Lockheed Martin
Photo, Video Operations Lead
(281)280-5852

TABLE OPS.3
CAMCORDER FLIGHT UNIT PROCEDURAL NOMENCLATURE

CAMCORDER NOMENCLATURE	SWITCH TYPE	FUNCTION	PROCEDURAL NOMENCLATURE
POWER	Momentary	Powers on/off camcorder.	POWER
STOP	Pushbutton	Ends the existing operation mode.	STOP
REC MODE	Pushbutton	From STOP mode activates Record/Pause mode.	REC MODE
PAUSE	Pushbutton	Pauses operation when pressed during Record or Play mode; resumes Record or Play operation when pressed again.	PAUSE
(not labeled) Big Red Button	Pushbutton	Same as PAUSE pushbutton.	START/STOP
REW	Pushbutton	Rewinds tape to beginning of cassette, or until STOP pb is pushed.	REWIND
PLAY	Pushbutton	Activates playback of tape.	PLAY
FF	Pushbutton	Advances tape forward at high speed to end of cassette, or until STOP pb is pushed.	FAST FORWARD
EJECT	Momentary	Activates cassette tape compartment door; approximately 5 second interval from operation of switch until door opens.	EJECT
BATT EJECT	Momentary	Releases latch in Power Source compartment to eject battery pack (training) or CCPI (inflight) .	BATT/EJECT
W/T	Momentary	Activates power zoom; W: Zoom to Wide angle FOV T: Zoom to Telephoto FOV (close-up).	WIDEANGLE/ TELEPHOTO WIDE ANGLE
W	Momentary	Activates Wide angle power zoom.	TELEPHOTO
T	Momentary	Activates Telephoto power zoom.	
ZOOMING	Lever	Rotates zooming ring manually.	ZOOMING RING
LEVER RING		Upward rotation zooms out to Wide angle FOV Downward rotation zooms out to Telephoto FOV.	
M (orange button on Zooming Ring)	Push and Hold	Accesses wide macro imagery focus range; used with “Manual” camera mode.	MACRO OR (M)
FOCUSING RING	Rotary	Adjusts image focus during manual operations; Camcorder is not to be operated manually, but only in AUTO setting, eliminating the need to use focusing ring. Focus will adjust constantly in Auto setting and should not be touched while camcorder is powered on.	FOCUSING RING
CAMERA MODE A/M		Toggle A: Activates fully automatic settings for focus, white balance, exposure, and shutter speed. M: Permits operator to control all settings; Camcorder is to be operated at all times in “A” setting, unless instructed otherwise in Photo/Video Checklist FDF.	CAMERA MODE A/M
FOCUS A/M	Pushbutton	Changes focus mode from auto to manual when Camera Mode A/M switch is set to M (manual); Autofocus zone box does not appear in viewfinder with manual mode activated.	FOCUS A/M

TABLE OPS.3
CAMCORDER FLIGHT UNIT PROCEDURAL NOMENCLATURE (CONCLUDED)

CAMCORDER NOMENCLATURE	SWITCH TYPE	FUNCTION	PROCEDURAL NOMENCLATURE
DIOPTER ADJUSTMENT RING (not labeled	Rotary	Adjusts diopter to operator eyesight correction. Rotate CW/CCW until displays in viewfinder are clearly visible.	DIOPTER ADJUSTMENT RING
DATE	Momentary	Displays Date and Time for recording. Display changes each time button is pressed; Press 1X: display Date only Press 2X: clear display Press 3X: display Time only Press 4X: clear display Press 5X: display Date and Time From 5X Date and Time display, press 1X to clear all display.	DATE
LENS RELEASE	Slide/Hold	Disengages attached lens from lens mount.	LENS RELEASE
TITLE/DATE	Momentary	Activates Date and Time displays for setting after lithium battery is changed; located in right-side compartment. With camcorder Power ON, Press and hold button for more than five seconds to display Date and Time in viewfinder; numerical year suffix will flash, prompting user for correct input.	TITLE/DATE
+	Momentary	Scans Date and Time data displays in ascending order. Press once to scan in single increments and repeat until desired data is displayed. Press and hold to scan quickly; release button when correct data displayed.	+
-	Momentary	Scans Date and Time data displays in descending order. Press once to scan in decreasing single increments and repeat until desired data is displayed. Press and hold to scan quickly; release button when correct data displayed.	-
SHIFT	Momentary	Sets selected data, advances prompt to next field.	SHIFT

S96-14151

Figure OPS-67 L2 Canon Camcorder

S96-14144

Figure OPS-66 Right-hand of the Camcorder

S96-14150

Figure OPS-68 L2 Canon Camcorder Back

S93-30214

Figure OPS-69 15X Lens

S93-30215

Figure OPS-71 Canon 15X Lens

S93-48951

Figure OPS-70 Camcorder 10X VAP Lens

S93-30216

Figure OPS-72 Canon 3X Lens

S93-25552

Figure OPS-73 3X Lens

3X AND 15X LENSES

The VL mount lenses attach to the camcorder body (in Power OFF mode only). The extra wide-angle 3X Zoom lens has a focal length of 5-15mm; the 15X Zoom lens and the 15X Zoom lens have macro-focus capabilities to allow richly detailed full-screen imagery of small subjects. This feature is useful in recording visual data of U.S. experiments on Mir, such as microbial sample growth, and crystal and cellular development.

TABLE OPS.4
CCPI 9 CONVERTER AND CABLING FLIGHT UNIT
PROCEDURAL NOMENCLATURE

CCPI AND CABLE NOMENCLATURE	FUNCTION	PROCEDURAL NOMENCLATURE
TEMPERATURE WARNING LABEL	Heat-sensitive safety marker warns crewmember that CCPI external temperature is warm to the touch.	TEMP WARNING LABEL
J1 CONNECTOR	Power input from 28Vdc.	J1
CCPI POWER CABLE	Interfaces with the CCPI J1 and the 28Vdc to supply payload power to the CCPI.	PRIRODA VIDEO CABLE (used in Priroda module) VIDEL CABLE 1 (used in other modules
J2 CONNECTOR	Power output to the camcorder.	J2
CC VIDEO/POWER CABLE	Interfaces with the camcorder and the CCPI J2; the CCPI converts payload power to the acceptable capacity of the camcorder and the converted power via the Video Cable 2.	VIDEO CABLE2
F1, 4A	Current overload protection.	FUSE F1
F2, 2A	Current overload protection.	FUSE F2

CCPI (CONVERTER), CCPI POWER CABLE (VIDEO CABLE 1 OR PRIRODA VIDEO CABLE), AND CC VIDEO/POWER CABLE (VIDEO CABLE 2)

The CCPI (the preferred nomenclature requested by Russian trainers has been agreed to be "Converter" in this document, both terminologies may be used interchangeably) converts the supplied 28V DC to the camcorder-required 7.5V DC. The CCPI connects to the PUP J10 or 28V DC outlet connector via the CCPI Power Cable (Priroda Video Cable or Video Cable 1) and to the camcorder via the CC Video/Power Cable (Video Cable 2).

The CC Video/Power Cable carries only power, and not a video signal, in this application. These are NASA-developed parts.

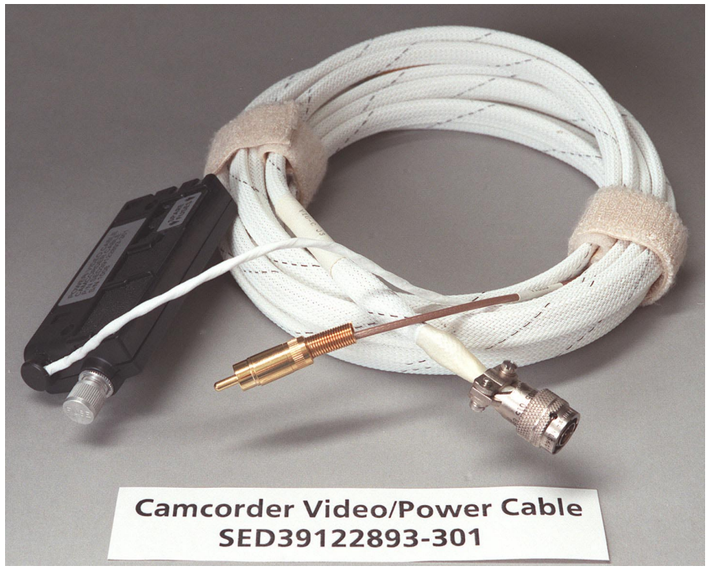

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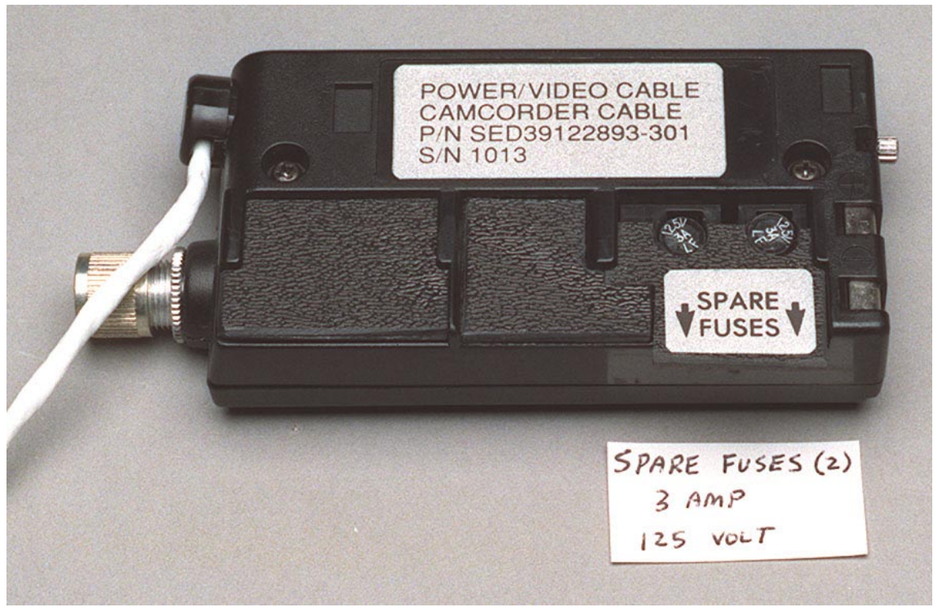
Figure OPS-74 Video/Power Cable



S93-30155

Figure OPS-75 Camcorder Video-Power Cable Box

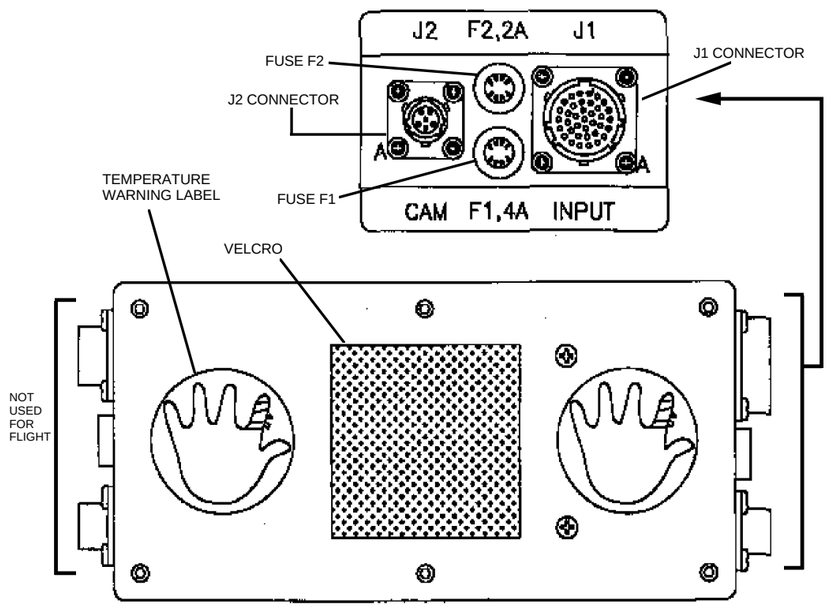


Figure OPS-76 CCPI (Connector)

MULTIUSE BRACKET AND CLAMP

The Bogen Multiuse Bracket and Multiuse Clamp are NASA-modified COTS devices designed to hold cameras in fixed locations inaccessible with a tripod or other anchoring device. The clamp fastens to handrails in the Priroda Module and the bracket connects to the clamp. The camcorder is equipped with a fitting that mates to a shoe at the end of the bracket. Once assembled and attached to the camcorder, the bracket and clamp assembly replicates the function and flexibility of a human arm, with the additional capability of locking its "shoulder," "elbow," and "wrist," holding a camera in a fixed position.

HI-8MM TAPES

The Hi-8mm videotape cassettes are the recording material used by the camcorder. A maximum of 2 hours can be recorded on each cassette.

LIA MICROPHONE

The Stereo/Zoom Microphone is operated by the camcorder power supply. It attaches to the camcorder with a pigtail cable which connects to the DC OUT and MIC terminals, and is secured with a thumbscrew. The camcorder power should always be off during microphone connect and disconnect ops.

The control switch and dial on the microphone are used to tailor the audio source configuration, and select between stereo and monaraul inputs. The angle can be adjusted for a center or wide source; recording sensitivity of near or distant sounds can also be modified.

HEADSET

The headset is a COTS Sony product, which connects to the headphone port on the camcorder. It is used to verify and monitor the audio signal as it is recorded on the videotape. ✳

TABLE OPS.5
MULTIUSE CLAMP FLIGHT UNIT
PROCEDURAL NOMENCLATURE

MULTIUSE CLAMP NOMENCLATURE	FUNCTION	PROCEDURAL NOMENCLATURE
BASE ASSEMBLY	Stationary jaw	BASE ASSEMBLY
ARM	Movable jaw	CLAMP ARM
CRANK HANDLE	Drives movable jaw to tighten or loosen.	CRANK HANDLE
BRACKET INTERFACE	Receptacle for Multiuse Bracket Joining Stud.	BRACKET INTERFACE
RELEASE PIN	Releases Joining Stud from Bracket Interface.	RELEASE PIN
KNOB	Tightens to secure Joining Stud into Bracket Interface; reverse to loosen stud before depressing Release Pin.	KNOB

TABLE OPS.6
MULTIUSE BRACKET FLIGHT UNIT
PROCEDURAL NOMENCLATURE

MULTIUSE BRACKET NOMENCLATURE	FUNCTION	PROCEDURAL NOMENCLATURE
JOINING STUD	Inserted into Bracket Interface to connect Multiuse Bracket to Multiuse Clamp; opposite end of Stud has ball interfaced to Stud Arm.	JOINING STUD
STUD ARM	Rigid extension from Joining Stud; has ball socket interfaced to ball on Joining Stud, allowing Stud Arm to adjust to any position or angle.	STUD ARM
MOUNT ARM	Rigid extension connected to Stud Arm by a pivot, allowing Mount Arm to rotate 360°; opposite end of Mount Arm has ball socket interfaced to Camera Mount Assembly ball.	MOUNT ARM
HANDLE	When tightened, locks all joints in their position.	LOCKING KNOB
CAMERA MOUNT ASSEMBLY	Camcorder or camera mounting interface assembly; ball interfaced to Mount Arm ball socket allows camcorder or camera adjustment to any position or angle.	CAMERA MOUNT ASSEMBLY
MOUNT ASSEMBLY SHOE	Mounting platform for camcorder or camera; a concealed spring device latches the camcorder or camera in place.	MOUNT ASSEMBLY SHOE
MOUNT ASSEMBLY BUTTON	Releases the spring latch on the Mount Assembly Shoe to allow camcorder or camera to be removed from Camera Mount Assembly.	MOUNT ASSEMBLY BUTTON

TABLE OPS.7
CAMCORDER/MICROPHONE AUDIO CONTROLS

CAMCORDER NOMENCLATURE	SWITCH TYPE	FUNCTION	PROCEDURAL NOMENCLATURE
MIC LEVEL A/M	Momentary	Selects Auto or Manual audio recording level adjustment; normally set to A (Auto).	MIC LEVEL A/M
REC LEVEL L/R	Rotary (2)	Adjusts (left/right) stereo microphone audio input level when manual audio recording level selected; observe audio level display at bottom of LCD to adjust settings (do not exceed < mark).	REC LEVEL L/R
ATT PUSH 20dB	Pushbutton	Counteracts loud audio source distortion; normally set to OFF (out).	MIC ATTENUATOR
PHONES LEVEL	Rotary	Adjusts volume to headphones used to monitor audio in record or record pause mode.	PHONES LEVEL
MICROPHONE STEREO/ZOOM	Slide	Selects sound recording function.	PROCEDURAL STEREO/ZOOM
TELE/WIDE	Rotary	Adjusts microphone range and distance sensitivity.	TELE/WIDE
MIC CORD		Connects to Camcorder power (DC OUT) and signal (MIC) terminals.	MIC CORD
MIC ATTACHMENT SCREW		Secures microphone in place after attachment to Camcorder Accessory Shoe.	MIC ATTACHMENT SCREW

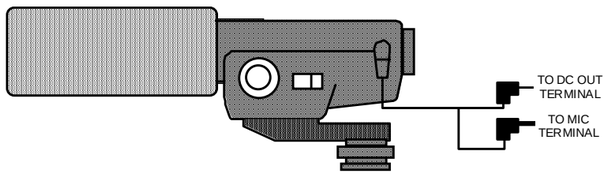


Figure OPS-77 L1A Microphone

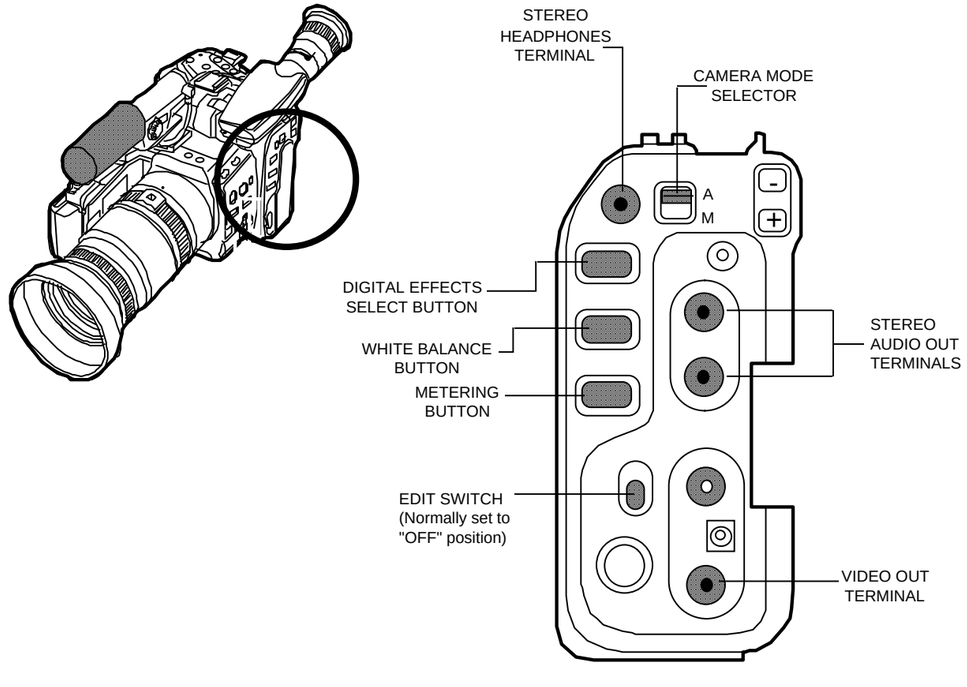


Figure OPS-78 Camcorder Center Panel — Left Compartment

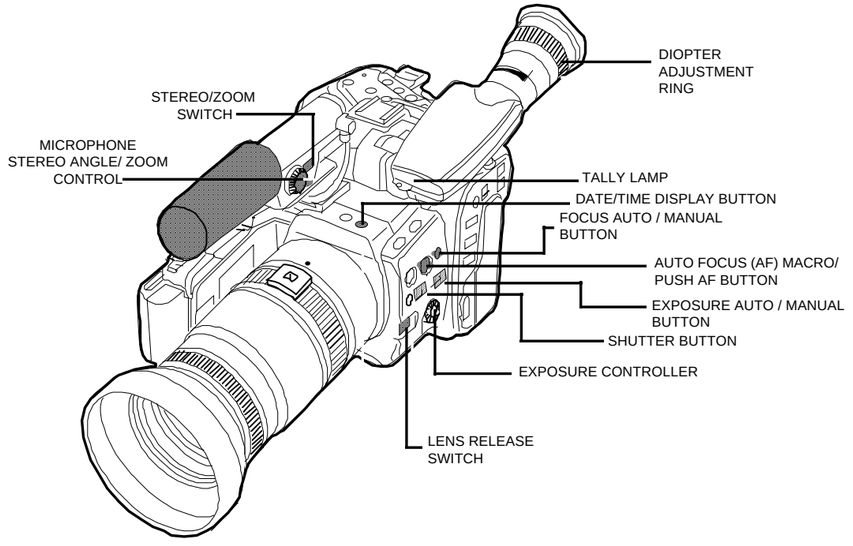


Figure OPS-79 Camcorder Control Panel

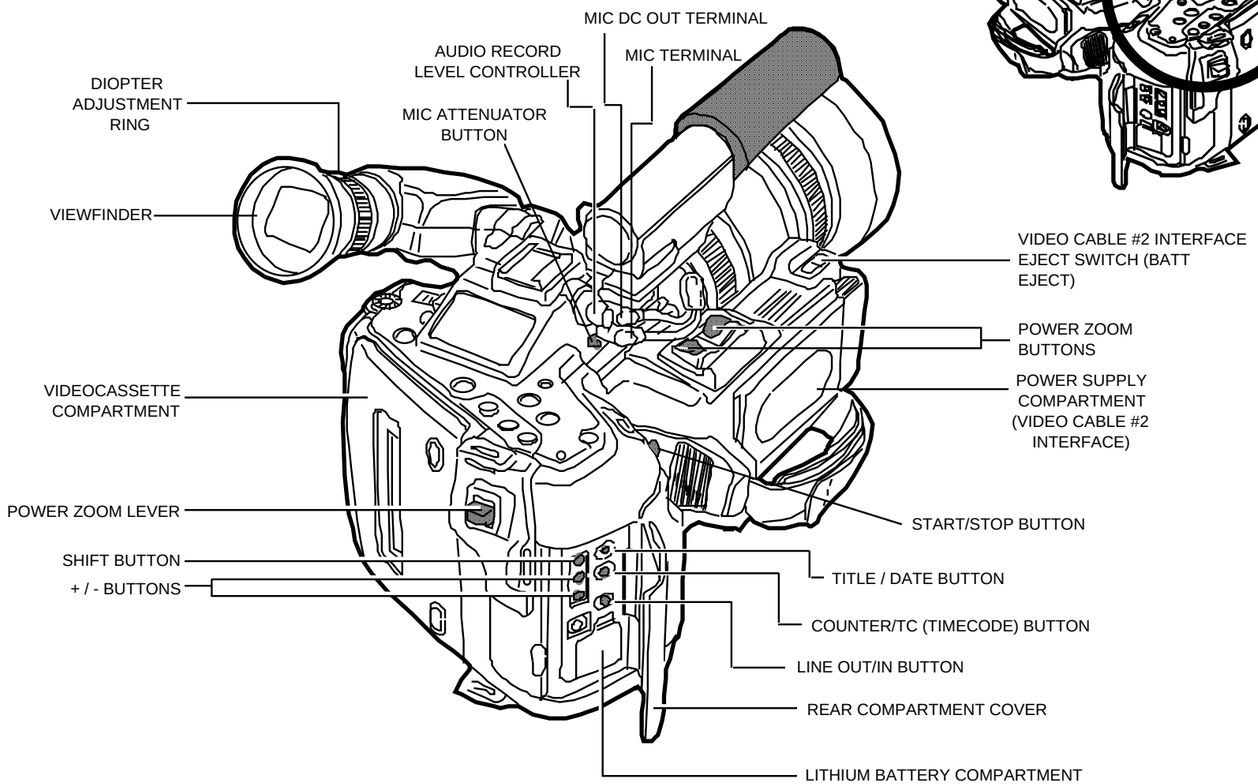


Figure OPS-80 Camcorder Control Panel

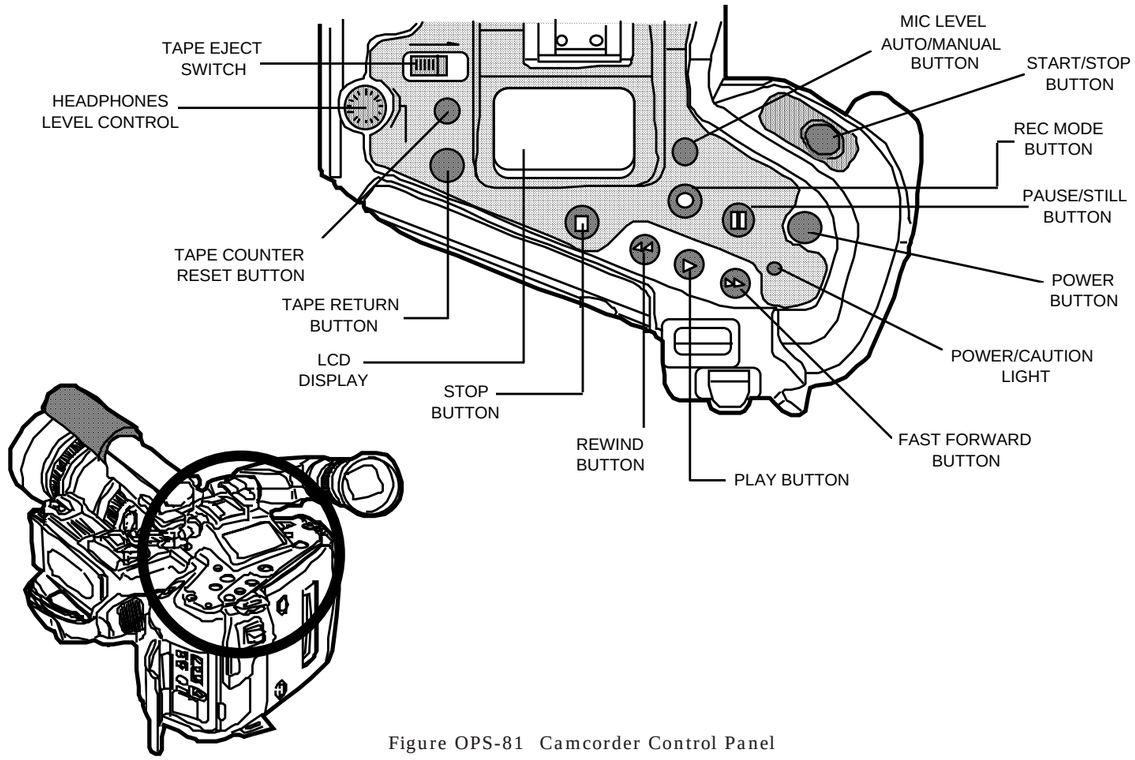
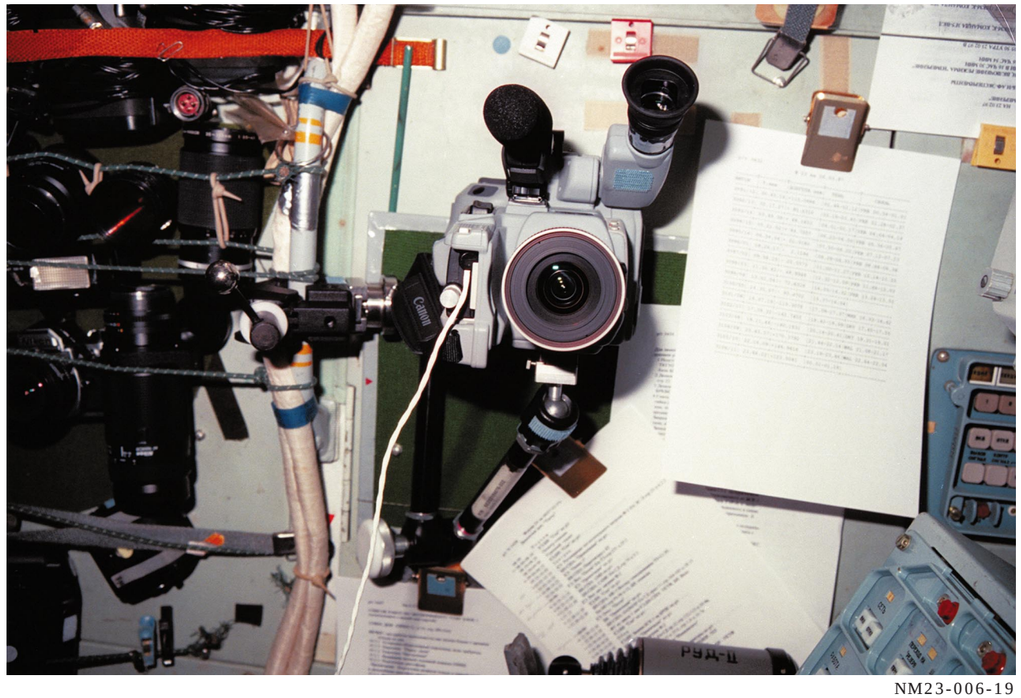


Figure OPS-81 Camcorder Control Panel



NM23-006-19

Figure OPS-82 Canon L2

STS81-306-10

Figure OPS-83 Camera Equipment in the Base Block

STS81-336-17

Figure OPS-84 Mir Main Core Module with Cameras

PHOTO/VIDEO: HASSELBLAD 70MM CAMERA

HARDWARE DESCRIPTION

The list below includes all of the hardware considered part of the NASA Hasselblad system:

- 70mm camera body
- 100mm f/3.5 lens
- 250mm f/5.6 lens
- Wratten 12 filter
- Remote ON/OFF switch
- Data Film magazine (5)
- Spotmeter
- Camera Stowage Bag
- Data Module Programming Unit
- Film Load/Download Bag
- 70mm Film Container (101)
- Tex Wipes
- Film — Color-Positive and Infra Red
- Spotmeter Battery, 6 V
- Battery, size AA, 1.5 V
- Battery, size N, 1.5 V

See Tables OPS.8 and OPS.9 for Hasselblad System Display and Control Nomenclature.

S87-43375

Figure OPS-85 Wratten 12 Filter

S95-04875

Figure OPS-86 70mm Hasselblad Bag Contents

TABLE OPS.8
HASSELBLAD LENS SPECIFICATIONS

Lens	Aperture Range (f/stop)*	Approximate Field of View (FOV)			Minimum Focus Distance	Weight (lb)	Filter Size
		Horizontal	Vertical	Diagonal			
100mm	f/3.5 - f/22	31°	31°	43°	3.0 ft	1.43	60mm
250mm	f/5.6 - f/45	13°	13°	18°	9.2 ft	2.28	60mm

*Detent at each half f/stop

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70MM CAMERA STOWAGE BAG/CONTENTS

P/N:	SED33102534-313
Qty:	1
Mass:	11.98 kg
Power:	0
x,y,z:	17.8 x 10.2 x 10.2 cm
Loc.:	Spektr

TABLE OPS.9
HASSELBLAD SPECIFICATIONS

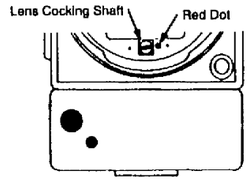
FILM WIDTH:	70mm
FILM IMAGE SIZE:	55mm by 55mm
FILM LOAD:	~95 exposures per Mag
EXPOSURE CONTROL:	Manual
SHUTTER SPEED:	1/500 sec to 1 sec plus B
FILM ADVANCE:	0 (Single) A (Auto) - Max 1 sec
BATT:	5 AA cells
BATT VOLTAGE:	7.5 V
BATT LIFETIME:	~1000 exposures
FUSE:	1.7A
BODY WEIGHT:	3.78 lbs
MAGAZINE WEIGHT W/FILM:	1.87 lbs

S93-30143

Figure OPS-87 Fully Assembled Camera

S93-30134

Figure OPS-88 Fully Assembled Hasselblad Left Side



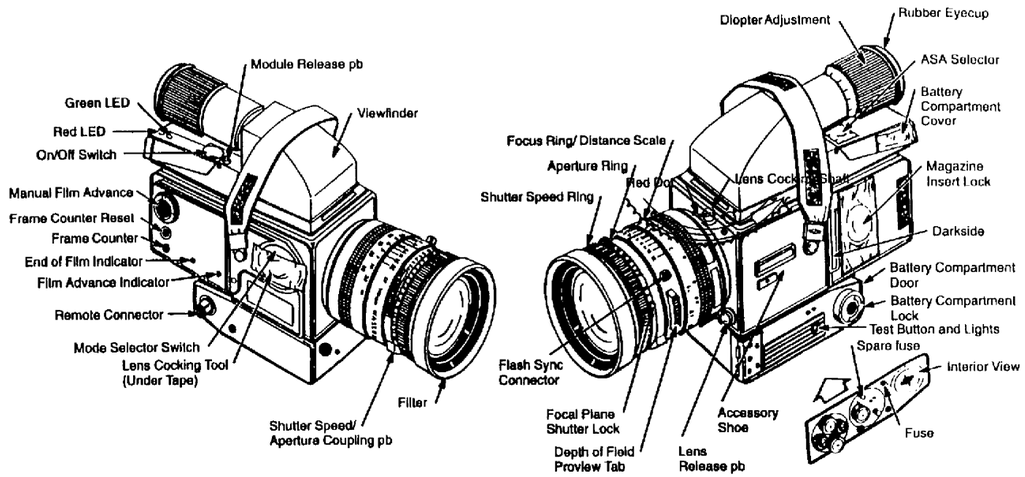
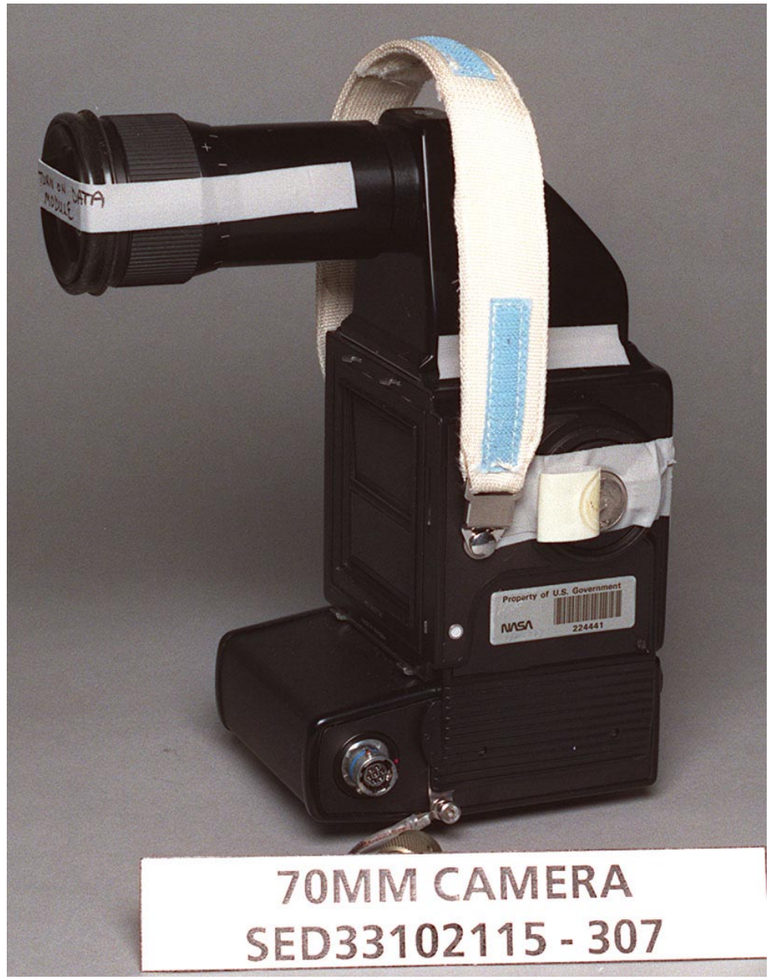


Figure OPS-89 Hasselblad System Display and Control Nomenclature



S93-30139

Figure OPS-90 Back of Hasselblad Camera Body

S93-46742

Figure OPS-91 Hasselblad Body Front View

S93-30137

Figure OPS-92 Front of Hasselblad Camera Body

S93-30117

Figure OPS-93 Hasselblad Battery and Fuse Location

S87-30216

Figure OPS-94 Data and Data Module Film Magazine for Hasselblad

S87-43384

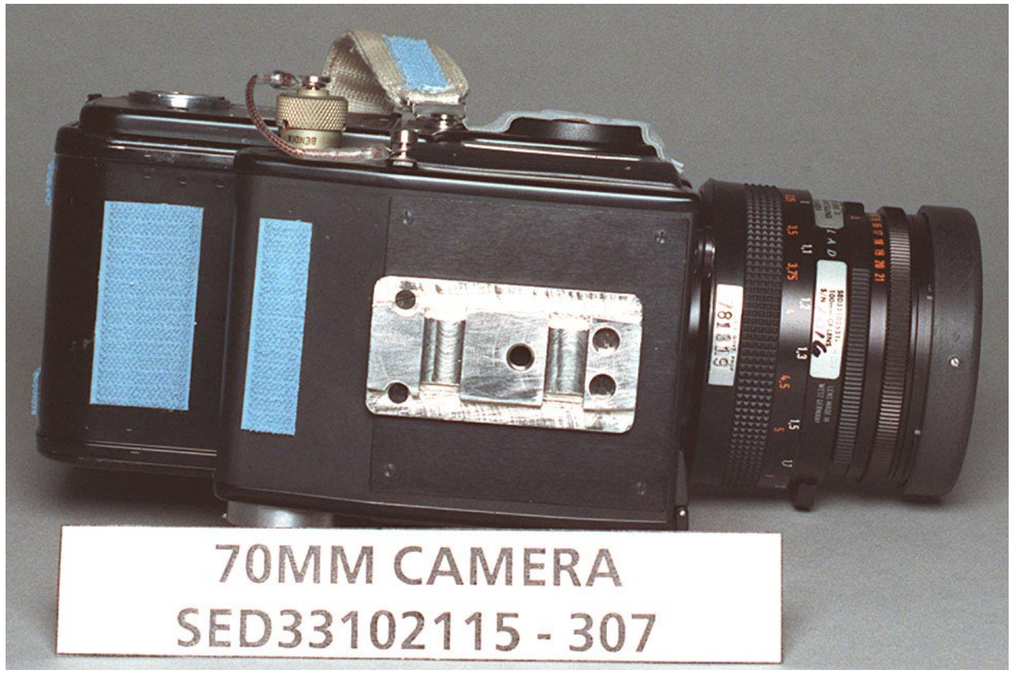
Figure OPS-96 Data Film Magazine Assembled

S93-30118

Figure OPS-97 Dark Slide

S93-30135

Figure OPS-95 Top of Hasselblad Body



S93-30136

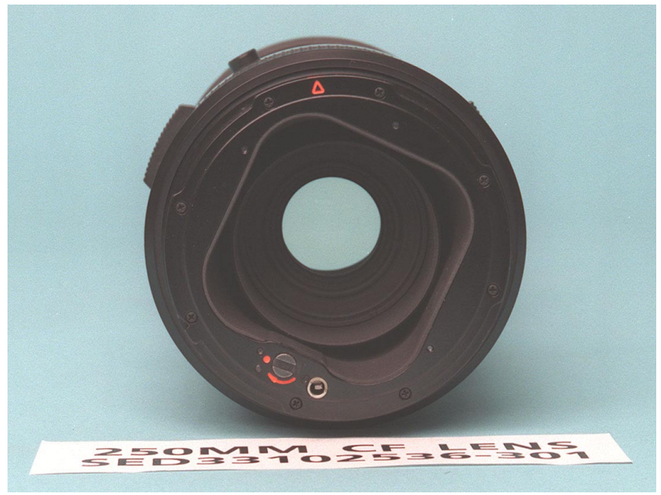
Figure OPS-98 Bottom of Hasselblad Body

S88-34676

Figure OPS-99 250mm CF Lens for the Hasselblad

S87-30213

Figure OPS-101 100mm Lens for Hasselblad



S87-30189

Figure OPS-103 250mm Lens Front View

S87-30208

Figure OPS-104 100mm Lens Front

S87-30189

Figure OPS-100 Spotmeter

S87-30291

Figure OPS-102 Remote On/Off Switch

PHOTO/VIDEO: NIKON F3 CAMERA SYSTEM

HARDWARE DESCRIPTION

35MM HARDWARE OVERWIEW

The 35mm Still Camera System hardware is used to support data and documentary photography of experiment ops sessions identified in the IPRD.

The flight and training hardware for the 35mm Still Camera System is listed in Table MG.10. The technical descriptions, including switch and control layout for the flight hardware, is listed in Tables MG.11 through MG.21.

There are no electrical interfaces for this hardware. The mechanical interface consists of a multiuse bracket and arm assembly included in the hardware complement, illustrated in the hardware complement photograph, and explained in the technical description.

The basic 35mm still photography system consists of a camera body with a permanently attached motor drive and interchangeable bayonet-mounted lenses. The motor drive automatically advances the film after each exposure is made. Preflight, a data back is attached for use during on-board photo sessions. The data back imprints information between each exposed film frame, including details of the time or date of each photograph. A flash attachment provides automatically adjusted additional lighting, when needed, to make adequately illuminated photographs. An intervalometer can operate the camera to make time-lapse exposures, when required. Extra batteries are included to power the flash, motor drive, and other systems. A stock of film to support photo requirements while withstanding the on-orbit environment is part of the photography system complement, and is replenished on each docking mission. Each lens possesses a unique capability of capturing each of the wide assortment of FOVs required by the experiments. Accessories

Figure OPS-105 35mm Bag Contents

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CAMERA FLIGHT BAG #1 (35MM)

P/N:	SED33102534-384
Qty:	1
Mass:	11.3 kg
Power:	0
x,y,z:	50.8 x 25.1 x 21.6 cm
Loc:	Priroda

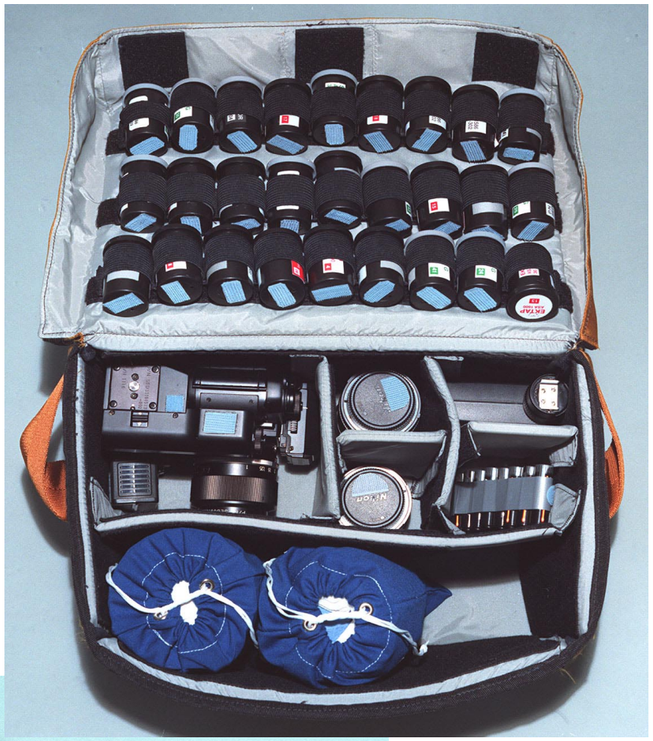
assist and enhance the capability of some of the lenses; disposable dry-wipe lens cloths are provided to maintain the condition of the lenses. The Return-To-Houston Bag is the receptacle for all exposed film rolls and recorded video cassettes; it is included in the Mir-Shuttle film transfer plan.

FLIGHT CAMERA BAG

The NASA-constructed padded Nomex-covered Flight Bag is configured for safe and proper stowage of the 35mm camera and accessories. The bag should always be utilized for any of the equipment not in use.

TABLE MG.10
35MM STILL CAMERA SYSTEM HARDWARE

Item	Part Number
F3 Camera Body	SED33101585-303
Data Back (Hr: Min:Sec)	SED33101588-304
28mm f/2.0 Lens	SED33101583-302
55mm f/2.8 Macro Lens	SED33101581-301
35-70mm f/3.5 Lens	SED33102540-301
105mm Lens	SED33101582-302
Camera Shroud	SED33103478-702
Shroud Adapter Ring	SED33103816-302
Extender PK13	SED33101581-002
35mm Cable	SED33102499-301
Intervalometer MT2	SED33102500-302
TTL Auto Flash Assembly	SED33102468-301
Flash Battery Container	SED33102467-301
AA Batteries	E91
Velvia CPos Film	Velvia-35mm
Lumiere Film	5046-35mm
Multiuse Bracket	SED33104076-303
Multiuse Clamp	SED33104844-303
Camera Flight Bag	SED33102534-310
Jettison Stowage Bag (RTH)	SEB13100134-304



S95-04978
Figure OPS-107 35mm Camera Bag Opened

Figure OPS-106 EVA 35mm F3 Camera with Thermal Cover Installed S96-13100

NIKON F3 CAMERA BODY

The Nikon F3 model Camera Body is a COTS 35mm single-lens reflex camera component. Some of the capabilities provided by the manufacturer, which have been determined to be counter-effective in spaceflight photography, have been eliminated. Other features have been enhanced to more greatly ensure proper performance. NASA modifications include a permanently-attached motor drive unit and a protective fuse in the battery-powered electrical system. When used with the lenses furnished, the camera can be used in its aperture-priority automatic exposure mode, which automatically adjusts film exposure and shutter speed controls, allowing the user to direct more attention to each picture's composition. In this way, meaningful photodocumentation including informative visual data can be executed and delivered as a lasting record of inflight events.

S93-46755

Figure OPS-108 Nikon F3 Camera with 28mm Lens (Front)

S93-46752

Figure OPS-109 Nikon F3 Camera (Back)

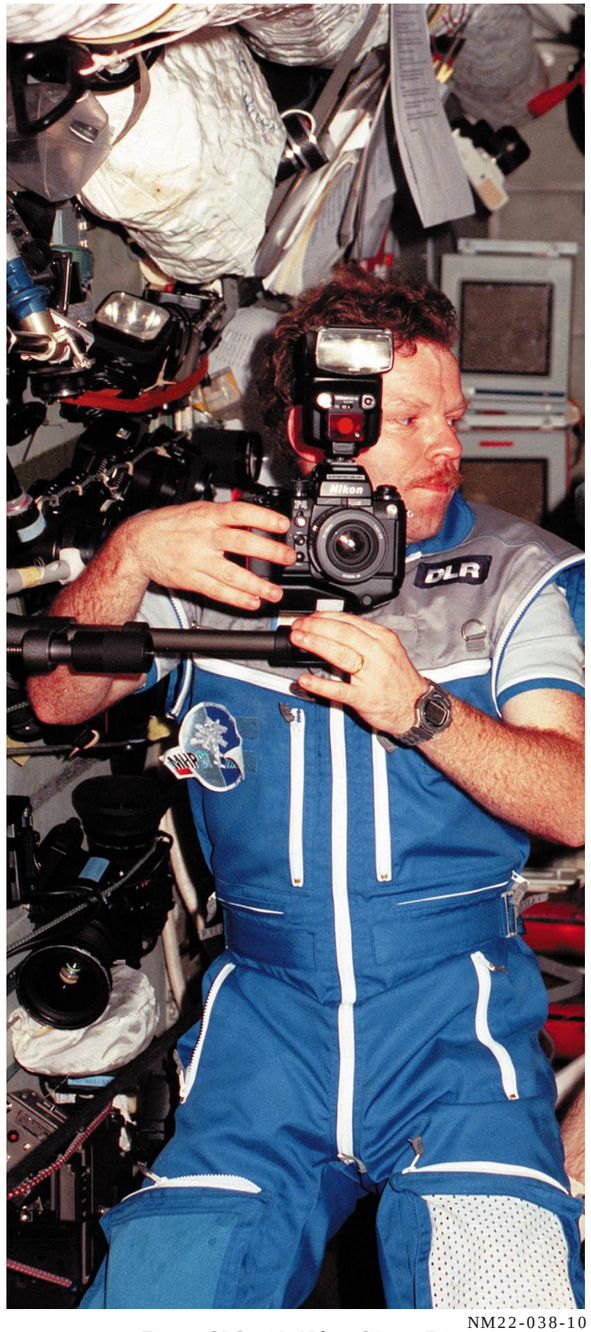
S93-46724

Figure OPS-110 35mm F3 Camera Top

TABLE MG.11
NIKON F3 SPECIFICATIONS

CAMERA BODY	FILM WIDTH: 35mm
	FILM IMAGE SIZE: 24mm by 36mm
	FILM LOAD: 36 exposures per roll
	EXPOSURE CONTROL: Auto (aperture priority), Manual
	METER PATTERN: Center weighted
	EXPOSURE COMP: ± 2EV in 1/3 EV step
SHUTTER	Auto 1/2000 through 30 sec (stepless)
	Manual 1/2000 through 8 sec (1 EV steps). Also B, T, X
	ASA SETTING: Manual – 12 – 6400 in 1/3 EV
FLASH	BATT: 4 AA
	BATT LIFETIME: ~4-8 rolls (varies w/ops)
	WEIGHT: .75 lbs
FILM ADVANCE SPEED	Single Continuous – 3.5 fps max
	BATT: 8 AA cells
	BATT VOLTAGE: 12 V
	BATT LIFETIME: ~140 rolls
	FUSE: 2A
BODY WEIGHT	3.15 lbs

S93-46725
Figure OPS-111 35mm F3 Nikon Camera Bottom



NM22-038-10
Figure OPS-112 Nikon 35mm F4

Figure OPS-113 Nikon F3 Side View S93-46764

TABLE MG.12
TECHNICAL DESCRIPTION — CAMERA BODY

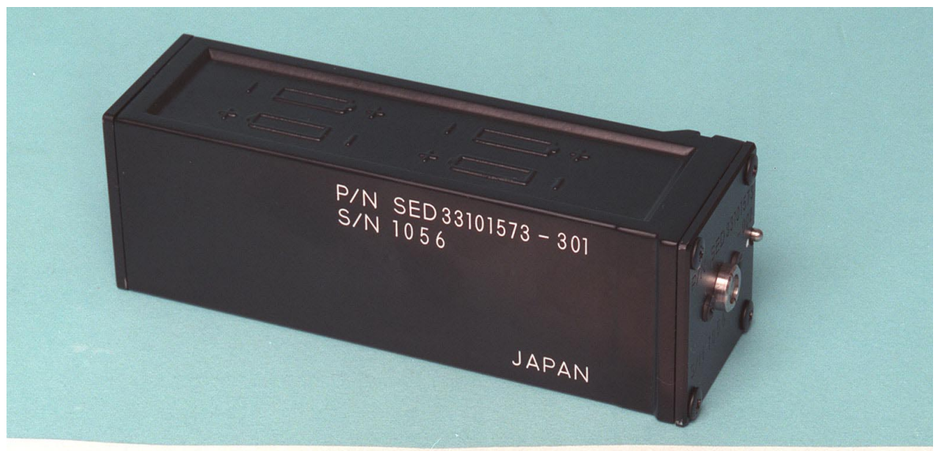
CAMERA BODY NOMENCLATURE	DEVICE TYPE	FUNCTION	PROCEDURAL NOMENCLATURE
LENS MOUNTING FLANGE	Physical Interface	Interfaces with lens rear to connect lens to camera body.	LENS MOUNTING FLANGE
LENS MOUNTING INDEX	Indicator	Reference indicator; line up lens Central Index (black dot) with Lens Mounting Index (white dot) before placing lens rear on Lens Mounting Flange, then twist lens CCW until it clicks into place.	LENS MOUNTING INDEX
LENS RELEASE PB	Push and Hold pb	Releases lens catch on camera body to permit removal of lens; depress pb while twisting lens CW, pull lens away from camera.	LENS RELEASE PB
REFLEX MIRROR	Optical Reflector	(Visible when no lens on camera) Permits user to observe the same FOV as will be recorded on the film; when the Shutter Release pb is activated, the Reflex Mirror rotates upward and the shutter opens, exposing the film to the image.	REFLEX MIRROR
BACKUP MECHANICAL RELEASE	Two-position lever	Trips shutter in event of battery failure; first position deploys mechanism, rotate away from lens to second position to trip shutter.	AUXILIARY SHUTTER RELEASE
SELF-TIMER LED	LED	Flashes with increasing frequency to indicate photograph is imminent when self-timer function activated (OBSCURED BY MOTOR DRIVE HANDGRIP).	SELF-TIMER LED
MIRROR LOCKUP LEVER	Lever	NOT USED — Locks Reflex Mirror in "up" position to reduce vibration during micro or super-telephoto photography.	MIRROR LOCKUP LEVER
VIEWFINDER ILLUMINATOR PB	Momentary pb	Adds illumination to viewfinder camera settings LCD; used in extremely low light settings. Exposure meter must first be activated for Viewfinder Illuminator to operate.	VIEWFINDER ILLUMINATOR
FILM REWIND CRANK	Fold-out Hand crank CW	Take up film slack after loading new film roll; used to manually rewind exposed film into canister in event of motor drive failure. Also used to verify camera is loaded with film: gently turn crank CW 2-3 turns; knob tension indicates film in camera.	FILM REWIND KNOB
ACCESSORY FOOT	Electronic Interface	Relays exposure data between flash unit and camera to set correct exposure/flash output.	ACCESSORY FOOT

TABLE MG.12
TECHNICAL DESCRIPTION — CAMERA BODY (CONCLUDED)

CAMERA BODY NOMENCLATURE	DEVICE TYPE	FUNCTION	PROCEDURAL NOMENCLATURE
EXPOSURE COMPENSATION CONTROLS	Dial	NOT USED — Sets film speed bias to correct exposure; dial should ALWAYS be set at "0"	EXPOSURE COMP DIAL
ASA/ISO FILM-SPEED DIAL	Lift-and-Turn Dial	ASA/ISO is a numerical rating of the light sensitivity of film; when loading each new film roll, verify the ASA Dial setting is the same as ASA number on film roll cartridge.	FILM-SPEED DIAL
CAMERA BACK LOCK	Lever	Releases Camera Back latch when lever is moved to right; lift Film Rewind Knob while moving lever in direction of arrow.	CAMERA BACK LOCK LEVER
VIEWFINDER EYEPIECE	Optical Sight	Window through which photographer observes and adjusts FOV and exposure data.	VIEWFINDER
EYEPIECE SHUTTER LEVER	Lever	Prevents stray light from entering camera through eyepiece and interfering with auto exposure meter reading; rotate lever ccw to close shutter and deploy a red blind in eyepiece to indicate Eyepiece Shutter in use.	VIEWFINDER SHUTTER LEVER
SHUTTER-SPEED DIAL	Dial	Controls setting at which shutter opens and closes to make each exposure; selectable numerals/modes shown on Shutter-speed scale on top of dial; locking button in center of dial must be depressed as dial is rotated from "A" (automatic shutter speed selection) setting. Setting "A" is recommended for all photography unless otherwise specified.	SHUTTER-SPEED DIAL
SHUTTER-SPEED INDEX	Indicator	Reference point for Shutter-speed dial setting.	SHUTTER-SPEED INDEX
SELF-TIMER LEVER/INDEX	Indicator	Move lever to engage Self-timer mode; red dot (index) exposed indicates Self-timer mode activated. Shutter Release pb depressed in this mode provides a 10-second delay before exposure made; red blinking LED on camera front warns to prepare for exposure.	SELF-TIMER LEVER
SHUTTER RELEASE PB	Momentary pb	Activates exposure meter when depressed halfway; electronically releases shutter to expose film frame.	SHUTTER RELEASE PB
FILM ADVANCE	Lever	Transports exposed film to next unexposed frame; rotate lever 140° to advance film completely.	FILM ADVANCE LEVER
FRAME COUNTER	Gear-driven Counter	Indicates number of exposed frames on film roll in camera; automatically resets when camera back is opened.	FRAME COUNTER
VIEWFINDER MOUNTING/RELEASE PB	Push-and-Hold pb	NOT USED — Releases interchangeable viewfinder.	VIEWFINDER MOUNTING/RELEASE PB

MOTOR DRIVE

Attached preflight to the base of the camera body, the NASA-modified Motor Drive is used to rapidly advance film to the next frame after each exposure (approximately four frames per second in Continuous, or “C,” mode). Useful features of the motor drive include a subtractive counter and reset, and a mode-selectable shutter release button. The button also activates the camera’s metering system when depressed halfway.



S87-30449

Figure OPS-114 Nikon Camera Motor Drive Battery Pack

TABLE MG.13
TECHNICAL DESCRIPTION — MOTOR DRIVE

MOTOR DRIVE NOMENCLATURE	DEVICE TYPE	FUNCTION	PROCEDURAL NOMENCLATURE
BATTERY CHECK PB	Momentary pb	Activates LEDs to indicate battery condition.	BATT CHECK PB
LED INDICATORS	Indicator Lights	Red LED: Film roll ended; motor drive counter at "0," needs resetting; replace all Motor Drive batteries. Red and Green LEDs: Battery charge OK. No LEDs: Replace all Motor Drive batteries.	LED INDICATORS (RED and GREEN)
FRAME COUNTER	Subtractive Counting Index	Indicates remaining film exposures; set at "41" when loading new film roll.	FRAME COUNTER
COUNTER SETTING DIAL	Dial	Positions correct starting number for new film roll.	FRAME COUNTER DIAL
REWIND SLIDE	Slide Switch	Disengages film advance clutch to permit manual rewind of exposed film into canister; orange dot exposed when rewind mode activated. Failure to deact Rewind Switch at completion of rewind will exhaust motor drive batteries.	REWIND SWITCH
RESET PB	Momentary pb	At completion of film rewind, press to return Rewind Slide to "off" position, concealing orange dot. ÃReset before loading new film roll.	RESET PB
TRIGGER BUTTON	Momentary pb	Activates shutter release; camera meter switch activator when depressed halfway (automatic deact after 16 seconds).	TRIGGER BUTTON
MODE SELECTOR RING	Lift-and-Turn Dial	Sets motor drive Trigger Button for Single frame (S) or Continuous operation (C); position (L) will disable, or Lock, the Motor Drive.	TRIGGER BUTTON SELECTOR RING
HANDGRIP	Handgrip	Allows user to firmly grip camera and access necessary controls.	HANDGRIP
BATTERY CHAMBER	Container	Holds 8 AA-size batteries in a magazine.	BATTERY CHAMBER
BATTERY MAGAZINE RELEASE LATCH	Momentary Slide pb	Releases Battery Chamber magazine.	BATTERY RELEASE LATCH
BATTERY MAGAZINE	Cartridge	Self-contained battery cartridge.	BATTERY MAGAZINE
BATTERY MAGAZINE INDEX	Indicator	White dot indicating correct orientation of magazine for insertion into Battery Chamber; white dot should be positioned adjacent to Release Latch white dot, then pushed into chamber until latch clicks into place.	BATTERY MAGAZINE INDEX

INTERVALOMETER MT2

The NASA-modified Intervalometer is used to activate the shutter at operator-set time intervals when time-lapse photography is desired.

35MM CABLE

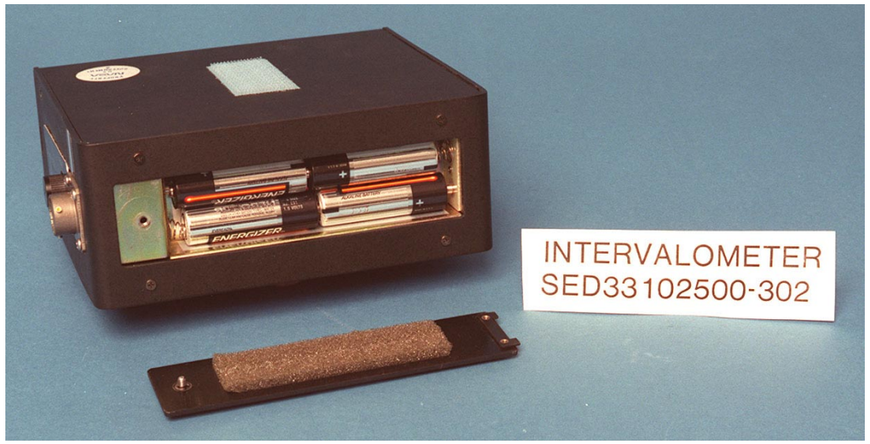
The NASA-built 35mm Cable connects between the Intervalometer and the camera motor drive, activating the shutter release upon pulse command from the Intervalometer.

S88-34622

Figure OPS-115 Intervalometer Front View

S88-34625

Figure OPS-116 Intervalometer Side View



S88-34624

Figure OPS-117 Intervalometer Battery Compartment

S87-30417

Figure OPS-118 Nikon Shutter Cable Release

S87-30441

Figure OPS-119 Intervalometer Cable

DATA BACK (HR: MIN:SEC)

The COTS Data Back is installed on the back of the camera body preflight, replacing the standard film compartment cover. With the PRINT mode activated from an LCD menu, data indicating details of the time or date of each photograph is conveyed via light-emitting electrodes and imprinted between frames of film. The Data Back is battery powered. Table MG.14 contains the Data Back technical descriptions.

TABLE MG.14
TECHNICAL DESCRIPTION — DATA BACK

DATA BACK NOMENCLATURE	DEVICE TYPE	FUNCTION	PROCEDURAL NOMENCLATURE
LCD	Display	Indicates Data Back settings, status, and modes, counts exposed film frames.	DATA BACK LCD
HINGED PANEL	Cover	Conceals Data Back control buttons. See Note A.	HINGED PANEL
ISO	Momentary pb	Toggles ASA/ISO setting through Low (L), Medium (M), and High (H) film speeds See Note B.	ISO PB
ADJUST	Momentary pb	Numerically ascending toggle sets date, time, or exposed film frames. To set higher number, press pb momentarily; push and hold more than three seconds to advance in increments of 5. Exposed frames display will reset to -2 when the camera back is opened to reload film. See Note C.	ADJUST PB
No. RESET/SELECT	Momentary pb	Toggles through each displayed field to permit data reset; used with ADJUST pb.	No. RESET/SELECT PB
MODE	Momentary pb	Changes display mode; selections are date (yy/mm/dd), day/time (dd/hr:min).	MODE PB
PRINT	Momentary pb	Press pb to display "PRINT" on LCD, data will imprint outside frame of photograph.	PRINT PB
BATTERY ACCESS PANEL SCREW	Fastener	Secures panel in place covering battery compartment. Turn screw CCW to remove panel, replace batteries, replace panel, turn screw CW to hand tighten.	BATTERY ACCESS PANEL SCREW
ALARM	Momentary pb	NOT USED	

Note A: To prevent eye or facial injury, and to avoid setting errors, Hinged Panel should be kept closed except during times when Data Back settings controls must be changed by operator.

Note B: Although the film types manifested are low-speed films, the Data Back ISO setting should always remain in the mode “H”.

S88-34602

Figure OPS-120 Data Back for F3 Nikon System (Installed Preflight on Camera Back)

TTL AUTO FLASH ASSEMBLY AND FLASH BATTERY CONTAINER

The NASA-modified battery-powered Flash Unit interfaces to the camera via a “hot shoe” contact, which transmits exposure information to the camera for proper performance. The unit is capacitor-charged for rapid refiring. See Table MG.15 for Flash Unit Technical Description.

S87-30370

Figure OPS-121 TTL Auto Flash for Nikon Camera

TABLE MG.15
TECHNICAL DESCRIPTION — FLASH UNIT

FLASH UNIT NOMENCLATURE	DEVICE TYPE	FUNCTION	PROCEDURAL NOMENCLATURE
MOUNTING SHOE	Sliding connector	Attaches to camera's Accessory Foot by sliding from the camera front.	MOUNTING SHOE
HOT SHOE CONTACTS	Electronic Interface	Relays exposure data between Flash Unit and camera.	HOT SHOE CONTACTS
LOCKING COLLAR	Rotating Coupler	Rotates CCW to tighten and secure flash unit to Mounting Shoe; failure to securely tighten will cause Ready Light to flash continuously until connection is tightened.	LOCKING COLLAR
ON/OFF SWITCH	Slide Switch	Activates flash operation and capacitor charging.	ON/OFF SWITCH
READY LIGHT/TEST PB	Momentary pb	Indicates unit is charging, glows steady when fully charged; any flashing is indication of setting or connection error. Depressing pb will test-fire the flash.	READY LIGHT/TEST PB
BATTERY COMPARTMENT	Container	Holds 4 AA batteries in a cartridge.	BATTERY COMPARTMENT
BATTERY COMPARTMENT RELEASE	Momentary Switch	Unlatches battery cartridge for removal from compartment.	BATTERY CARTRIDGE RELEASE
FLASH HEAD	High-Intensity Light	Provides measured momentary light burst for photography subject illumination.	FLASH HEAD
BOUNCE LATCH RELEASE	Slide and Hold pb	Slide release in direction of arrow and hold while rotating Flash Head bottom up away from flash unit; 4-position adjustment for directing flash angle away from subject; undesirable shadows can occur if flash head rotated to position indirect to subject.	BOUNCE LATCH RELEASE
PIVOT	Pivot	Allows horizontal and vertical repositioning of Flash Unit while installing on camera; ALWAYS position flash horizontally for photography.	PIVOT
REFERENCE DIAL		NOT USED	

S87-30377

Figure OPS-122 TTL Auto Flash Showing Battery Location with the Flash Diffuser Lens Removed

S87-30369

Figure OPS-123 TTL Auto Flash

LENSES

All lenses provided in the 35mm Camera System are specifically for use with the Nikon F3 aperture indexing camera. Each COTS lens features distance scale in both meters and feet, multi-element/multi-group coated lens construction, and an engraved aperture-direct readout scale to allow the selected aperture setting to be visible through the camera viewfinder.

A technical description of the included lenses is shown in Table MG.16, Interchangeable Lenses.

TABLE MG.16
INTERCHANGEABLE LENSES

Lens	Focus Range	Angle of View	Features
28mm f/2.0	8 inches to infinity	74°	medium wide-angle high-speed
55mm macro f/2.8	9 inches to infinity	43°	Macro
35-70mm f/3.5	12 inches to infinity	62-34°	Zoom
105mm f/2.8	14 inches to infinity	23°	Micro

TABLE MG.17
TECHNICAL DESCRIPTION — LENS

LENS NOMENCLATURE	FUNCTION	PROCEDURAL NOMENCLATURE
LENS CAP	Protects exposed glass elements when camera not in use.	LENS CAP
APERTURE RING	Rotates to adjust size of lens opening, controlling amount of light used to make an exposure; measures in "f/stop" numbers.	APERTURE RING/ APERTURE INDEX
APERTURE-DIRECT-READOUT SCALE	Displays f/stop in camera viewfinder; changes display when Aperture Ring is rotated.	APERTURE SCALE
APERTURE/ FOCUSING INDEX	Color-coded scale indicating range of acceptable focus for various f/stop settings.	DEPTH-OF-FIELD SCALE
CENTRAL INDEX	Alignment reference during lens mounting; also used for aperture and focus indexes.	BLACK DOT/ CENTRAL INDEX
FOCUSING RING	Focuses lens by rotating until image is sharp.	FOCUSING RING
DISTANCE SCALE	Displays subject-to-film distance.	DISTANCE SCALE
METER COUPLING RIDGE	NOT USED	
METER COUPLING SHOE	NOT USED	

S93-33448

Figure OPS-124 300mm Lens

TABLE MG.18
NIKON LENS SPECIFICATION

Lens	Aperture Range (f/stop)*	Approximate Field of View (FOV)			Minimum Focus Distance (in feet)	Weight (lb)	Filter Size
		Horizontal	Vertical	Diagonal			
28mm	f/2 – f/22	66°	46°	75°	0.9	.8	52mm
55mm macro	f/2.8 – f/32	36°	25°	43°	0.9	.6	52mm
180mm	f/2.8 – f/32	11°	8°	14°	6.0	1.8	73mm
300mm	f/2.8 - f/22	7°	5°	8°	10.0	5.3	39mm

300MM F/2.8 LENS

P/N: SED33103868-301
Qty: 1
Mass: 2.93 kg
Power: 0
x,y,z: 27.31 x 13.3 x 13.59 cm
Loc: Mir Core

EXTENDER PK13

The Extender is a COTS component. When mounted between the camera and the 55mm macro lens (set at minimum focus) a 1:1 image-to-film ratio is created.

LENS CLEANING DRY WIPES

Disposable dry-wipe lens cloths are provided to maintain the condition of the lenses. The soft wiping/polishing materials should be used at frequent intervals for removing debris, fingerprints, and other pollutants from the glass surfaces of the lenses.

BATTERIES

An adequate supply of AA batteries, used to power the flash unit and the motor drive, are provided. When the time interval exceeds 20 seconds before the flash unit "Ready" indicator light illuminates, the batteries should be replaced. On the motor drive, a set of red and green lights, activated by a "Batt Check" pushbutton, indicates battery state.

FILMS

COTS Velvia and Lumiere color positive films have film speeds of 50 ASA and 100 ASA, respectively. Each roll contains approximately 36 exposures.

S87-30313

Figure OPS-126 105mm Lens

S88-38674

Figure OPS-128 28mm Lens

S93-46790

Figure OPS-125 Extension Ring, PK 13

S87-30314

Figure OPS-127 55mm Lens

MULTIUSE BRACKET AND CLAMP

The Bogen Multiuse Bracket and Multiuse Clamp are NASA-modified COTS devices designed to hold cameras in fixed locations inaccessible with a tripod or other anchoring device. The clamp fastens to spacecraft handrails, and the bracket connects to the clamp. The camera is equipped with a fitting that mates to a shoe at the end of the bracket. Once assembled and attached to the camera, the bracket and clamp assembly replicates the function and flexibility of a human arm, with the additional capability of locking its “shoulder,” “elbow,” and “wrist,” holding a camera in a fixed position.

35MM INFLIGHT ACTIVITIES AND PROCEDURES

An overview of contingency and malfunction procedures is shown in Table MG.19, Contingency Procedures. ✳

TABLE MG.19
CONTINGENCY PROCEDURES

Procedure	Cause	Overview Of Procedure
Camera fails to operate	Motor Drive counter at "0".	Reset counter.
Motor Drive red battery check light glows	End of film roll.	Rewind and stow exposed film; reload.
Camera fails to operate	Motor Drive rewind activation not reset.	Reset "Rewind" pb.
Camera fails to operate	Loose battery in motor drive.	Remove and reinstall battery.
Camera fails to operate	Dead battery.	Activate Batt Check pb; if red or no light replace batt.
Operator cannot see through viewfinder	Lens cap in place; or shutter open (mirror up) and will not release.	Remove lens cap; move shutter speed dial out of "A" mode until shutter closes, return to "A" mode.
Operator cannot see through viewfinder	Mirror moved up and locked.	Rotate mirror lockup lever to vertical position.
Operator cannot see through viewfinder	Eyepiece shutter closed.	Rotate eyepiece shutter lever CW.
Ready Light on Flash Unit blinks constantly	Flash improperly attached to camera.	Remove and reinstall; verify locking collar fully rotated CW.
"Flash Ready" light not illuminated or slow to relight after firing flash	Flash unit not powered on; weak or dead battery.	Replace all four batteries in battery holder.

TABLE MG.20
TECHNICAL DESCRIPTION — MULTIUSE CLAMP

MULTIUSE CLAMP NOMENCLATURE	FUNCTION	PROCEDURAL NOMENCLATURE
BASE ASSEMBLY	Stationary jaw.	BASE ASSEMBLY
ARM	Movable jaw.	CLAMP ARM
CRANK HANDLE	Drives movable jaw to tighten or loosen.	CRANK HANDLE
BRACKET INTERFACE	Receptacle for Multiuse Bracket Joining Stud.	BRACKET INTERFACE
RELEASE PIN	Releases Joining Stud from Bracket Interface.	RELEASE PIN
KNOB	Tightens to secure Joining Stud into Bracket Interface; reverse to loosen stud before depressing Release Pin.	KNOB

TABLE MG.21
TECHNICAL DESCRIPTION — MULTIUSE BRACKET

MULTIUSE BRACKET NOMENCLATURE	FUNCTION	PROCEDURAL NOMENCLATURE
JOINING STUD	Inserted into Bracket Interface to connect Multiuse Bracket to Multiuse Clamp; opposite end of Stud has ball interfaced to Stud Arm.	JOINING STUD
STUD ARM	Rigid extension from Joining Stud; has ball socket interfaced to ball on Joining Stud, allowing Stud Arm to adjust to any position or angle.	STUD ARM
MOUNT ARM	Rigid extension connected to Stud Arm by a pivot, allowing Mount Arm to rotate 360°; opposite end of Mount Arm has ball socket interfaced to Camera Mount Assembly ball.	MOUNT ARM
HANDLE	When tightened, locks all joints in their position.	LOCKING KNOB
CAMERA MOUNT ASSEMBLY	Camera mounting interface assembly; ball interfaced to Mount Arm ball socket allows camera adjustment to any position or angle.	CAMERA MOUNT ASSEMBLY
MOUNT ASSEMBLY SHOE	Mounting platform for camera; a concealed spring device latches the camera in place.	MOUNT ASSEMBLY SHOE
MOUNT ASSEMBLY BUTTON	Releases the spring latch on the Mount Assembly Shoe to allow camera to be removed from Camera Mount Assembly.	MOUNT ASSEMBLY BUTTON

PAYLOAD UTILITY PANEL (PUP)/ POWER

HARDWARE DESCRIPTIONS

PAYLOAD UTILITY PANELS (PUPS)

Two identical PUPs (A and B) are used in the Priroda Module. Each of these PUPs interfaces with a 50 amp Russian circuit breaker (RBS-50) and distributes 23 to 32V DC to experiment hardware. PUP B is located on the docking port end of the module; PUP A is located on the central portion of the module adjacent to the eleven single lockers.

A general diagram of the Payload Utility Panel is shown in Figure OPS-129. This diagram applies to both PUP-A and PUP-B. Table OPS.22 identifies the power cable being used by each PUP to interface with the Priroda module. Table OPS.23 lists the prerouted cables used by the experiment hardware interfacing with the PUP.

The PUP provides power to various locations within the module via prerouted cables with one end connected to the rear of the PUP and the other extending out from a hole in a decorative panel near the intended location of a relatively permanent piece of powered hardware. There are also standard American connectors on the front of the PUP.

OTHER UTILITY OUTLETS

The 10 amp connectors on Universal Russian Power Outlets are additional power interfaces that are available. These outlets are located throughout the station and require a power cable with a Russian connector.

Payload Utility Panel (PUP)

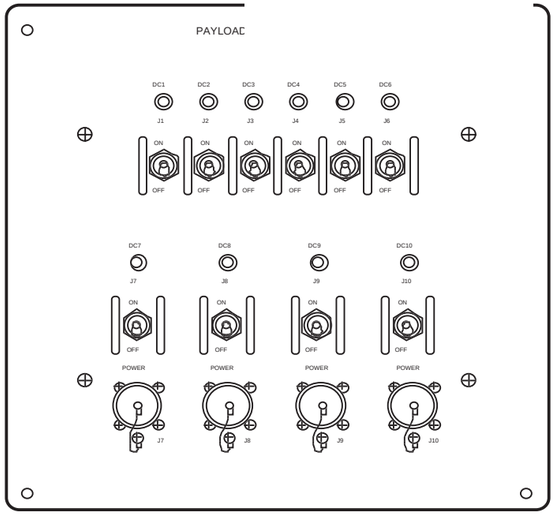
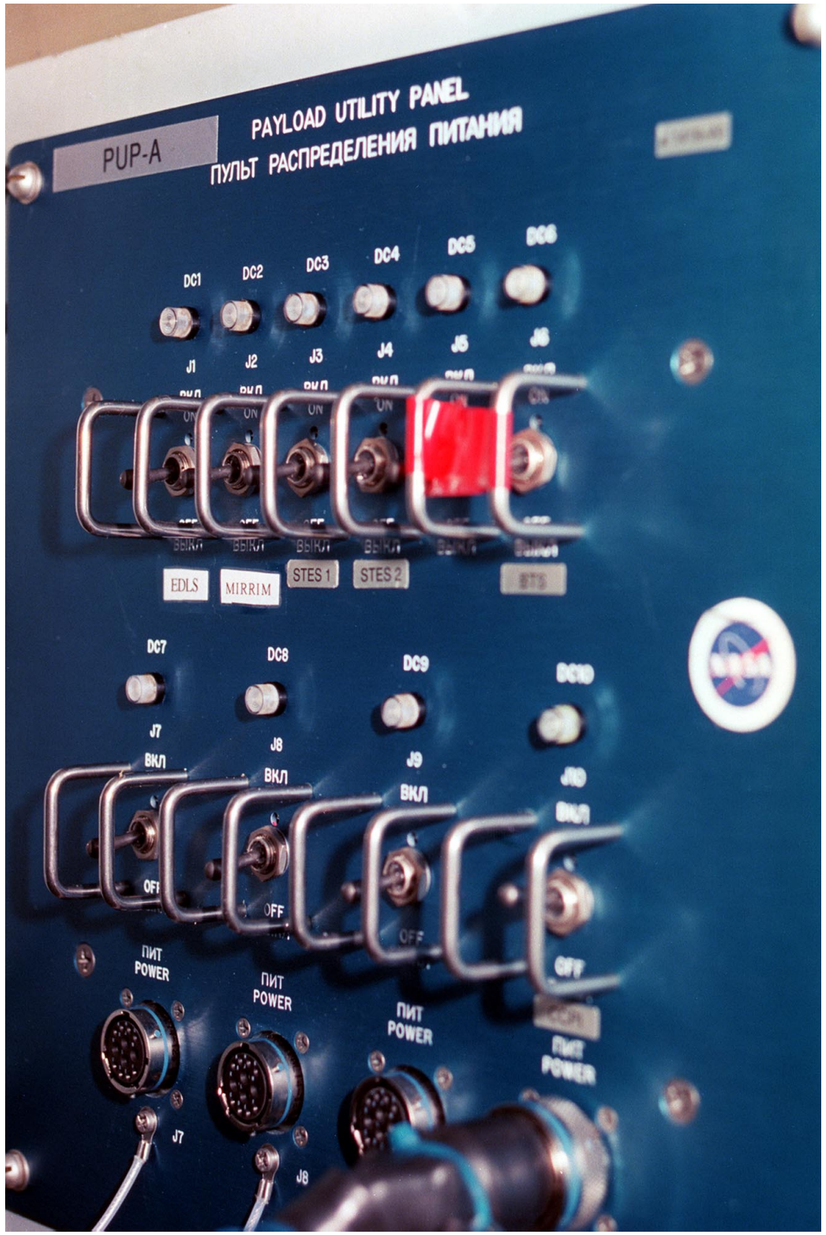


Figure OPS-129 PUP Front Panel

S97-05264

Figure OPS-130 PUP Power Cable



NM22-039-037

Figure OPS-131 PUP Front Panel Photo

D.I.D.

Payload Utility Panel

D.I.D.

Electrical Interface Diagrams

PRIRODA PAYLOAD UTILITY PANEL (PUP)

Aluminum 6061 - T6
Width + 12.0”
Height = 12.0”
Depth = 6.0”
Mass = 8.0 lbs (est)

PUP-A

P/N:	SEM46111452-301
Qty:	1
Mass:	5.00 kg
Power:	6 W
x, y, z:	15.60 x 30.50 x 30.50 cm
Loc.:	Priroda
DID#:	SLM46111437

PUP-B

P/N:	SEM46111452-301
Qty:	1
Mass:	5.00 kg
Power:	6 W
x, y, z:	15.60 x 30.50 x 30.50 cm
Loc.:	Priroda
DID#:	SLM46111437

TABLE OPS.22
PUP INPUT POWER CABLES

Connector	Cable Name	Cable Part Number	Cable ID	Notes
PUPA-J11 (Back)	Joint Power Cable to PUPA	SEM46111370-301	PUPA≠	Input from RBS-50 to PUPA
PUPB-J11 (Back)	Joint Power Cable to PUPB	SEM46111371-301	PUPB≠ 1371	Input from RBS-50 to PUPB

TABLE OPS.23
PREROUTED CABLES

PUPA Connector	Cable Name	Cable Part Number	Cable ID	Notes
J1 (back)	Power Cable S/N: 1002	SEM46111482-301 S/N: 1002	PUPB≠ 1482	Preroute d Cable
J2 (back)	Mir RIM Power Cable	SEM46111992-301	PUPA≠ 1992	Preroute d Cable
J3 (back)	Power Cable STES1	SEM46111480-301	PUPA≠1 480	Preroute d Cable
J4 (back)	Power Cable STES2	SEM46111481-301	PUPA≠ 1481	Preroute d Cable
J5 (back)	20 amp Power Extension Cable	SEM46113185-301	PUPA≠ 3185	Preroute d Cable
J6 (back)	Power Cable BTS ECC A1	SEM46111478-301	PUPA≠ 1478	Preroute d Cable
PUPB Connector				
J1 (back)	Glovebox Power Cable 1	SEM46111482-301 S/N: 1001	PUPB≠ 1482	Preroute d Cable
J2 (back)	Glovebox Power Cable 2	SEM46111483-301	PUPB≠ 1483	Preroute d Cable
J3 (back)	MIM Power Cable	SEM46111485-301	PUPB≠ 1485	Preroute d Y-Cable
J4 (back)	MIM Power Cable	SEM46111485-301	PUPB≠ 1485	Preroute d Y-Cable
J5 (back)	SIA Power Cable	SEM46111372-301	PUPB≠ 1372	Preroute d Y-Cable
J6 (back)	SIA Power Cable	SEM46111372-301	PUPB≠ 1372	Preroute d Y-Cable

ELECTRICAL CHARACTERISTICS

Input/Output Characteristics

The PUP accepts 23-32V DC provided by the Priroda module and provides ten 23-32V DC outputs. The four PUP outputs are routed to four circular-type connectors located in the front panel of this unit. These front panel connectors will be used to power portable hardware. The remaining six outputs will be routed to the back panel of this unit.

Circuit Protection and Control

A magnetic circuit breaker is provided on each of the output circuits to provide circuit protection and on/off switching capability to each output. Table OPS.24 summarizes the circuit protection of each output connector.

Circuit Monitoring

Indicator lights (LED) are provided to indicate the status of each output circuit.

Power Consumption

Without an external load, the PUP consumes approximately 6 Watts. This number is estimated and is not expected to increase significantly. The power dissipated by this unit will increase depending on the current drawn by the external load. The PUP has been designed so that if one CB trips open the other CBs in the PUP, it will not be affected. The external loads connected to each PUP will be chosen so that one H/W failure causing one of the output breakers to trip will not affect the upstream 50 Amp rated CB in the Priroda module. For any chosen combination of NASA operational hardware, the total current consumption should not exceed 44 Amps at 28V DC.

Input Power Connector

The input power connector J11 receives 23 to 32V DC from the Priroda module. The PUP receptacle part number is MS3470L24-19P. The mating plug part number of the power cable is MS3475L24-19S. These connectors have nineteen contacts that accept 12 or 14 AWG wire. To reduce voltage drop, 12 AWG wire will be used. Table OPS.25 describes the pin assignments for this connector.

Front Panel Power Connectors

There are four utility power connectors on the front panel of the chassis: J7, J8, J9 and J10. These connectors are used to power portable hardware. The receptacles J7, J8, and J9 on the front panel are part number MS3470L14-12S. The mating plug part number of the power cables is MS3476L14-12P. These connectors have 12 contacts: four contacts that accept 16 AWG wire and eight contacts that accept 20 AWG wire. Only the 16 AWG contacts are used. The part number for receptacle J10 is MS3470L14-19S. The mating plug is MS3476L14-19P. This connector has 19 contacts that accept 20 AWG wire to 24 AWG wire. Only 22 AWG is used. Table OPS.26 describes the pin assignments for these connectors.

Back Panel Power Connectors

The PUP back panel has six power outlets available for payload usage: two 20 amp power outlet, and four 10 amp power outlets. The cables that are connected to these outlets are all prerouted behind the decorative panels.

Back Panel 20 Amp Outlets

The part number for the 20 amp power receptacle, J5, is MS3470L18-8S. The mating plug part number is MS3476L18-8P. This connector has four contacts that accept 12 AWG wire or 14 AWG wire; only 12 AWG wire is to be used.

The part number for the second 20 amp power receptacle, J6 is MS3470L24-19S. The mating plug part number is MS3476L24-19P. This connector has nineteen contacts that accept 12 AWG wire or 14 AWG wire; only 12 AWG is to be used. Table OPS.27 describes the pin assignments for these connectors.

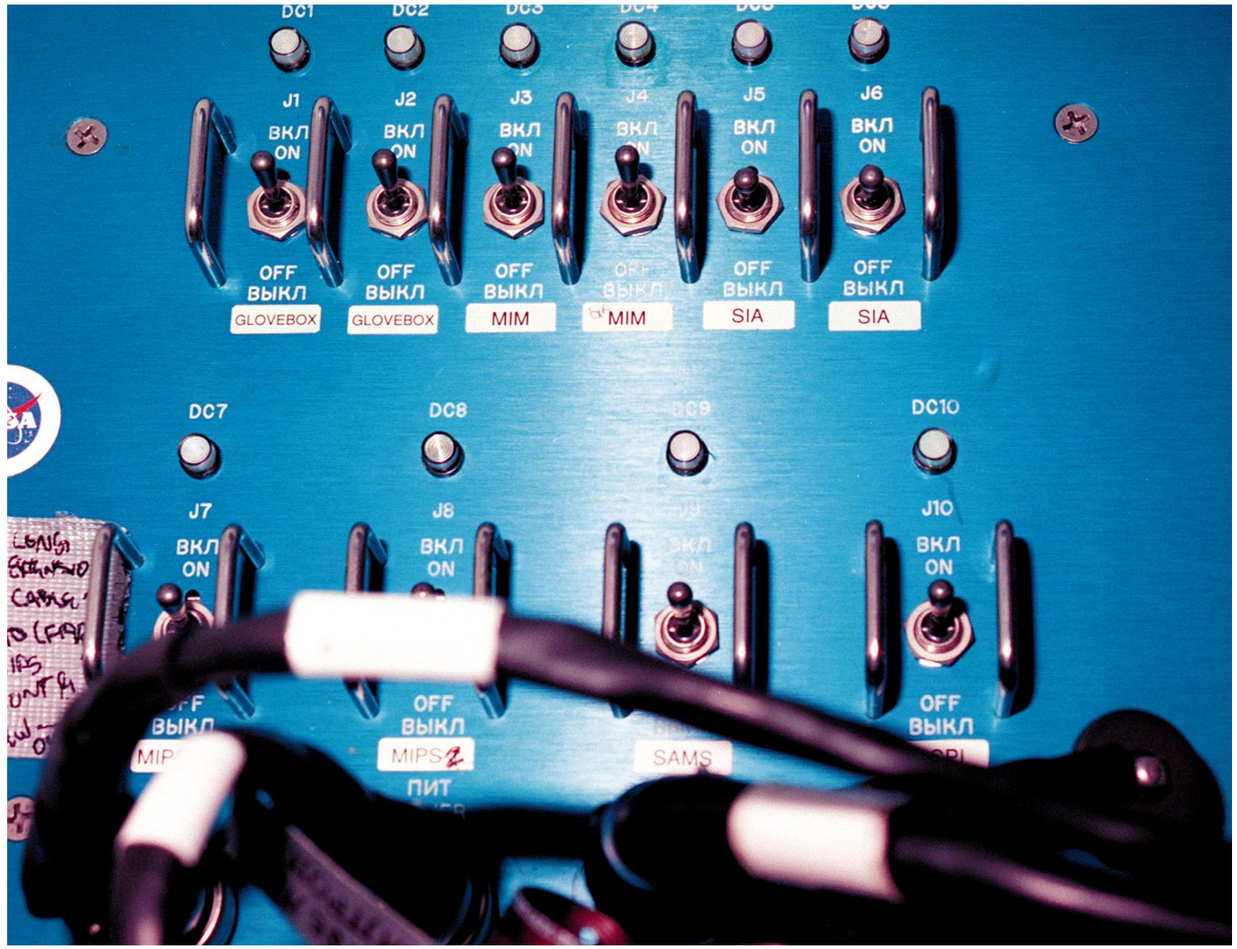
TABLE OPS.24
OUTPUT CIRCUIT PROTECTION

CONNECTOR LABEL	CIRCUIT BREAKER	SIZE
J1	DC1	10 Amp
J2	DC2	10 Amp
J3	DC3	10 Amp
J4	DC4	10 Amp
J5	DC5	20 Amp
J6	DC6	20 Amp
J7	DC7	10 Amp
J8	DC8	10 Amp
J9	DC9	10 Amp
J10	DC10	5 Amp

TABLE OPS.25
PIN ASSIGNMENTS FOR CONNECTOR J11
(INPUT POWER)

CONNECTOR	PIN	DESCRIPTION
J11	H	28 VDC IN
J11	F	RETURN
J11	J	28 VDC IN
J11	S	RETURN
J11	K	28 VDC IN
J11	D	RETURN
J11	L	28 VDC IN
J11	P	RETURN
J11	M	28 VDC IN
J11	B	RETURN
J11	N	28 VDC IN
J11	C	RETURN
J11	T	28 VDC IN
J11	E	RETURN
J11	U	28 VDC IN
J11	R	RETURN
J11	A	28 VDC IN
J11	V	RETURN

Note: Throughout this document, “Return” is equivalent to - 28 Vdc.



NM23-018-31

Figure OPS-132 PUP-B Front Panel

TABLE OPS.26
PIN ASSIGNMENTS FOR CONNECTORS J7, J8, J9, AND J10 (UTILITY POWER)

CONNECTOR	PIN	DESCRIPTION
J7	J	28 VDC IN
J7	K	RETURN
J7	L	CHASSIS GROUND
J8	J	28 VDC IN
J8	K	RETURN
J8	L	CHASSIS GROUND
J9	J	28 VDC IN
J9	K	RETURN
J9	L	CHASSIS GROUND
J10	G	28 VDC IN
J10	F	RETURN
J10	L	CHASSIS GROUND

TABLE OPS.27
PIN ASSIGNMENTS FOR CONNECTORS J5 AND J6
(20 AMP POWER OUTLET)

CONNECTOR	PIN	DESCRIPTION
J5	A	28 VDC IN
J5	B	RETURN
J5	C	28 VDC IN
J5	D	RETURN
J5	F	CHASSIS GROUND
J6	A	28 VDC IN
J6	B	RETURN
J6	C	CHASSIS GROUND
J6	D	28 VDC IN
J6	E	RETURN
J6	F	CHASSIS GROUND

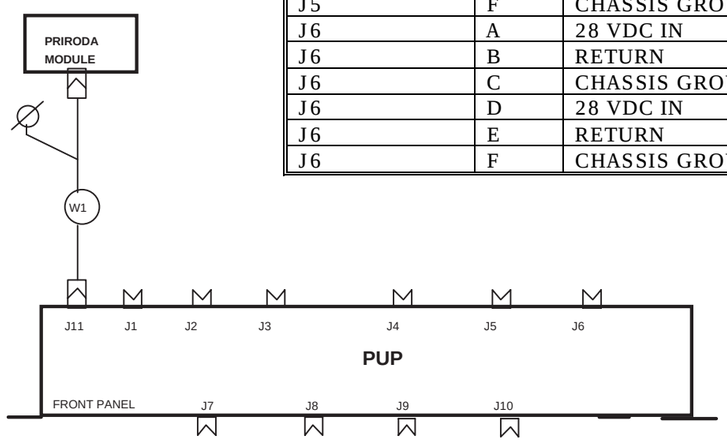
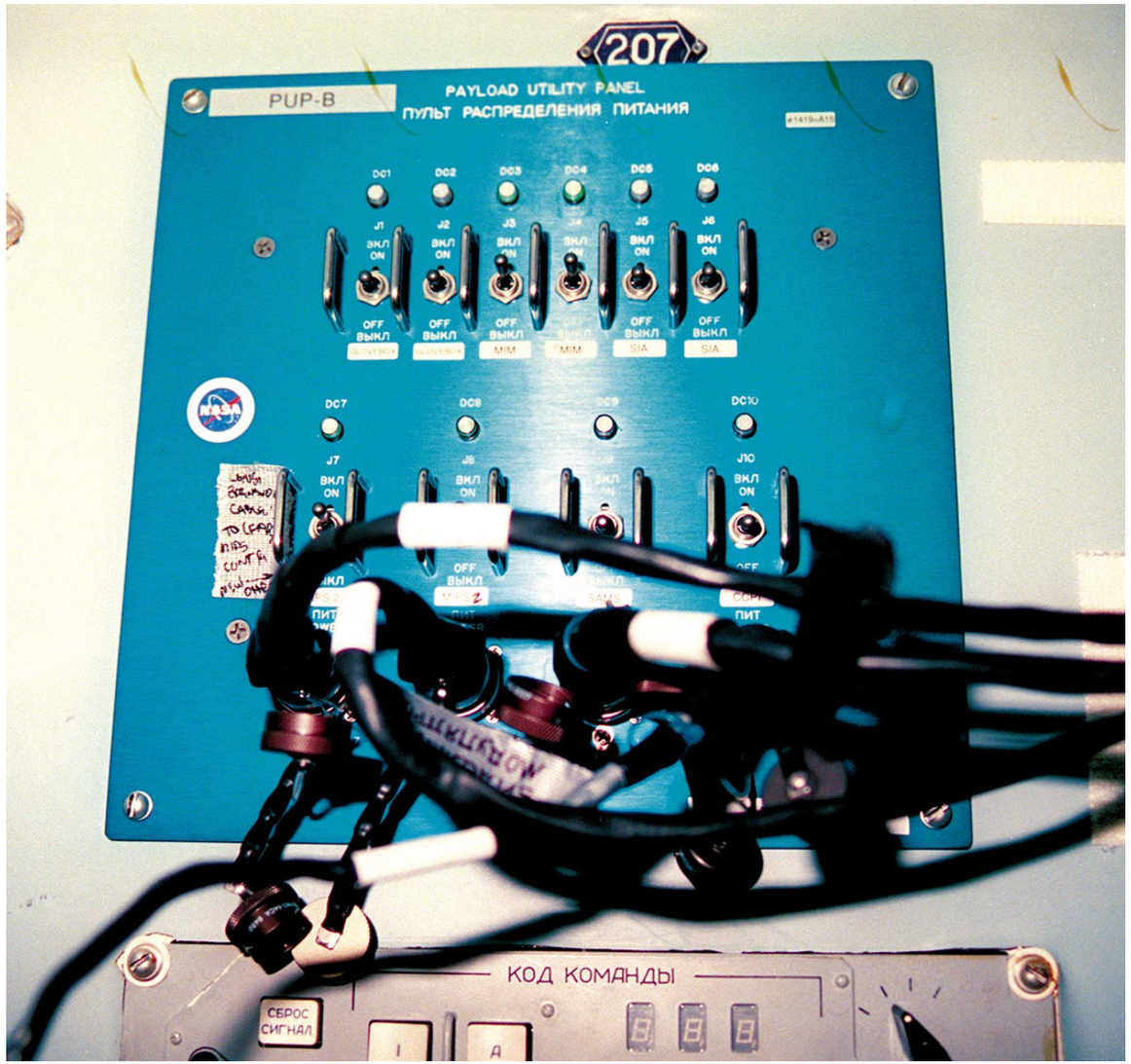


Figure OPS-133 Electrical Interconnect Drawing



NM23-109-11

Figure OPS-134 PUP-B Panel in Priroda

Back Panel 10 Amp Outlets

There are four 10 amp output connectors on the back panel of the chassis: J1, J2, J3, and J4. The part number of these receptacles is MS3470L14-12S. The mating plug part number is MS3476L14-12P. These connectors have 12 contacts: four contacts that accept 16 AWG wire and eight contacts that accept 20 AWG wire. Only the 16 AWG contacts are used. Table OPS.28 describes the pin assignments for these connectors.

TABLE OPS.28
PIN ASSIGNMENTS FOR CONNECTORS
J1, J2, J3, AND J4
(10 AMP POWER OUTLET)

CONNECTOR	PIN	DESCRIPTION
J1	J	28 VDC IN
J1	K	RETURN
J1	L	CHASSIS GROUND
J2	J	28 VDC IN
J2	K	RETURN
J2	L	CHASSIS GROUND
J3	J	28 VDC IN
J3	K	RETURN
J3	L	CHASSIS GROUND
J4	J	28 VDC IN
J4	K	RETURN
J4	L	CHASSIS GROUND

MECHANICAL CHARACTERISTICS

Chassis Description

The PUP chassis is made of aluminum alloy material. In addition to the connectors, there are circuit breaker switches and the LEDs described previously.

Weight

The weight of the PUP is approximately 11 lbs.

POWER SUMMARY LAYOUT

PURPOSE

The power Summary Layout provides an overall representation of outlet allocation throughout the Mir Station for American hardware.

This layout represents Priroda outlets and all needed Russian Universal power outlets (10 amp). Where available, the location of these outlets is specified. This layout makes the following assumptions: power from Spektr hatch IVA, Spektr module closed, no hardware retrieved from Spektr, in other modules current baseline of NASA 7 (incorporates CRs as of date on drawing).

KEY

Auxiliary Powered Items - Items powered from other hardware are identified as extensions to the hardware from which it receives its power.

Shared Outlets - Items in dashed line boxes must share the outlet with other hardware.

Power Outlets - Accessible connectors (not connectors on the rear of the PUP or PDD) are identified by a circle with the amperage of the circuit breaker within the circle.

Power Cables - Power cables are listed in connection sequence with respect to the hardware and the power source. (For example, if there are two cables, the cable connected to the hardware is listed directly under the hardware; then the next cable is listed; then the power source is below).

POWER CONFIGURATION DRAWINGS

PURPOSE

The Power Configuration Drawings provide a graphical representation of the onboard power for American hardware. All drawings include estimated locations (from Russian console documents) of Russian power outlets. These drawings are in the “modules” section.

Generic Layouts (See Module Section) - These layouts illustrate power capabilities of a given module. Callouts are prerouted cables that provide power to the specified location. The cable part number, length, and power source are included. Permanently mounted hardware items are also labeled.

Increment Layouts - These layouts identify the known configuration of a module for a specific increment based on approved CRs and operational knowledge of the current station configuration. They identify specific hardware and how it is powered. They also include the basic power capability illustrated on the generic drawings.

KEY

Mir Module Layout - Each drawing illustrates all four walls of the module.

Decorative Panels - The numbered decorative panels in each module have been estimated from Russian console documentation. The numbering of the panels follows a standard: 1xx for the floor, 2xx for port, 3xx for the ceiling, and 4xx for starboard.

Power Outlets - Russian power outlets are identified in all modules. The key is on each drawing. Each RBS-U includes the standard 10 amp connector and a 3 amp connector. The 20 amp and 50 amp power outlets are also identified on the drawings. The location of the PUPs and PDD are also illustrated.

Power Connections - The notations “(FRONT)” and “(BACK)” refer to the location of the connector with respect to the PUP or PDD. Generally, BACK refers to items with prerouted cables that are plugged into the back of the PUP or PDD, and FRONT refers to items which are plugged into the front of a PUP or the PDD.

Powered Hardware - Items in bolded text represent powered hardware.

Mobile Hardware - The location of “Mobile” items do not represent the location within a module of the item - only the module in which it is believed to reside.

Auxiliary Powered Hardware - Items which are powered by another item are identified in parenthesis next to the item from which it is powered (for example, QUELD is powered by MIM).

Power Cables - Power cables are listed in connection sequence with respect to the hardware and the power source. (For example, if there are two cables, the cable connected to the hardware is listed directly under the hardware; then the next cable is listed; then the power source is below).

HARDWARE INTERFACE WITH SYSTEMS

- Joint Power Cables: These cables interface the PUPs or experiment hardware to the Mir power distribution system (RBS-50, RBS-Us).
- Experiment Power Cables: These cables are used to distribute power from the PUP to the experiment equipment.

DISPLAYS AND CONTROLS

Circuit breakers located on the front panel of the PUP provide circuit protection and ON/OFF switching capability to each output.

Indicator lights (Light-Emitting Diodes [LEDs]) are used to monitor the status of each output. When the circuit breaker is enabled, the LED is lit and the corresponding connector is receiving voltage. ✳

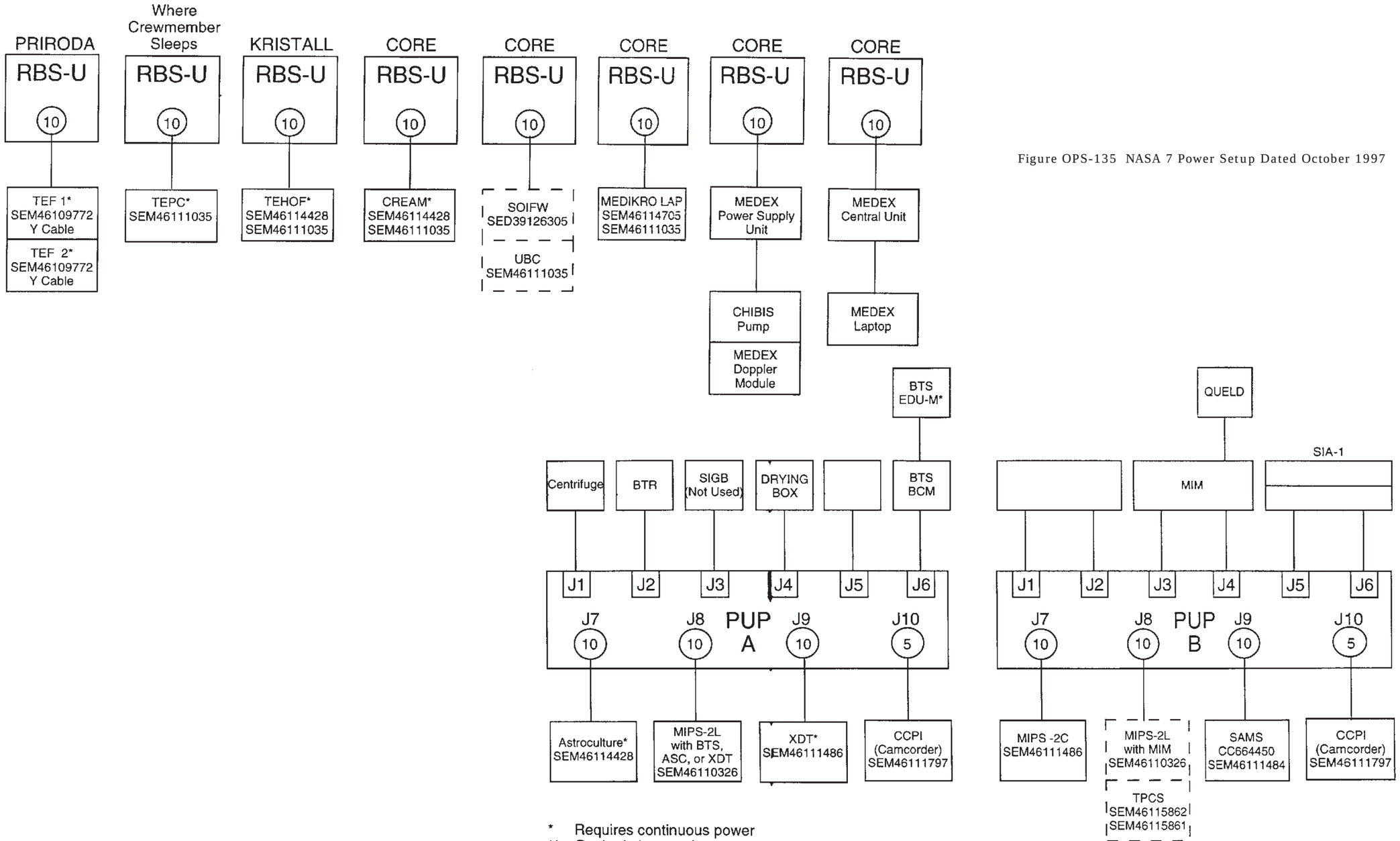


Figure OPS-135 NASA 7 Power Setup Dated October 1997

* Requires continuous power
** Docked phase only

NOTES: 1. Dashed boxes indicate hardware that shares an outlet due to necessary location and outlet availability (only one item is powered at a time).
2. PUP A and PUP B total usage at one time may not exceed 44 A.
3. Items that were powered by an RBS-U in Spektr may theoretically be powered by an RBS-U in Priroda or other modules.

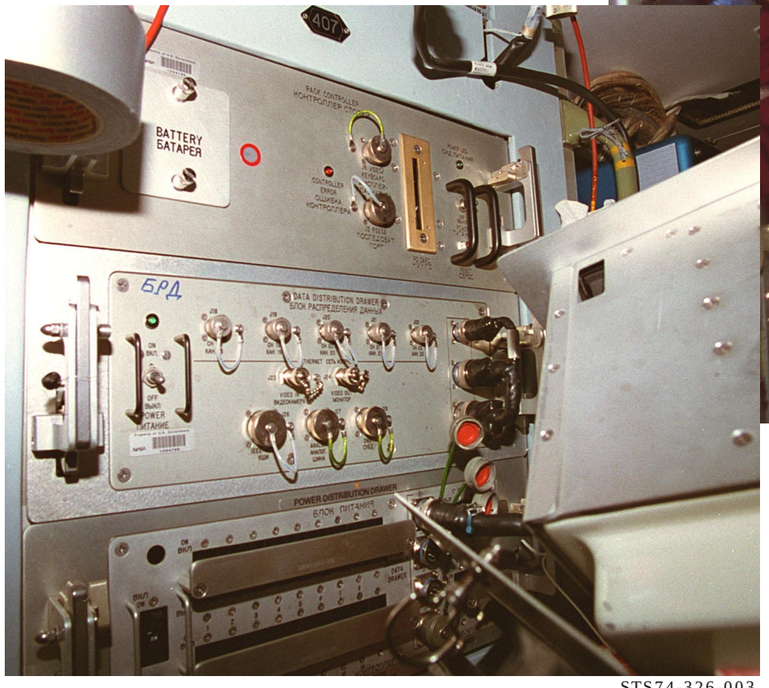
Standard Interface Adapter (SIA)

TABLE OPS.29
SIA SYSTEM COMPONENTS

Name	Part Number
FA-1	FA-2
Controller SIA	SEM46109140-301
Rack Controller (RC)	SEM46109152-301
Power Distribution Drawer (PDD)	SEM46110255-301
Data Distribution Drawer (DDD)	SEM46110298-301

STS76-312-006

Figure OPS-137 SIA Rack Controller Unit in Spektr next to the TEHOF and CUPS



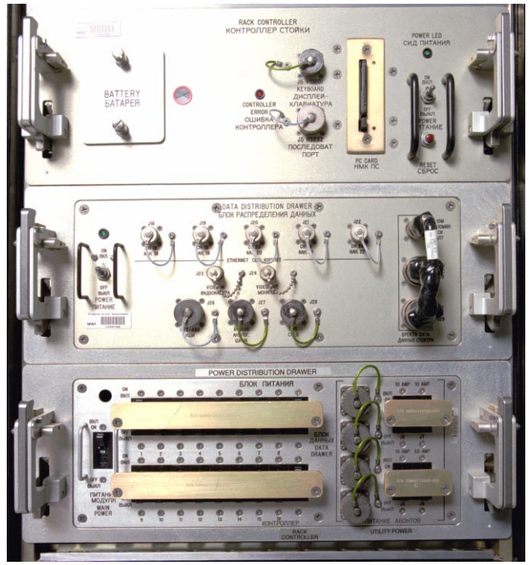
STS74-326-003

Figure OPS-136
SIA Rack Controller, Data Distribution Drawer, and Power Distribution Drawer

D.I.D.

Standard Interface Adapter Assembly

Due to PCMCIA card failures and the return of MIPS-3C, the SIA Rack Controller, PDD, DDD are unavailable for use to support Experiments.



S97-01173

Figure OPS-138 Training SIA Controller Equipment

HARDWARE DESCRIPTION

EXPERIMENT SIA, POWERED

The SIA provides mechanical, power, and data interfaces between the active experiment drawer and the Spektr and Priroda Modules (No data in Priroda Modules). Each powered Experiment SIA accommodates two 4 Panel Unit (PU) drawers or one 8PU drawer and provides a structure for carrying as much as 60 kg. The SIA also provides power interface from the Power Distribution Drawer (PDD) in the Controller SIA to the experiment drawer and data interface to other experiment drawers or to Mir Telemetry System by way of the Rack Controller (RC) in the Controller SIA. The experiment SIAs are hard mounted to the Spektr and Priroda structure in fixed locations.

SENSORY MOTOR INVESTIGATION (SMI) SIA, POWERED A9, A10

The wiring in the SIA A10 is designed specifically for the SMI Rotator Experiment (which never flew) and includes internal data interfaces between the two 4PU slots that are available. SIA A9 receives Spektr power from the SIA A10. Experiment electronics drawers are not launched on Spektr. The Experiment SIAs are hard mounted to the Spektr structure in fixed locations.

CONTROLLER SIA

The Controller SIA is a mechanical structure that accommodates the RC, PDD, and Data Distribution Drawer (DDD). One Controller SIA is required for each set of eight Experiment SIAs. The Controller SIA provides the mechanical and wiring interface between the RC, PDD, DDD, Mir data and power systems, and Experiment SIAs.

PDD

The PDD provides the distribution of power from the Spektr 50-amp current source to the eight Experiment SIAs. It can be used for powering the Thermoelectric Freezer (TEF) when used in the Spektr Module.

Each Experiment SIA power connector is capable of operating as much as 35 amps. However, the total current draw by all of the Experiment SIAs cannot exceed the 50-amp supply. The PDD also provides four utility power outlets on its front panel for operation of portable devices. J6, J7, and J8 can provide as much as 10 amps each. J9 can provide as much as 35 amps. The PDD is not an active device and does not dissipate any power internally. The PDD only passes the Spektr power through to the Experiment SIAs, so there is no voltage control capability.

PDD Voltage Range

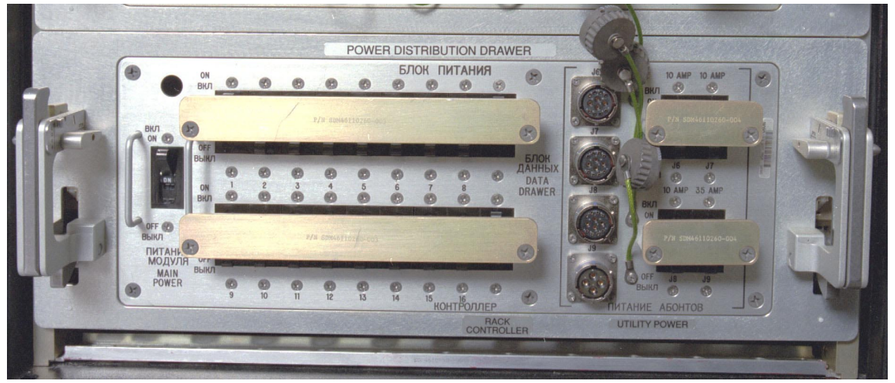
Voltage 23 to 34 V is expected at the input to the PDD. The final voltage at the Experiment SIA depends upon the current carried by the interconnect cable and the length of the cable run.

PDD Current Overprotection

Electrical current is limited to a maximum of 50 amps input to the PDD, but current supplied to the Experiment SIAs is restricted to 35 amps per power connector (two power connectors per SIA).

PDD Physical Configuration

The PDD is configured in an 18 inch-long Standard Interface Drawer that is 4PU high.



S97-01169

Figure OPS-139 Power Distribution Drawer

Because the PDD installs into the Controller SIA, proper PDD configuration can be demonstrated by installation into the Controller SIA and verification that the power connectors interface properly by performance of a power input and power output test.

S97-01168

Figure OPS-140 Training Power Distribution Drawer

S97-01171

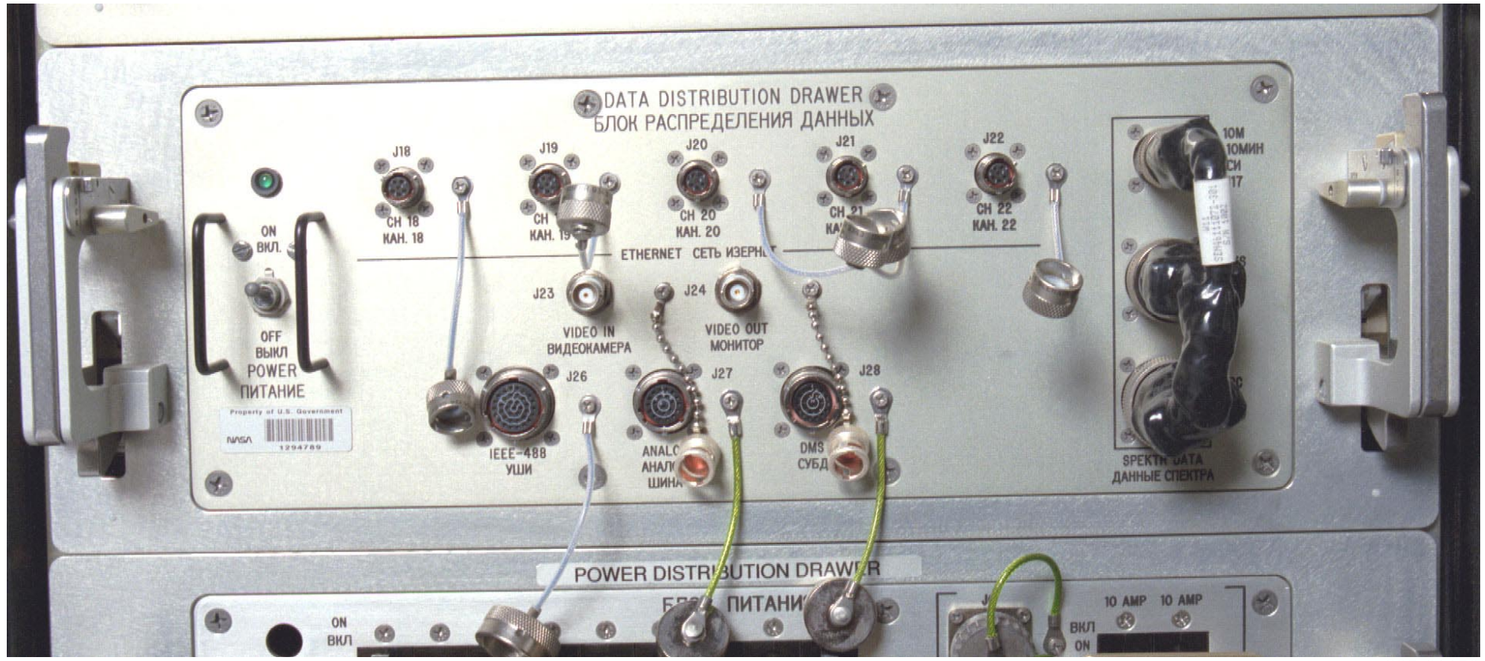
Figure OPS-141
Battery Location in
the Rack Controller

S97-01170

Figure OPS-142 Training Rack Controller Unit

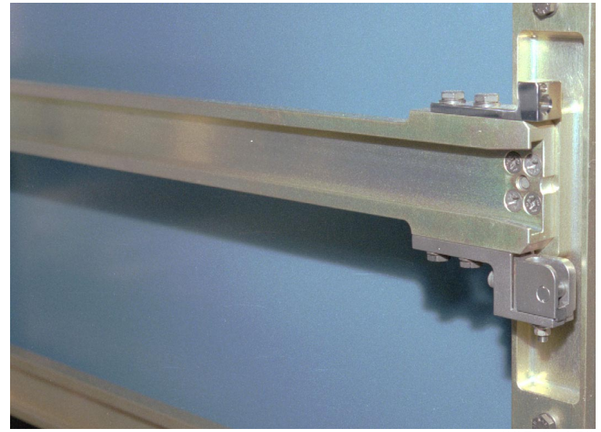
CONTROLLER SIA ASSY

P/N:	SEM46109140-301
Qty.:	1
Mass:	15.88 kg
Power:	112.00 W
x,y,z:	72.20 x 48.90 x 52.20 cm
Loc.:	Spektr, A100



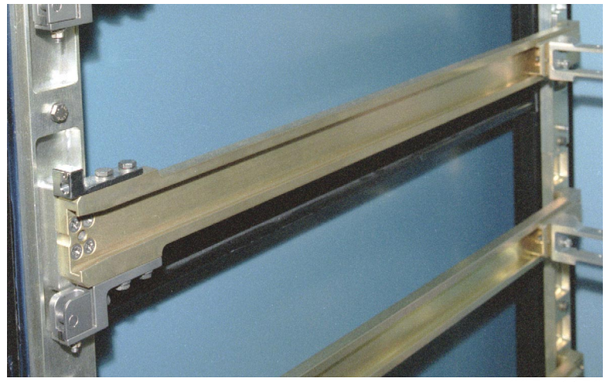
S97-01170

Figure OPS-143 SIA Data Distribution Drawer (Training Equipment)



S97-01179

Figure OPS-144 Training SIA Racks (Left Side)



S97-01178

Figure OPS-145 Training SIA Rack (Right Side)

POWER CABLES

Power cables have an overall shield that is terminated to the connector body at each end. The power cable that interfaces with the Spektr power terminates at the United States (U.S.) end by connection of the overall shield to the connector body. The Russian end is the responsibility of NPO Energia (Russia's Space Agency).

DATA CABLES

The data cable individual signal pairs utilize twisted shielded cabling and have the signal pair shield terminated through a pin in the connector. Data cables have an overall shield that is terminated to the connector body at each end. The data cable that interfaces with the Spektr telemetry system is terminated by bringing the shields for twisted shielded pairs through the connector on a pin and grounded in the chassis and having an overall shield terminated through a connector pin.

PRIRODA SIA

The SIA system for the Priroda consists of two passive SIAs and one powered Experiment SIA. The initial complement of Gas Analyzer System for Metabolic Analysis of Physiology (GASMAP) hardware with assorted experiment stowage is launched in the SIA structures mounted in the Priroda Module. GASMAP has since been moved to Priroda. Experiments launched on later Progress or Space Shuttle flights are transferred to the Module and installed in drawers.

SIA Drawers

The mechanical interface of the SIA is a set of rack-mounted drawers on slide guides with fixed connector support bars.

Slide Guides

The SIA-mounted connector bar and slide guide assemblies provide secure support for the experiment or stowage drawers under dynamic conditions such as launch or landing. The guides have a tapered entrance to receive the drawer slide. This simplifies the task of inserting the drawer into the guide and is important when on-orbit integration is required. The guides are installed at preflight by hardmounting onto the Priroda Module at fixed locations.

Powered SIAs

Powered SIAs have power connector receptacles and accommodate two 4PU drawers or one 8PU drawer. The SIA receives power through a cable that interfaces with the Payload Utility Panel (PUP).

Passive SIAs

The passive SIAs are mechanically identical to the powered SIA, except there is no electrical interface within the Module. ✳

MIR EXPERIMENT INTEGRATED COLD STOWAGE (TEF/TEHOF/BSHS)

THERMOELECTRIC FREEZER (TEF) HARDWARE DESCRIPTION

The TEF is designed to freeze biological samples (blood, urine, and saliva) on Shuttle/Mir missions. After samples are frozen in the TEF, the samples are transferred to the TEHOF for long-term storage.

TABLE OPS.30
TEF FLIGHT HARDWARE

Name	Qty
TEF	2
TEF Power Cable	2
Foam Insert	1
Spare Cold-Side Fan	1

S96-18517

Figure OPS-146 TEF Units and TEHOF Unit

The TEF has two modes of operation:
- Refrigerate
- Freeze

There are 2 TEFs on Mir. Typically one is operated as a freezer and the other as a refrigerator. The refrigerator will eventually be activated as a freezer.

The TEF operates at a regulated temperature of 4 ± 2 °C for refrigerating and an unregulated temperature of -20 °C or lower for freezing.

The TEF internal volume is 1050 cc and accommodates four sample holder cards simultaneously.

The TEF will freeze six 12-mL test tubes containing saline solution from 25 to -5 °C in 45 minutes. The TEF is pre-chilled to reach a minimum of -20 °C before samples are added.

The TEF is defrosted when visual inspection indicates it is necessary. Defrosting the TEF takes 30 minutes.

The TEF has an ON/OFF power switch, and the power supply voltage is 28 ± 4 V. The TEF power consumption during initial startup and during steady-state operation is less than 140 W. The TEF consists of two major assemblies: the active lid and the lower assembly, which are separable from one another.

The lower assembly is actually the cold volume of the freezer. The insulation between the cold volume and the outer case is Stephanfoam insulation (Stephanfoam is a brand name). Stephanfoam is a two-part mixture that is poured into a volume, then it expands and hardens.

Located inside the TEF cold volume is the sample holder cage, which is permanently attached. The sample holder cage is oriented such that when the sample holders are inserted, the airflow from the TEF cold-side fan is parallel to the length of the sample holders.

The sample holder cage consists of two aluminum plates with slots held together by four threaded stainless steel rods.

STS76-312-001

Figure OPS-147 TEFs in Mir

D.I.D.

Thermoelectric Freezer

D.I.D.

Thermoelectric Freezer Cold Side Fan

Principal Investigator:
Randy Jenkins
Lockheed Martin
(281)280-2789

THERMO ELECTRIC FREEZER ASSEMBLY-MIR

P/N: SEM46109990-301
Qty.: 1
Mass: 11.0 kg
Power: 140 W
x,y,z: 26.7 x 29.2 x 41.9 cm
Loc.: Kristall
DID#: SLM46109991

TEF COLD SIDE FAN (SPARE)

P/N: SDM46111524-701
Qty: 1
Mass: .08 kg
Power: N/A
x,y,z: 6 x 6 x 2.5 cm
Loc: Kristall
DID#: SLM46102123

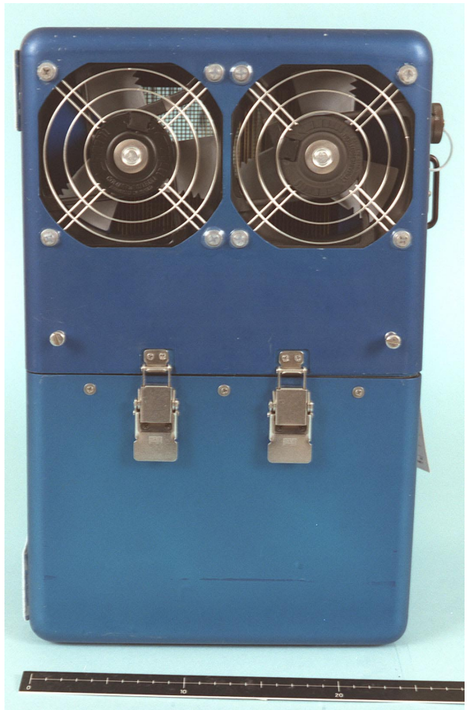
The sample holder cage has four slots. The two outside slots are for urine/saliva sample holders. The two central slots are for blood sample holders. The sample holders cannot be inserted into incorrect slots because of differences in the sample holder widths.

Two latches are located on opposite sides of the lower assembly and serve to attach the lid to the lower assembly.

TEF LID

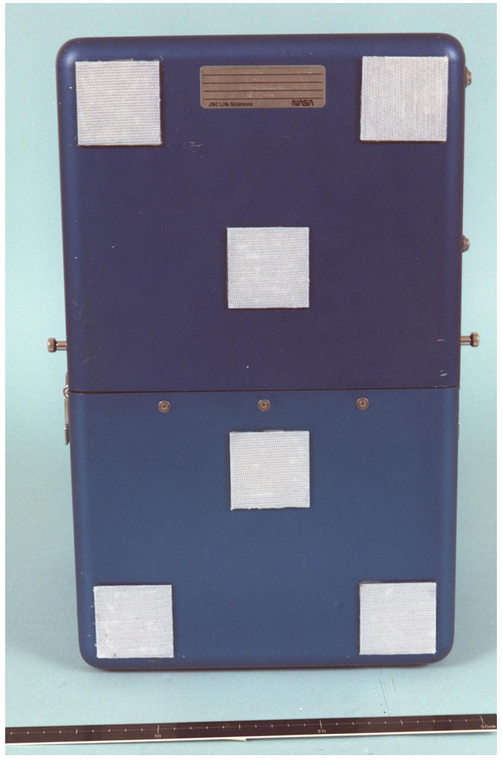
All active mechanical and electrical components are in the lid. The lid houses the heat pump, electrical and control circuitry, temperature readout, and fans. Insulation is included in the bottom of the lid to maintain temperatures.

The fan air intake and exhaust openings are located on the sides of the lid. The intake side has a screen. The exhaust side has wire grills.



S96-18466

Figure OPS-149 TEF Left Side Latches



S96-18465

Figure OPS-150 TEF Back Showing Velcro Locations

S96-18464

Figure OPS-151 TEF Right Side Latches

S96-18470

Figure OPS-148 TEF Control Panel

TEF POWER CABLE

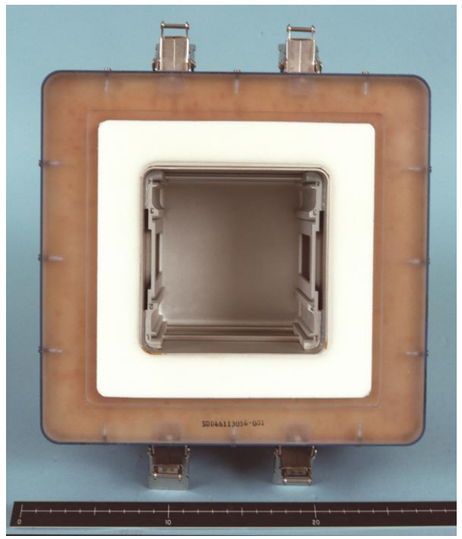
A Power Cable supplies the lid with the power necessary to run the thermoelectric heat pump, the Light-Emitting Diode (LED) power indicator, the temperature display, and the hot- and cold-side fans. The Power Cable connects to the J1 receptacle located on the front panel of the lid. Power to both TEFs is supplied from the PUP or an RBS-U using a Y-Cable.

TEF LAUNCH INSERT

The insert is a plyoletin foam construction shaped like a box with five enclosed sides and one open side. The insert is placed between the TEHOF Tub Assembly and the TEF and provides cushion during launch.

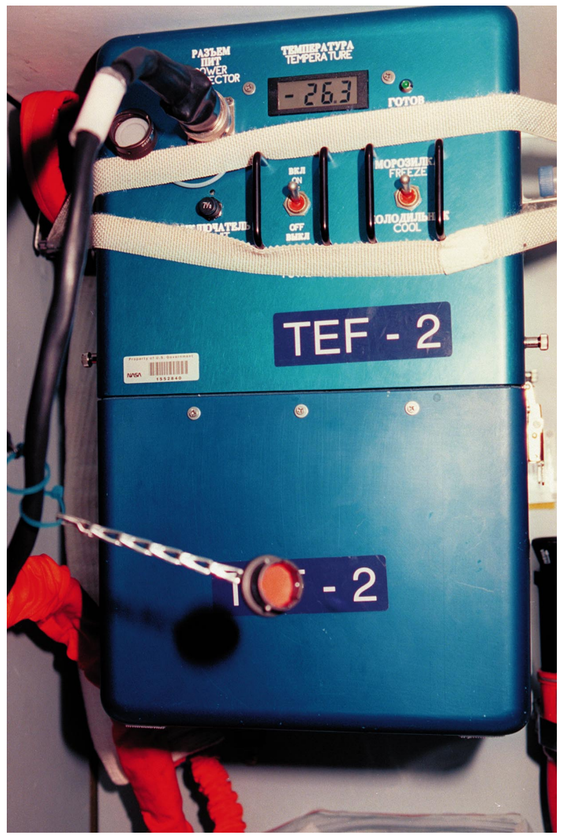
S96-18467

Figure OPS-153 TEF Active Lid Interior



S96-18468

Figure OPS-154 TEF Lower Assembly Interior



NM23-001-25

Figure OPS-152 TEF-2 in Spektr

S96-18471

Figure OPS-155 TEF Active Lid, Lower Assembly, and Complete Unit

THERMOELECTRIC HOLDING FACILITY (TEHOF) HARDWARE DESCRIPTION

The TEHOF is a supplemental freezer for the Shuttle/Mir program. Its purpose is to store biological samples previously frozen in the TEF. The TEHOF is used primarily to support Metabolic investigations such as blood, urine, and saliva.

The main body of the box is insulated and provides the cold volume. The insulation of the cold volume is fused glass vacuum panels embedded in polyurethane foam and encapsulated by aluminum or fiberglass. The interior cold-volume duct is Lexan or Teflon and directly adjoins the inner liner made of aluminum.

The TEHOF provides a temperature of -22 °C in the internal volume at an ambient temperature of 20 to 25 °C and power of 28± 4 V. In case of voltage drop to 24 V and simultaneous temperature increase to 35 °C, TEHOF internal temperature will remain at 22 °C for less than 1 hour and then increase to -9 °C after 6 hours. The TEHOF reaches -22 °C in 7 to 14 hours at ambient temperature of 20 to 25 °C and operating power of 28± 4 V.

A need to defrost is indicated by an increase of 1 to 4 °C of the internal temperature, as well as by visual inspection.

The TEHOF has an on/off power switch, which contains the circuit breaker rated at 7.5 A. Startup current is less than 7 A for not more than .01 seconds.

TEHOF consumption power is not more than 140 W at 28 V, 100 W at 24 V, and 175 W at 32 V during cool down and steady-state operation.

Inside the freezer volume, the TEHOF accommodates the following samples:

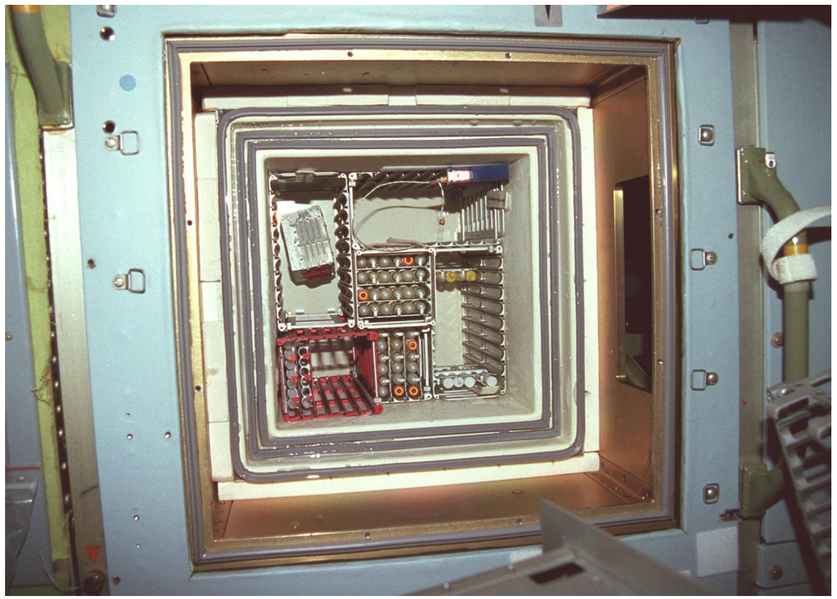
- 126 Blood Samples
- 408 Urine and/or Saliva Samples

The TEHOF system deliverables are listed in Table OPS.31.

A TEHOF to replace the one lost in Spektr flew on STS-89. It will reside in the docking compartment of Kristall and will be powered by an RBS-U.

TABLE OPS.31
TEHOF SYSTEM DELIVERABLES

Name	Qty
TEHOF Flight Assembly: These are assemblies and parts of the TEHOF, 1 Trainer	3
TEHOF Tub Assembly, 1 Trainer	3
Active Lid Assembly, 1 Trainer	3
Passive Lid Assembly, 1 Trainer	3
TEHOF Power Cable, No Trainer SEM46110384-301	2
TEHOF Foam Boot, 1 Trainer	3
TEHOF Foam Collar, 1 Trainer	3
TEHOF Shell Assembly, No Trainer	2
Sample Holder System, Separate delivery is permitted	2
Defrost Kit	
Bolt Assembly for Shell to Spektr Attachment, to be provided by Russian Party	20
Bolt Assembly for Passive Lid, to be provided by Russian Party	8
Spare Fan (cold-side)	1

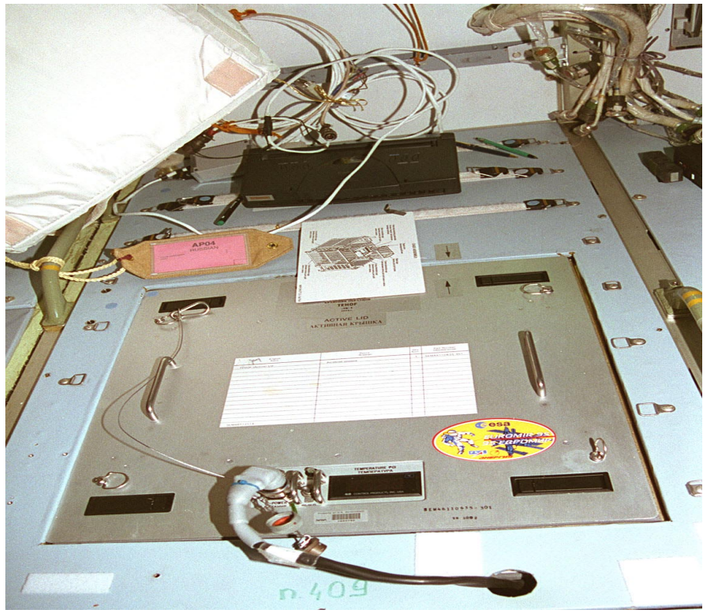


STS76-312-009

Figure OPS-156 TEHOF Interior with Sample Holder Assemblies in Spektr

STS74-326-007

Figure OPS-157 TEHOF Active Lid, Hot Side Exhaust Fans



STS76-461-019

Figure OPS-158 TEHOF in Spektr with CUPS Printer Attached to the Adjacent Wall

D.I.D.

Thermoelectric Holding Facility

TEHOF POWER CABLE ASSEMBLY

P/N: SEM46110837-301
Qty: 1
Mass: 1.80 kg
Power: 0
x,y,z: 200.00 x 0. x 0. cm
Loc: Kristall
DID#: SLM46110625

ACTIVE LID

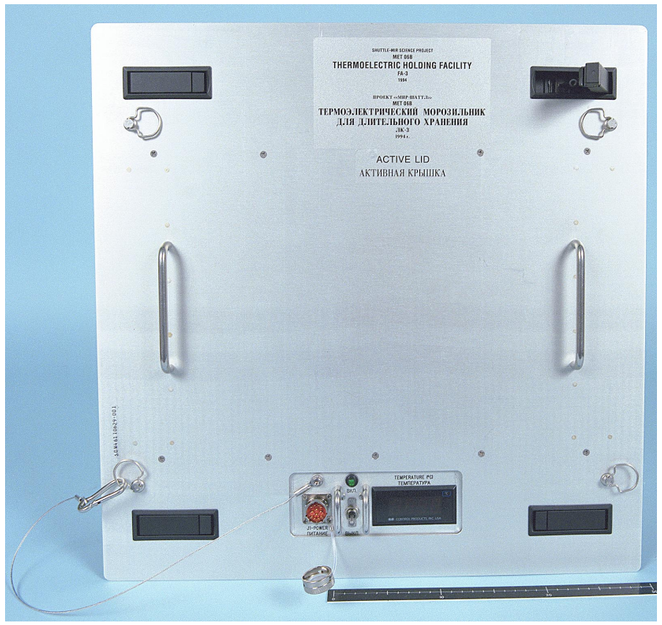
All active mechanical and electrical components are in the active lid. The active lid houses the heat pump, electrical and control circuitry, and temperature readout. Table OPS.31 lists the items located on the front panel.

S97-15730

Figure OPS-159 TEHOF Active Lid Interior

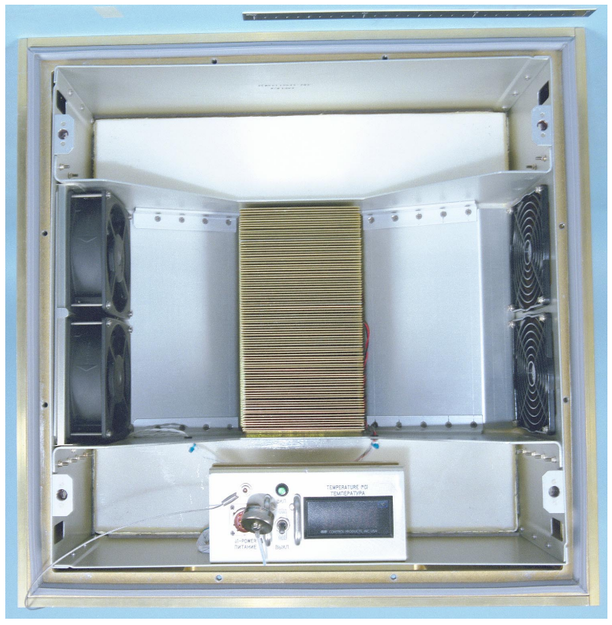
S97-15731

Figure OPS-160 TEHOF Active Lid Interior Without Fan



S97-15728

Figure OPS-161 TEHOF Active Lid Front Panel



S97-15742

Figure OPS-162 TEHOF Active Lid Without Front Panel

S97-15732

Figure OPS-163 Active Lid, Inlet

S97-15729

Figure OPS-164 Active Lid, Exhaust

TABLE OPS.32
TEHOF FRONT PANEL ITEMS

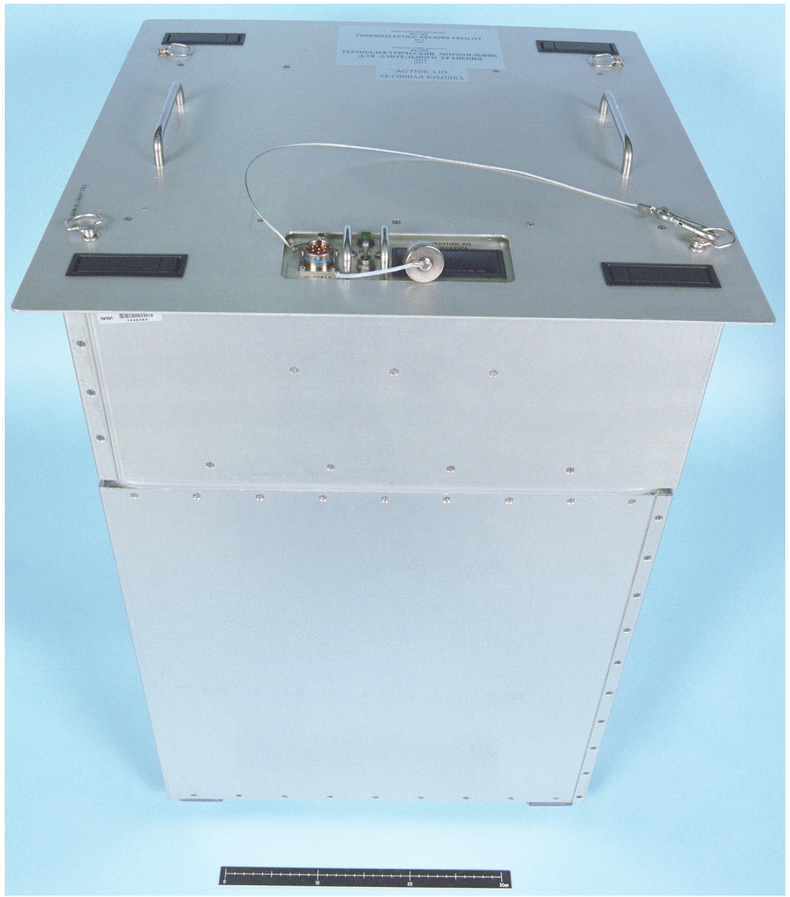
Item	Function
Power Connector Receptacle	The attachment point for the TEHOF Power Cable. The power used to operate the thermoelectric heat pump, cooling fans, and LEDs are routed through the power connector receptacle.
Power Switch	A circuit breaker used to control the power to the Active Lid.
LED Power Indicator	If a green light is illuminated, then power is being supplied to the Active Lid; if the green light is not illuminated, then the storage area of the TEHOF is not being cooled.
Temperature LED	A four-place alphanumeric LED displays the temperature inside the storage area of the TEHOF. The temperature is displayed in °C for Centigrade.
Handle	Two handles are placed on either side of the Active Lid to be used in moving the lid to and from the Tub Assembly.
Tether Cable	Attached to the front panel is one end of a tether cable with the other end attached to a wall or rack. The tether is used so the Active Lid does not float off once it is removed from the Tub Assembly.
Attachment Latch	Four latches are located on the Active Lid (one per corner). Each attachment latch activates a hook, which grabs onto a dedicated grappling location on the hard-mounted shell. With the attachment latches in extended position, the Active Lid is configured to allow a clamp to the hard-mounted shell. With the Active Lid sitting on top of the tub assembly and hard-mounted shell and with the attachment latches in the flush position, the Active Lid should be firmly attached to the hard-mounted shell. An airtight seal is then formed between the Active Lid and the Tub Assembly.
Quarter-Turn Quick Release Pin	Four devices are located on the Active Lid (one per corner). Used to quickly and easily remove the front panel from the Active Lid.

TEHOF ACTIVE LID ASSEMBLY

P/N: SEM46110635-302
Qty: 1
Mass: 15.98 kg
Power: 0
x,y,z: 52.10 x 52.10 x 33.25 cm
DID#: SLM461110626

TUB ASSEMBLY

The Tub Assembly is the container within which samples are stored. The Tub has a box-like configuration, with five sides and one open end. Each of the five sides uses a vacuum panel, contained within the walls, as its primary form of insulation. During operation of the TEHOF, the open end is covered by the Active Lid. With the Active Lid in place, the TEHOF contains a useful freezer volume of approximately 1.8 cubic feet.



S97-15724

Figure OPS-165 TEHOF Tub Assembly with Active Lid Attached

S97-15727

Figure OPS-166 TEHOF Tub Assembly, Bottom

S97-15725

Figure OPS-167 TEHOF Tub Assembly and Active Lid, Side View, Showing Active Lid Exhaust Ports

S97-15726

Figure OPS-168 TEHOF Tub Assembly, Interior

S97-15740

Figure OPS-169 TEHOF Active Lid, Front Panel

TEHOF TUB ASSEMBLY

P/N:	SEM46110625-301
Qty:	1
Mass:	19.77 kg
Power:	0
x,y,z:	47.00 x 47.00 x 52.10 cm
Loc:	N/A
DID#:	SLM46110626

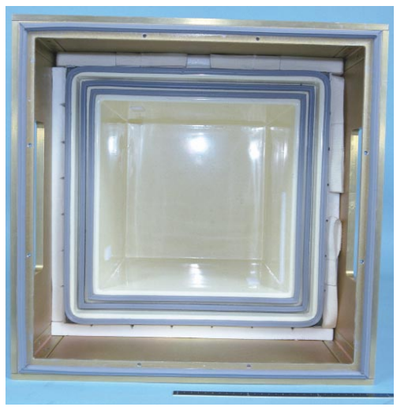
S97-15741

Figure OPS-170 TEHOF Shell Assembly with Active Lid Attached

TEHOF SHELL ASSEMBLY

The TEHOF Shell Assembly is a structural member in the shape of a five-sided box and is to be hard-mounted to the Spektr rack. When the TEHOF Tub Assembly is placed inside the Shell Assembly, the Active Lid Assembly will be latched to the Shell.

The shell assembly will be assembled inflight by the crew. The shell consists of 5 metal plates, a Flange Seal, and 5 foam pieces. Once the shell is assembled, the tub will be placed in the Shell Assembly; the active lid will then be placed in the shell assembly, and the four latches will be engaged.



S97-15739

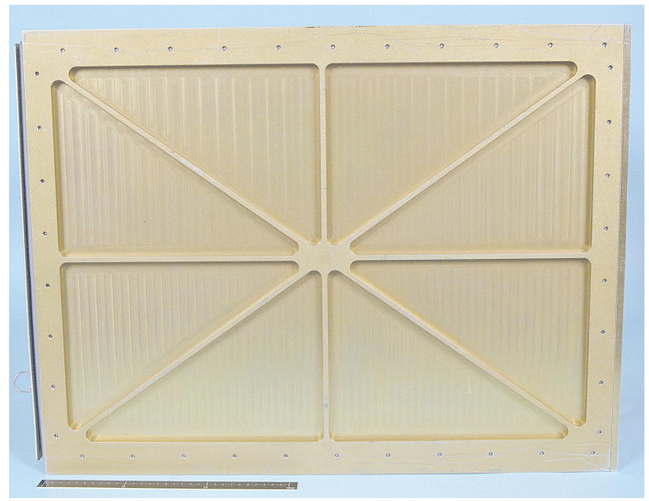
Figure OPS-173 TEHOF Tub Assembly Within the Shell Assembly

S97-15765

Figure OPS-171 TEHOF Shell Assembly, Side Plate (2 pc); Hole is to Facilitate Air Flow

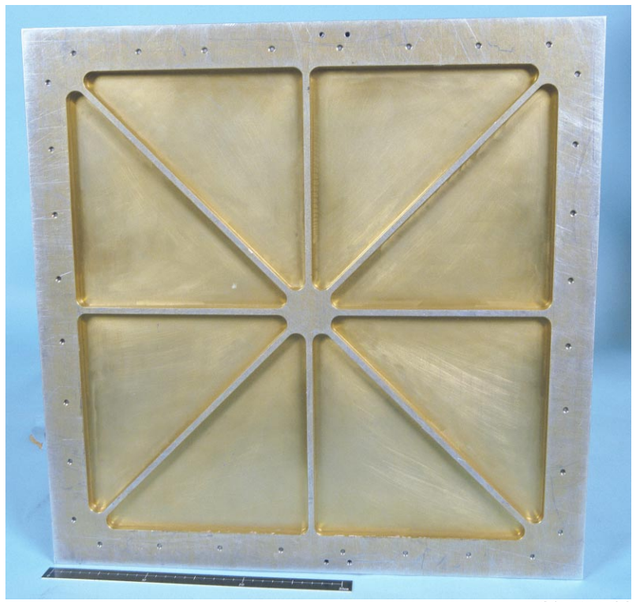
S97-15738

Figure OPS-174 TEHOF Shell Assembly, Interior



S97-15769

Figure OPS-172 TEHOF Shell Assembly, Side Plate (2 pc)



S97-15766

Figure OPS-175 TEHOF Shell Assembly, Rear Plate

SHELL ASSY, TEHOF

P/N:	SEM46109715-301
Qty:	1
Mass:	30.3 kg
Power:	0
x,y,z:	54.6 x 54.6 x 72.7 cm
Loc:	N/A
DID#:	N/A

TEHOF TEMPERATURE AND POWER SYSTEMS

The TEHOF is designed to operate as an open-loop system; no feedback circuitry is included in the TEHOF design. Instead, the TEHOF is designed to maintain a temperature within the Tub, which is approximately 50 °C below the temperature of the ambient environment.

THERMOELECTRIC HEAT PUMP SYSTEM

The TEHOF utilizes a two stage thermoelectric heat pump system. The thermal gradient across each stage is calculated to be 30°C per stage. The stages are separated by a midplate to facilitate efficient heat transfer interaction. The “hot” side of the second stage interfaces directly with the heat sink in the lid for heat dissipation to cabin air.

The thermoelectric elements are located in the thermal insulation of the lid between the exhaust heat plenum and the cold-volume lid liner. The “cold” side of the first stage interfaces directly with the cold sink for heat absorption.

THERMAL TRANSFER — HOT-SIDE

Forced air serves as the primary cooling medium. Two fans pressurize a plenum and force air through the hot-side heat exchanger fins at a rate of 220 SCFM and exhaust it into the Mir environment. The temperature of the exhaust air is calculated to be 4°C above 35°C ambient.

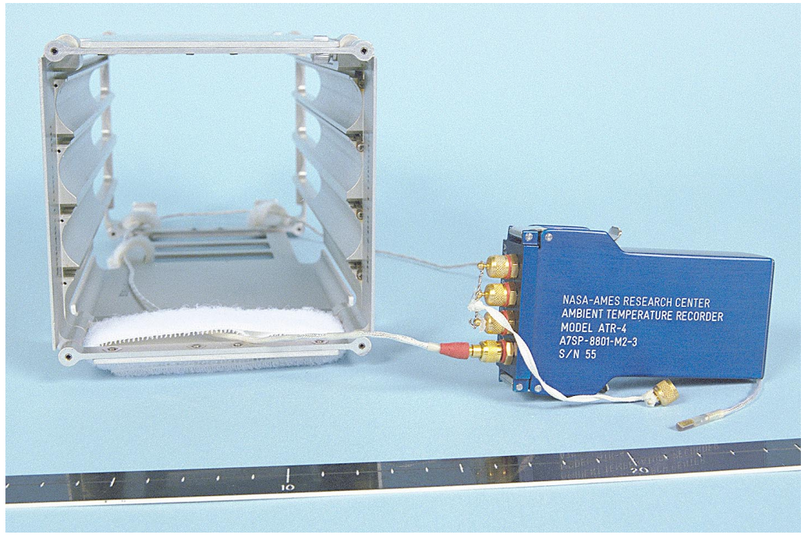
THERMAL TRANSFER — COLD-SIDE

Forced air serves as the primary cooling medium. A fan draws cold volume air through cold-side heat exchanger fins at interfaces with the fan and by a subliner to direct airflow.

BIOLOGICAL SAMPLE HOLDING SYSTEM (BSHS)

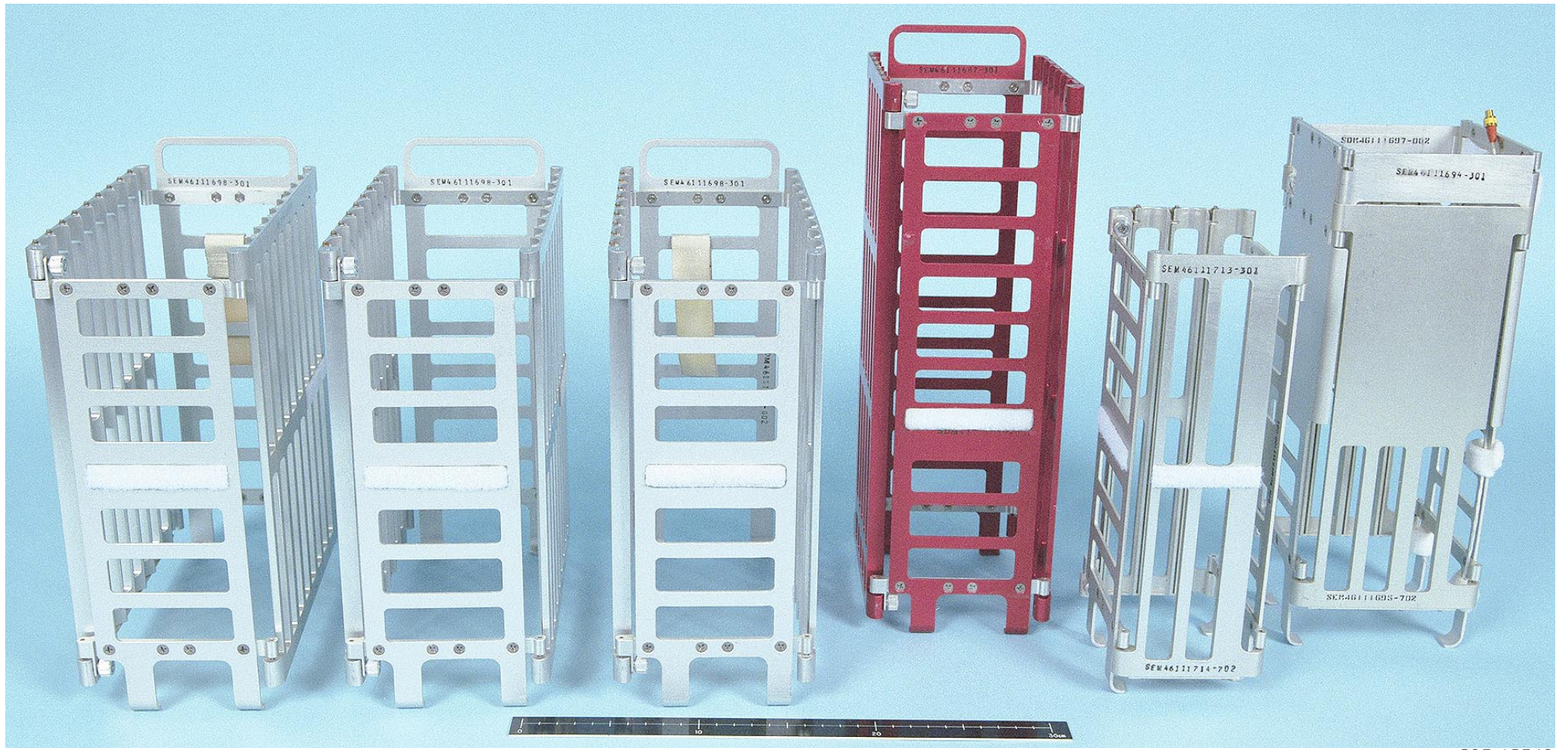
The BSHS is composed of two main subassemblies (sampleholders, sample holder cages), Ambient Temperature Recorder (ATR-4) and probe, a sampleholder extractor tool, a schedule assembly, and a Cage/TEHOF Installation Cue Card. The BSHS has a sample capacity of 126 blood samples and 408 urine and/or saliva samples. The BSHS has no electrical interconnections with the TEF, TEHOF, or other Life Sciences hardware. It is a passive system except for the ATR-4, which is a self-contained device powered by two batteries.

The extractor tool is flown in the frozen stowage transfer bag (FSTB). ✵



S97-15764

Figure OPS-177 TEHOF Urine/Saliva Center Cage and ATR

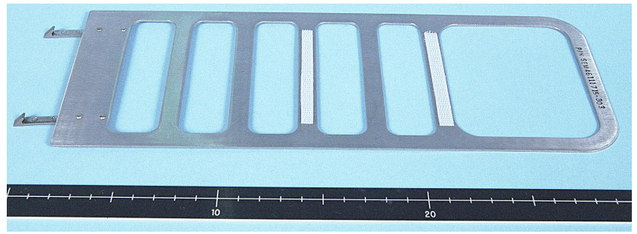


S97-15748

Figure OPS-176 TEHOF Sample Holder Cages: (L-R) Urine/Saliva, Long (Qty 3); Blood; Urine/Saliva, Short; Urine/Saliva, Center

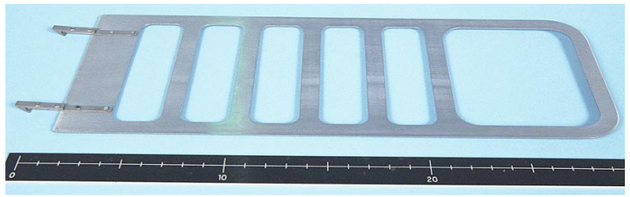
D.I.D.

Biological Sample Holder



S97-15706

Figure OPS-178 Sample Holder Extractor Assembly



S97-15707

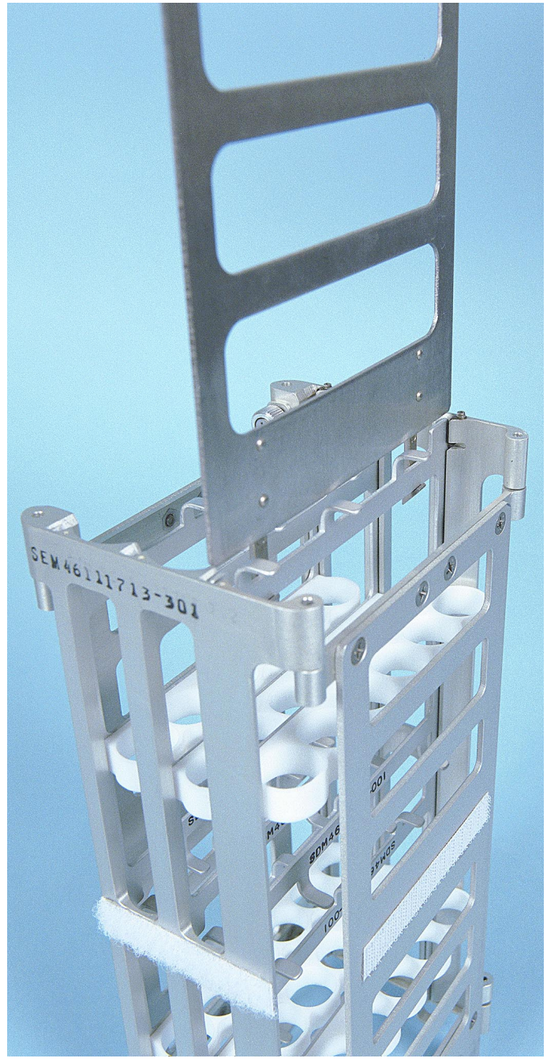
Figure OPS-179 Extractor Assembly, Reverse Side

S97-15708

Figure OPS-180 Sample Holder Cage Showing Latches to Secure Sample Cards in Place

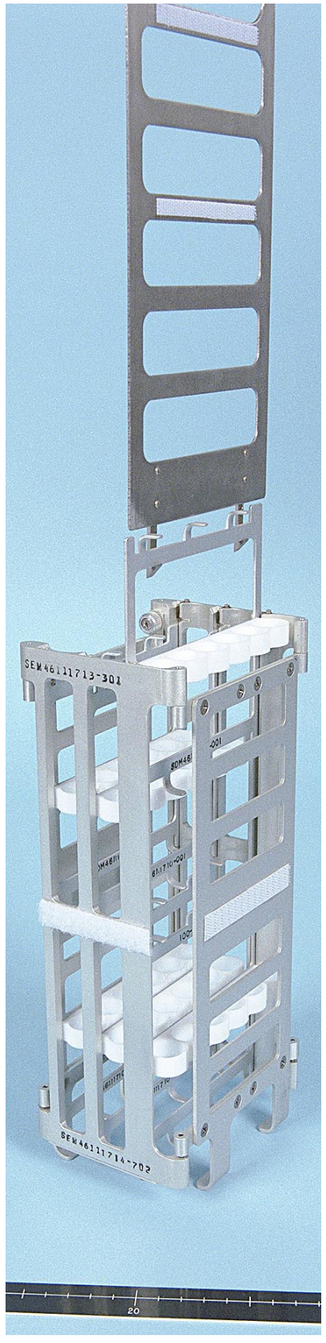
S97-15709

Figure OPS-181 Extractor Assy Operation



S97-15710

Figure OPS-182 Extractor Assy Operation, Opposite View

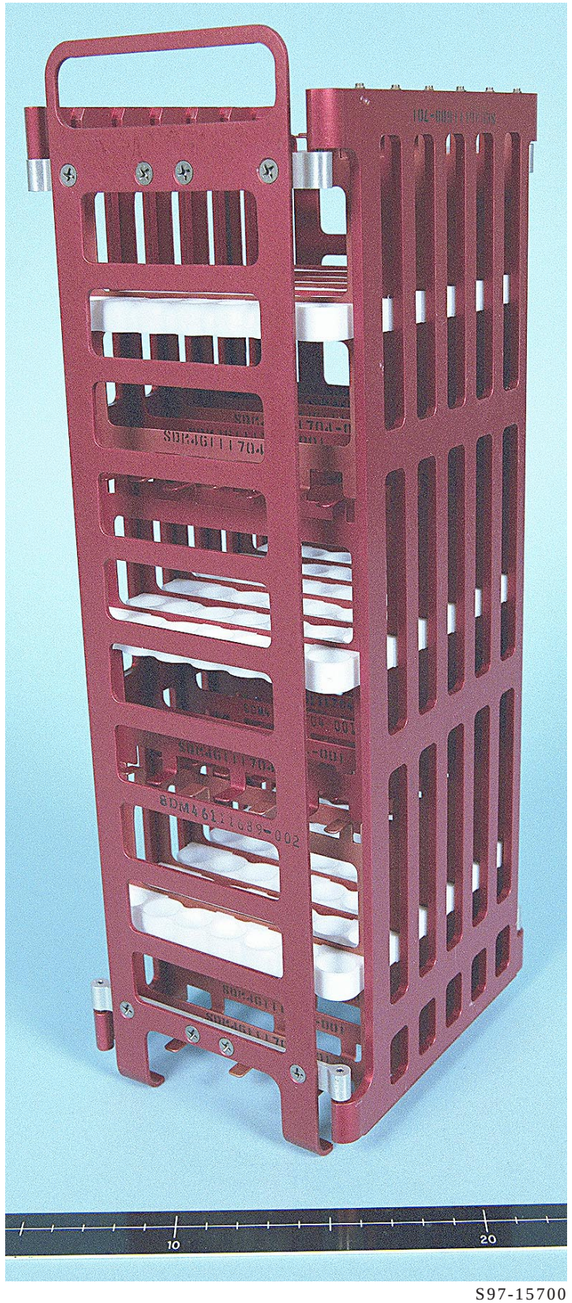


S97-15711

Figure OPS-183
Extractor Assembly Operation

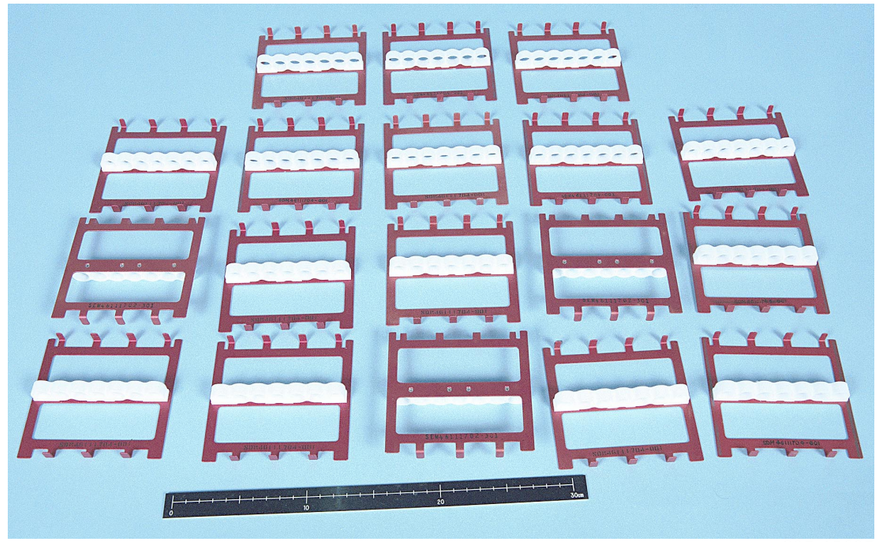
SAMPLE HOLDER EXTRACTOR ASSEMBLY

BLOOD SAMPLE HOLDER CAGE ASSEMBLY



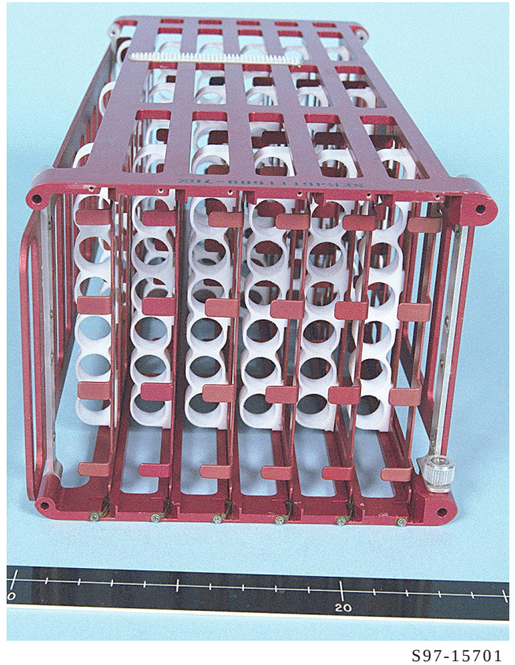
S97-15700

Figure OPS-184 Blood Sample Holder Cage



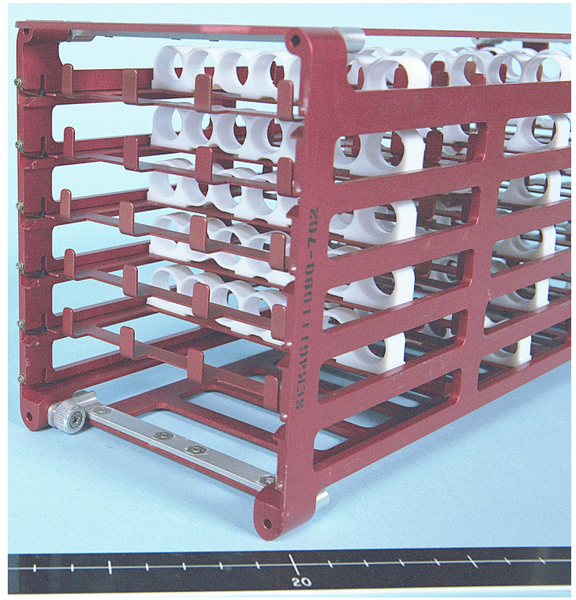
S97-15697

Figure OPS-185 Blood Sample Holders



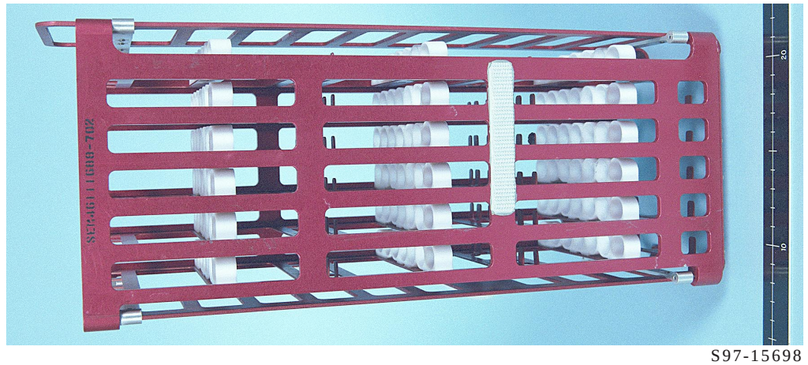
S97-15701

Figure OPS-186 Blood Sample Holder Cage, End View



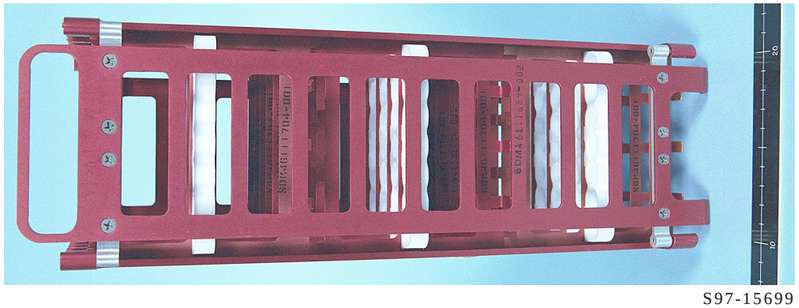
S97-15702

Figure OPS-187 Blood Sample Holder Cage



S97-15698

Figure OPS-188 Blood Cage, Side View



S97-15699

Figure OPS-189 Blood Cage, Side View

BLOOD SAMPLEHOLDER CAGE ASSEMBLY

P/N: SEM46111687-301
Qty: 1
Mass: 0.68 kg
Power: 0
x,y,z: 36.5 x 11.6 x 14.14 cm
Loc: TEHOF
DID#: SLM46112007

SAMPLEHOLDER ASSEMBLY, BLOOD

P/N: SEM46111702-301
Qty: 18
Mass: 0.03 kg
Power: 0
x,y,z: 11.2 x 1.7 x 10.8 cm
Loc: TEHOF
DID#: SLM46112007

S97-15753

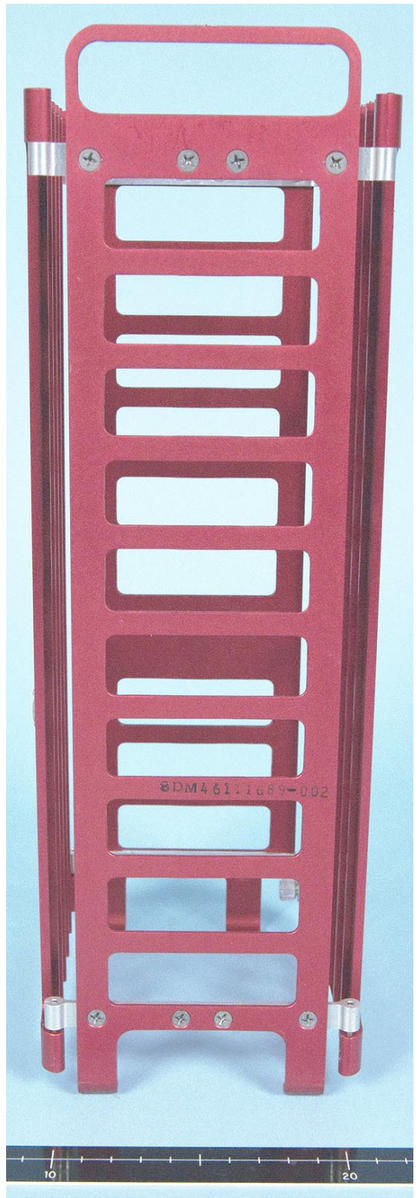
Figure OPS-190 Blood Cage, End View

S97-15749

Figure OPS-191 Blood Cage, Side View

S97-15751

Figure OPS-192 Blood Cage, Side View



S97-15750

Figure OPS-193 Blood Cage, Side View

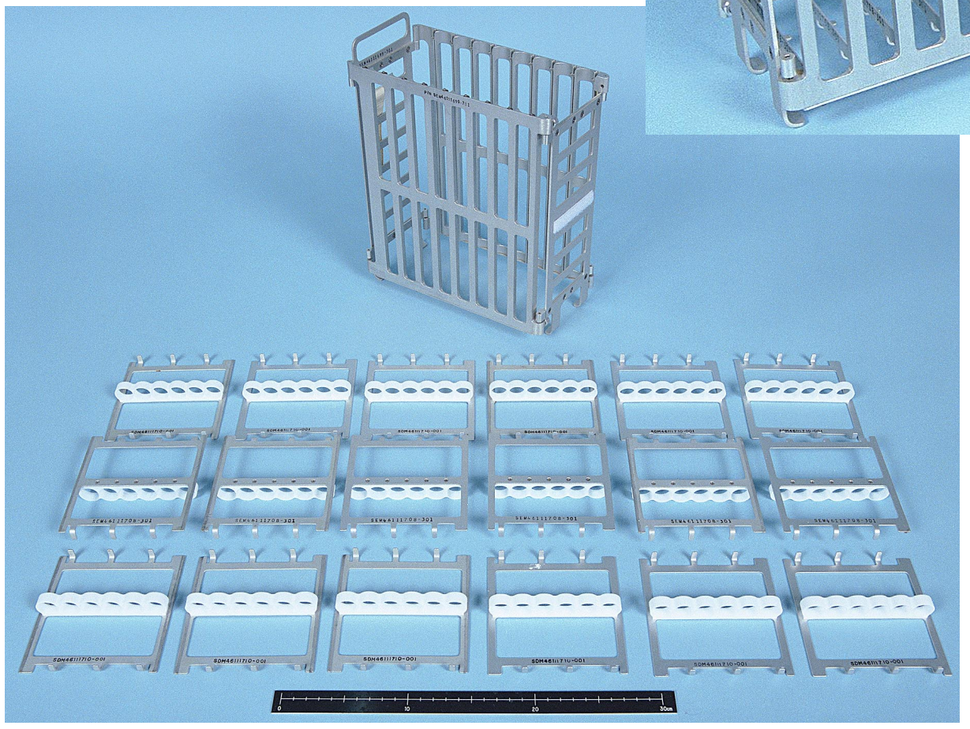
S97-15752

Figure OPS-194 Blood Cage, Side View

URINE/SALIVA SAMPLE HOLDER CAGE ASSEMBLY, LONG

S97-15713

Figure OPS-197 Urine/Saliva Sample Holder Cages, Long (Qty 3)



S97-15714

Figure OPS-195 Full Complement of Urine/Saliva Sample Holders for Long Cage

S97-15693

Figure OPS-196 Urine/Saliva Cage, Side View

CAGE ASSEMBLY SAMPLEHOLDER URINE/ SALIVA, LONG

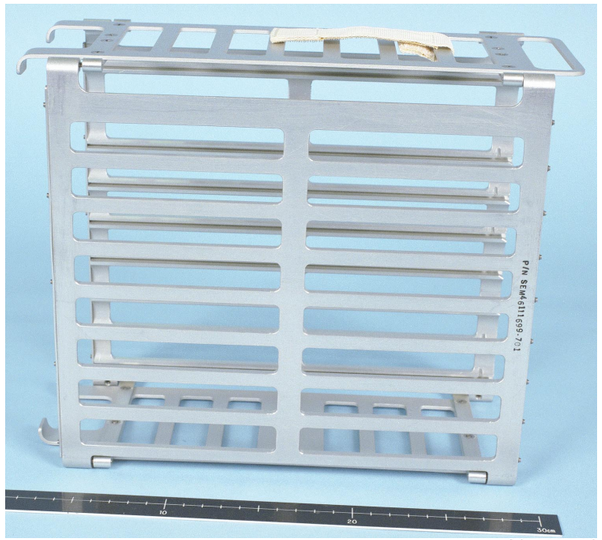
P/N: SEM46111698-301
Qty: 3
Mass: 0.78 kg
Power: 0
x,y,z: 28.90 x 11.6 x 23.20 cm
Loc: TEHOF
DID#: SLM46112007

SAMPLEHOLDER ASSEMBLY, URINE/SALIVA

P/N: SEM46111708-301
Qty: 68
Mass: .03 kg ea.
Power: 0
x,y,z: 11.30 x 2.10 x 12.10 cm
Loc: Kristall
DID#: SLM46112007

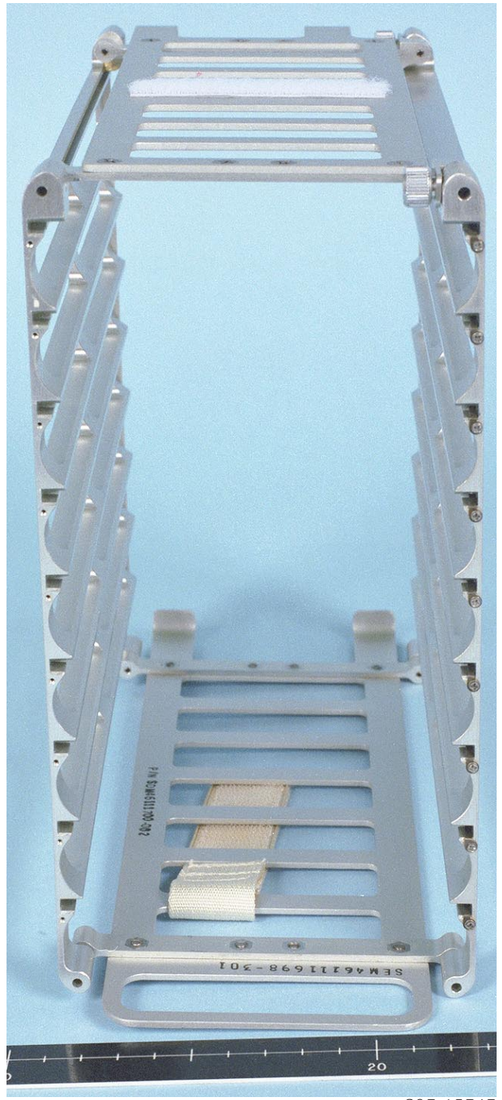
S97-15743
Figure OPS-198 Urine/Saliva Cage, Side View

S97-15745
Figure OPS-199 Urine/Saliva Cage, Side View



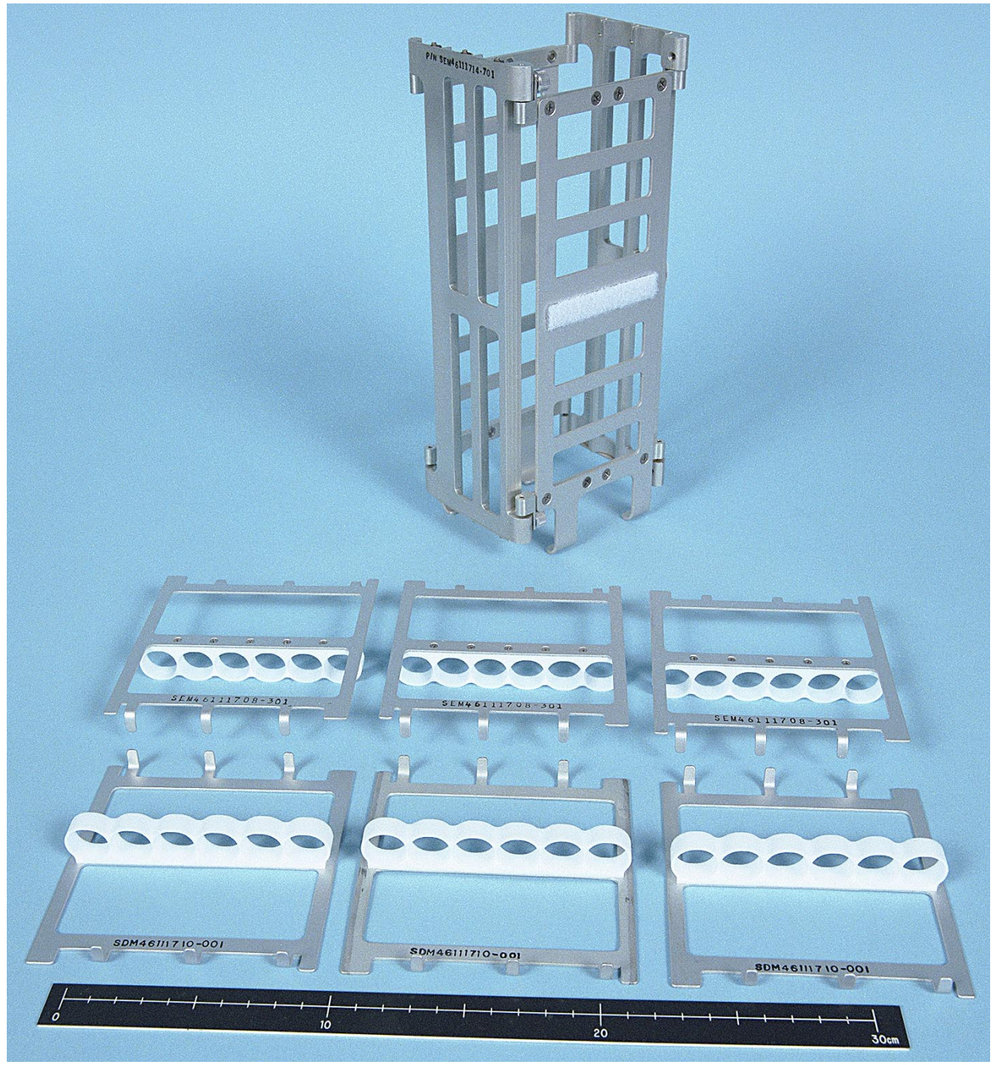
S97-15746
Figure OPS-200 Urine/Saliva Cage, Side View

S97-15744
Figure OPS-201 Urine/Saliva Cage, Side View



S97-15747
Figure OPS-202 Urine/Saliva Cage, End View

URINE/SALIVA SAMPLE HOLDER CAGE ASSEMBLY, SHORT

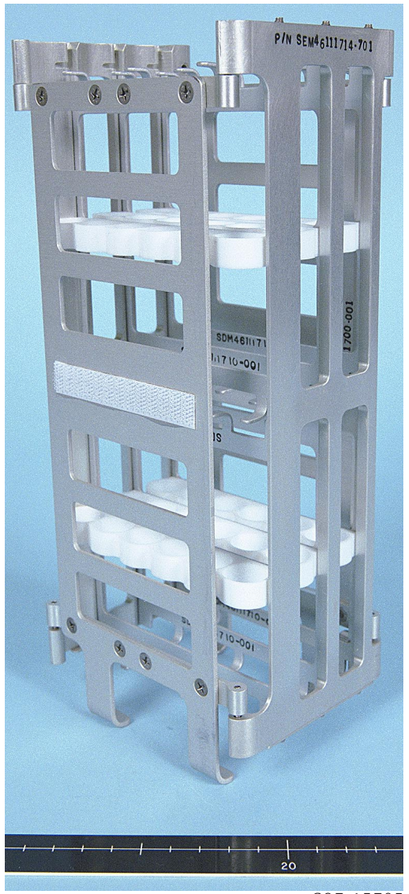


S97-15712

Figure OPS-203 Full Complement of Urine/Saliva Sample Holders for Short Cage

S97-15703

Figure OPS-204
Urine/Saliva Short Cage, Side View



S97-15705

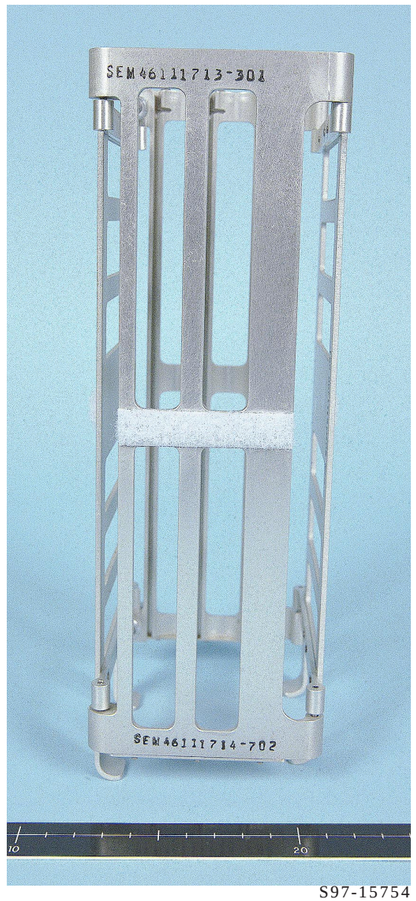
Figure OPS-205 Urine/Saliva Sample Holder Short Cage Assembly

S97-15704

Figure OPS-206 Urine/Saliva Short Cage, Side View

URINE/SALIVA SAMPLEHOLDER CAGE ASSY (SHORT)

P/N:	SEM46111713-301
Qty:	1
Mass:	0.41 kg
Power:	N/A
x,y,z:	27.2 x 11.6 x 8.9 cm
Loc:	TEHOF
DID#:	SLM46112007



S97-15754

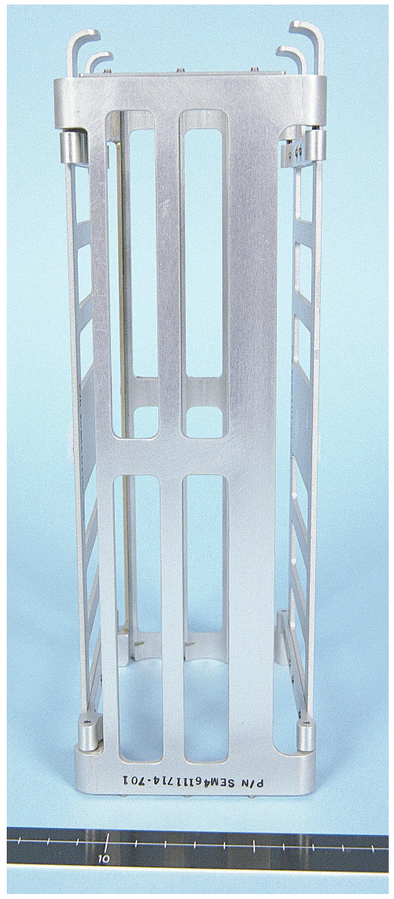
Figure OPS-207
Urine/Saliva Short Cage, Side View

S97-15758

Figure OPS-208
Urine/Saliva Short Cage, End View

S97-15755

Figure OPS-209 Urine/Saliva
Short Cage, Side View



S97-15756

Figure OPS-210
Urine/Saliva Short Cage, Side View

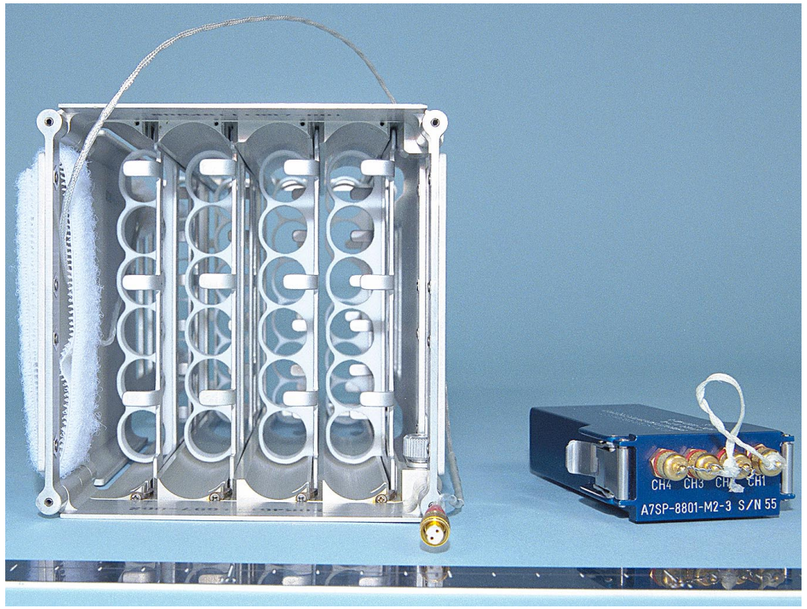
S97-15757

Figure OPS-211
Urine/Saliva Short Cage, Side View

URINE/SALIVA SAMPLE HOLDER CAGE ASSEMBLY, CENTER AND AMBIENT TEMPERATURE RECORDER

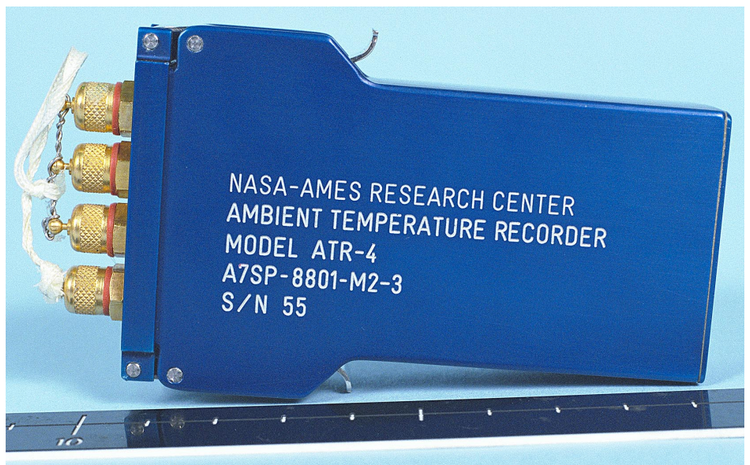
S97-15715

Figure OPS-212 Urine/Saliva Sample Holder Center Cage Assy



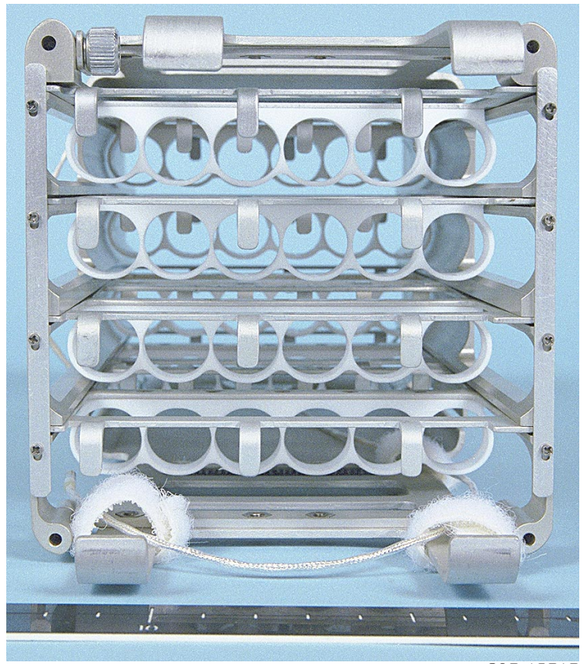
S97-15716

Figure OPS-213 Urine/Saliva Center Cage and ATR



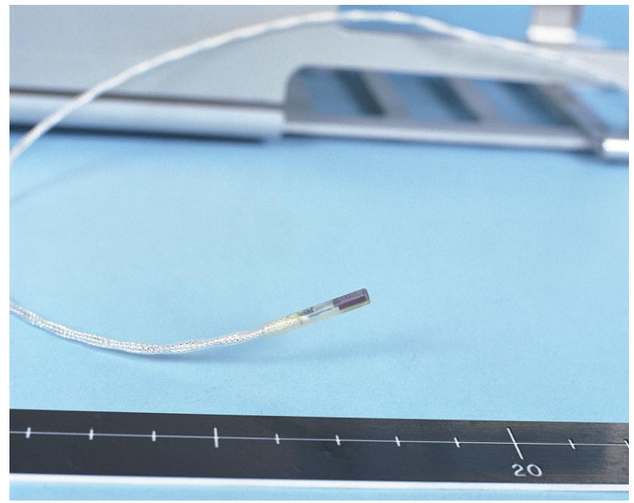
S97-15695

Figure OPS-214 Ambient Temperature Recorder (ATR)



S97-15717

Figure OPS-215 Urine/Saliva Center Cage, End View



S97-15696

Figure OPS-216 Temperature Probe

URINE/SALIVA SAMPLEHOLDER CAGE ASSY (CENTER)

P/N: SEM46111694-301
Qty: 1
Mass: 0.77 kg
Power: 0
x,y,z: 31.6 x 11.6 x 11.6 cm
Loc: Kristall
DID#: SLM46112007

CAGE SAMPLEHOLDER ASSEMBLY, (CENTER)

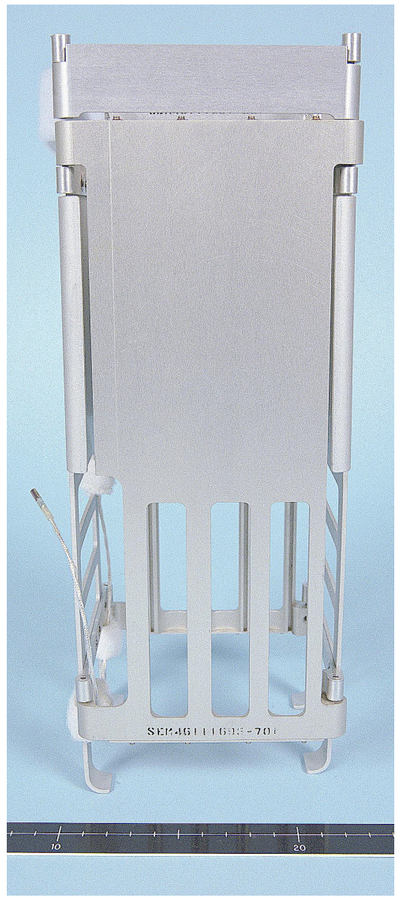
P/N: SEM46111694-301
Qty: 1
Mass: 0.77 kg
Power: 0
x,y,z: 31.6 x 11.6 x 11.6 cm
Loc: TEHOF
DID#: SLM46112007

AMBIENT TEMPERATURE RECORDER ASSEMBLY-ATR-4

P/N: A7SP-8801-M2-3
Qty: 1
Mass: 0.12 kg
Power: 0
x,y,z: 10.4 x 5.6 x 2.4 cm
Loc: TEHOF
DID#: SLM46112007

AMBIENT TEMPERATURE RECORDER ASSEMBLY ATR-4 PROBE

P/N: A7SP-8801-M12-36
Qty: 1
Mass: 9.76 g
Power: 0
x,y,z: 915 x 7.63 mm
Loc: TEHOF
DID#: SLM46112007

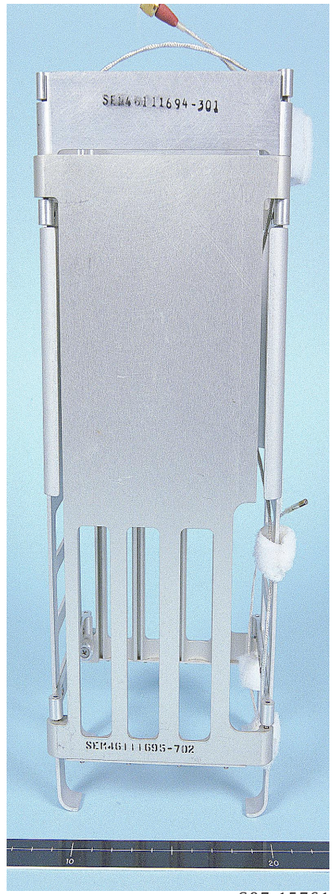


S97-15759

Figure OPS-217 Urine/Saliva Center Cage, Side View

S97-15760

Figure OPS-218 Urine/Saliva Center Cage, Side View

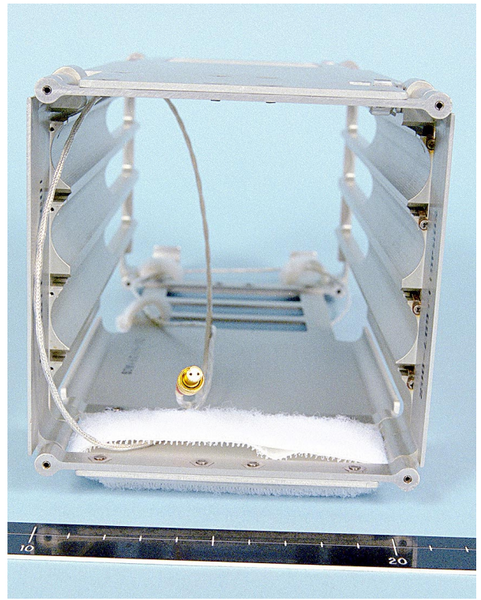


S97-15761

Figure OPS-219 Urine/Saliva Center Cage, Side View

S97-15762

Figure OPS-220 Urine/Saliva Center Cage, Side View



S97-15763

Figure OPS-221 Urine/Saliva Center Cage, End View, with Temperature Probe Connector

S97-15694

Figure OPS-222 Temperature Probe Connector and ATR Connector Panel

UNIVERSAL BATTERY CHARGER (UBC)

HARDWARE DESCRIPTIONS

The UBC is a state-of-the-art test instrument capable of performing all the functions needed by a typical battery user. It contains a microcomputer control system that will automatically process up to six rechargeable batteries and a programmable power supply based on the latest switch-mode technology. The compact front panel allows the user to easily initiate battery processing, monitor and evaluate ongoing functions, or quickly set up for processing a new battery.

The new UBC is designed to charge up to six batteries of the same or different types sequentially. The types of batteries capable of being serviced include Silver-Zinc, Nickel-Cadmium, and Lead-Acid. The UBC can also discharge, analyze, and recondition batteries, or act as a power supply. Power supply input voltage shall be limited to 28 +/- 5V DC, and the output power is limited to 100 watts. The UBC is convection cooled and requires a minimum of 2 inches free air clearance on all sides and 4 inches on the top. Operation of the UBC is achieved using the built-in keypad or by attachment to a DOS-run computer.

The UBC is powered by an RBS-U.

The UBC performs the following functions:

- Charge any rechargeable battery type
- Charge Nickel-Cadmium batteries using the reFLEX charge mode
- Charge all batteries in an optimized charge mode
- Slow or “trickle” charge batteries
- Analyze batteries for discharge capacity
- Analyze batteries for charge capacity
- Recondition Nickel-Cadmium batteries, eliminate memory
- Discharge batteries for storage or shipment
- Provide power supply capability

If the input power is interrupted for any reason, when later restored, the UBC will resume operation from the point of interruption.

DISPLAY AND CONTROLS

The front panel is the user’s interface with the UBC. It contains all connections and controls that need ready access. A description of the various parts follows.

CONNECTORS AND CABLES

- Battery Connectors:

  The numbered channel connectors allow as many as six batteries of the types listed previously to be processed by the UBC.

- Battery Cables:

  These cables (provided with the UBC) connect the battery to the UBC and allow the UBC to identify the battery type connected.

- Special Cable 132:

  Part Number 122132-032. This cable will be assigned to a specific battery at the time of operation, unlike the other cables that are preassigned.

KEYBOARD

The keyboard is the main interface for programming and operation of the UBC. The keyboard is divided into function keys and an alphanumeric keypad for programming functions.

Function Keys

- SHIFT Key:

  The SHIFT key is used with the other keys to provide expanded capability. This is referenced as either UP-SHIFT/(other key) or DOWN-SHIFT/(other key) and is accomplished by pressing the appropriate side of the SHIFT key, then the other key. The selected key responds one way when used alone, another way when used with the UP-SHIFT key, and a third way when used with the DN-SHIFT key. See later sections relating to specific details about this feature.

- DISPLAY Keys:

  Each of the DISPLAY keys causes the information shown on the Liquid Crystal Display (LCD) screen to change and show the requested information. The DISPLAY information will appear for a few seconds, then the screen will revert to displaying the active channel information. The factory setting is 5 seconds. The display information can also be “locked” on the screen by pressing UP SHIFT/L when the display is active.

  - *Battery Voltage:*

    Pressing the VOLTS key turns the top line of the LCD screen into a digital voltmeter, which shows the channel selected for viewing and the voltage of the battery connected to that channel.

    UBC interrupts charging and discharging very briefly each second to read and display the battery voltage. This eliminates any voltage errors due to cable resistance.

    While in the VOLTS mode, the channel to be viewed is selected by using the ARROW keys. Press the RIGHT ARROW key to meter the next higher numbered channel and the LEFT ARROW key to meter the next lower numbered channel.

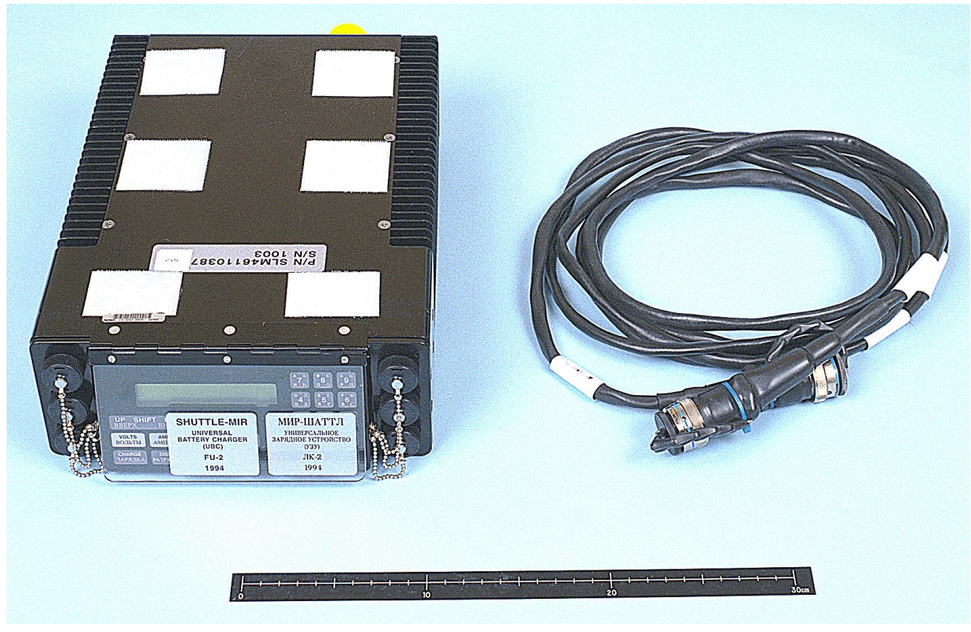
  - *AMPS Key:*

    When the AMPS key is pressed, the top line of the LCD screen acts as a digital ammeter. While in the AMPS mode, press the RIGHT ARROW key to view the next higher numbered channel and the LEFT ARROW key for the next lower.

    During “Simultaneous Alt Charge” (UP-SHIFT/ALT CHARGE), the current displayed is peak current, usually six times the ALT CHRG AMPS value. The average current to the battery is one-sixth of the displayed value.

  - *TYPE Key:*

    Pressing the TYPE key displays battery data. Use the RIGHT ARROW key to view



S97-17391

Figure OPS-223 Old UBC Hardware (Current Unit Has no Arm Beneath the Unit)

D.I.D.

Universal Battery Charger

Principal Investigator:
Carl Dillon
Lockheed Martin
(281)483-7389

SHUTTLE/MIR UNIVERSAL BATTERY CHARGER

P/N:	SLM46110387-302
Qty:	1
Mass:	4.7 kg
Power:	100 W
x,y,z:	34.4 x 22.3 x 9.35 cm
DID#:	SLM46109789

the next higher numbered channel, or the LEFT ARROW key for the next lower. If no battery cable is connected to a selected channel, or if the UBC has been improperly recalibrated, the message “Unknown type” will be displayed.

Pressing UP-SHIFT/TYPE causes the top line to display the selected channel number and the cable ID number.

DOWN-SHIFT/TYPE is used with special battery cable #122132 to assign that cable to the desired battery type.

- *HISTORY Key:*

  Pressing the HISTORY key recalls the status of completed TASKs to the LCD display. The channel to be viewed is selected by using the ARROW keys. Press the RIGHT ARROW key to view the next higher numbered channel, or the LEFT ARROW key to view the next lower numbered channel.

  Once a battery has been connected, the battery's serial number or other identification data may be entered by pressing DOWN-SHIFT/HISTORY then entering the data before any process is selected. This information will be included on the printout or voltage graph.

  Pressing UP-SHIFT/HISTORY displays the previously entered battery serial number or ID.

  When the battery is disconnected, the HISTORY and ID numbers for that channel are retained, but as soon as another battery is connected, the data is erased. The HISTORY and ID data are also erased if the cable is disconnected from the UBC or if DOWN-SHIFT/STOP is pressed.

- CHARGE Key:

  Pressing the CHARGE key initiates a standard (fast reFLEX charge for Nickel-Cadmium, constant voltage for lead-acid, constant current for silver-zinc, etc.) charge cycle with charge current set by the CHARGE AMPS entry, charge type and cutoff mode set by the CHARGE CODE entry, and the maximum time controlled by the CHARGE TIME parameters in the Parameter Table OPS.32 for the battery type selected. These settings are pre-programmed into the software and only for verification purposes. The Parameter Table is available in the program as well.

- DISCHARGE Key:

  Pressing the DISCHARGE key initiates a discharge cycle with current set by the DISCHARGE AMPS and cutoff voltage set by the DISCHG V/CELL entry for the selected battery type.

- ANALYZE/RECOND Key:

  - *Analyze Discharge Capacity:*

    Pressing ANALYZE/RECOND key starts discharge/charge cycle, where the charge rate is the CHARGE AMPS, and the discharge rate is the DISCHARGE AMPS for the battery type selected. After running the discharge TASK, the discharge ampere-hours (Ah) and the elapsed time of the discharge will be displayed.

  - *Analyze Charge Capacity:*

    Pressing the UP-SHIFT then the ANALYZE/RECOND key starts a discharge/charge cycle with the discharge current set by the DISCHARGE AMPS entry, and the charge current set by the CHARGE AMPS entry for the battery type selected. The charge time and charge Ah rating are displayed at the conclusion of the FUNCTION.

  - *Recondition FUNCTION:*

    Pressing DOWN-SHIFT then ANALYZE/RECOND starts a “charge/discharge/charge” cycle, which is repeated three times. At the FUNCTION conclusion, the last discharge time and Ah rating are displayed. This FUNCTION is intended for reconditioning Nickel-Cadmium batteries with faded capacity (memory).

- ALT CHARGE Key:

  - *Slow Charging:*

    Pressing the ALT CHARGE key starts a low-rate constant current charge. The six connected batteries (channels) are serviced one at a time in numerical sequence. The charge rate is the ALT CHRG AMPS for the selected battery type; the charge terminates at the time defined by the ALT CHARGE AMPS entry in the same Parameter Table.

    NOTES: All new batteries, batteries that have been in extended storage, or batteries that display an Ls* or Ra* error must be charged on ALT.Charge or Simultaneous ALT.Charge.

    The ALT CHARGE function must not be used on Silver-Zinc batteries.

  - *Simultaneous Slow Charging:*

    Pressing the UP-SHIFT/ALT-CHARGE initiates “simultaneous” low-rate constant current charging of up to six batteries at a time. Total charge time for all six batteries will be the same as for one.

    This charge mode is not truly simultaneous. Rather, each output channel in turn is active for 10 seconds each minute. The actual charging current during the active 10 seconds will be “^Alt Curr Mult” parameter in Table 099 (set to ‘6’ at the factory) times the ALT CHRG AMPS for the selected battery type. The average current to each battery is therefore the same as the ALT CHRG AMPS value. This process proceeds for the time specified in the ALT CHARGE TIME parameter for each battery.

  - *Maintenance Charge:*

    Pressing DOWN SHIFT/ALT CHARGE starts a maintenance current charge of up to six batteries at a time. This is usually half the slow charge rate. Maintenance charge is used to “float” batteries after normal charge so that they are maintained at full charge.

    The actual charging current used will be “vAlt Curr Mult” parameter in Table 099 (set to ‘3’ at the factory) times the ALT CHRG AMPS for the selected battery type. On each channel in turn, this higher current is on for 10 seconds, then off for 50 seconds. This process proceeds until stopped by the operator.

    CAUTION: The ALT CHARGE FUNCTION must not be used to charge Silver-Zinc batteries.

- STOP CHAN Key:

  The STOP key is active at all times during operation. STOP should be used whenever process interruption is required. There are three STOP modes available:

  - The STOP key halts any active process and retains HISTORY information for later display on the LCD screen. Pressing the STOP key a second time returns to the “ok” opening message. To restart or start a new FUNCTION, press the desired FUNCTION key when the “ok” message screen is displayed.

  - UP-SHIFT/STOP halts operation of the presently active channel and begins the same FUNCTION on the next higher numbered channel that has a battery connected.

  - DN-SHIFT/STOP (hold the STOP key until a second “beep” is heard) halts all processing, clears HISTORY information, and returns to the “ok” opening message.

Data (Alphanumeric) Keys

The Alphanumeric keys enter the number or symbol shown in the center of the key. UP-SHIFT, then one of the Alphanumeric keys enters the letter that appears in the upper left corner of the key. DN-SHIFT, then one of the Alphanumeric keys enters the letter that appears in the lower right corner of the key.

Most alphanumeric keys have preassigned functions from the "O" screen. For example:

- "D" (download) starts the UBC sending download data.
- "K" (calibration) forces a self-recalibration of the analog-to-digital converters.
- "L" (lock) locks the display so that only one piece of data is shown (such as AMPS only, volts only etc.).
- "P" (print) allows the user to print a copy of the LCD display, a status display, or history display.
- "Q" (query) initiates program inspection mode so that the user can view program values, but not alter them.
- "R" (recalibrate) puts the UBC into full recalibration mode.

  WARNING: Immediately press STOP unless you actually intend to recalibrate the UBC!

- "U" (user) is the standard factory setting.
- "V" (volt) places the UBC in power supply mode. Cable 122098 is required to operate in this mode.
- "W" (watch) displays the internal clock and calendar settings.

LCD Display

The LCD is used to show information to the operator. Displayed messages will differ for various operations.

Rear Panel

The rear panel of UBC contains the power input connector and serial data connector.

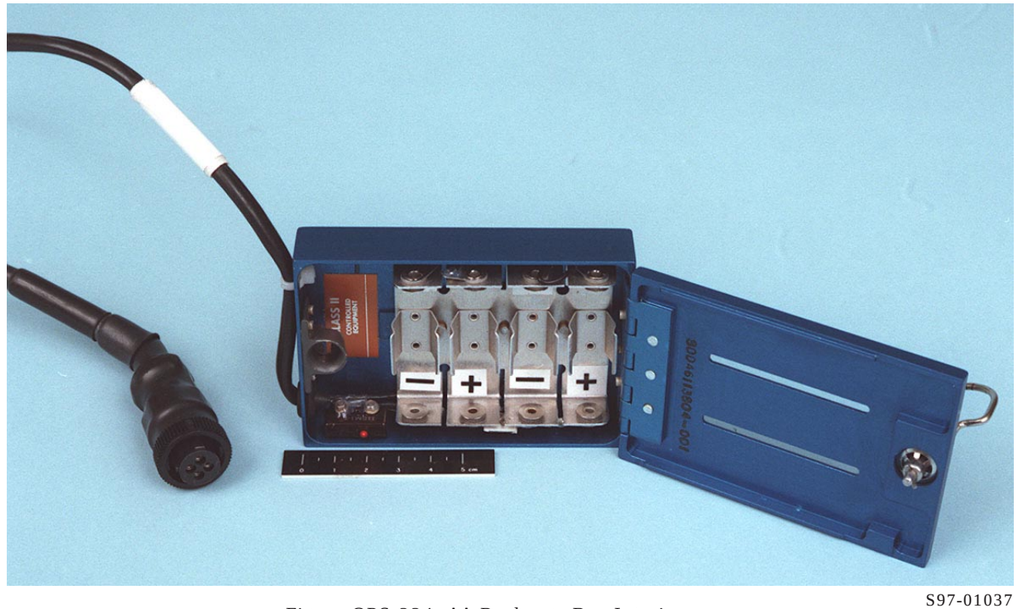
- Power Input Connector:

  UBC (DC input) — The input power cable provided with the UBC is prewired for easy connection. The positive wire is RED, negative is BLACK. The UBC is rated at 5 amps maximum input current; the wiring to it should be sized accordingly. Generally, use American Wire Gauge (AWG) 10 wire for the low range (12V DC nominal), and AWG 12 for high range (24 or 28V DC nominal). Use a larger wire size if a long run of wire is needed.

  The UBC input power connector is an MS3476L14-12S. The terminals are solder-type and should be installed only with the proper tools.

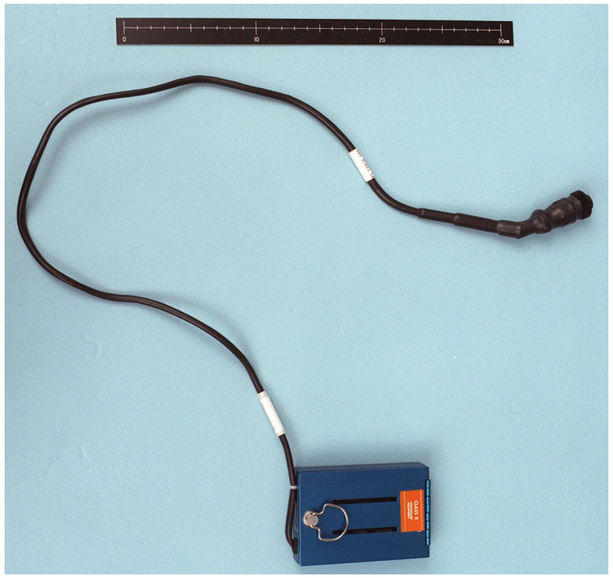
  The terminal adjacent to the red alignment mark of the connector is the positive terminal.

WARNING: Take care to observe the correct polarity of the DC power connections as designated on the connector and the UBC rear panel. Incorrect polarity will result in a blown input power fuse.



S97-01037

Figure OPS-224 AA Recharge Box Interior



S97-01036

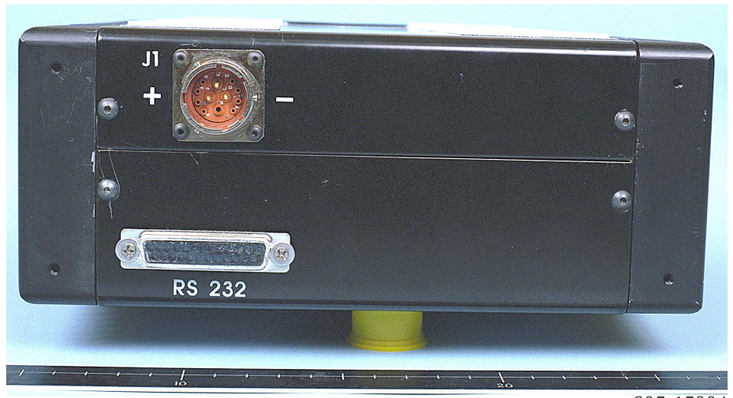
Figure OPS-226 AA Recharge Box

S97-01035

Figure OPS-225 Universal Battery Charger
(Flight Version is Without the Stand) Attached to AA Recharge Box

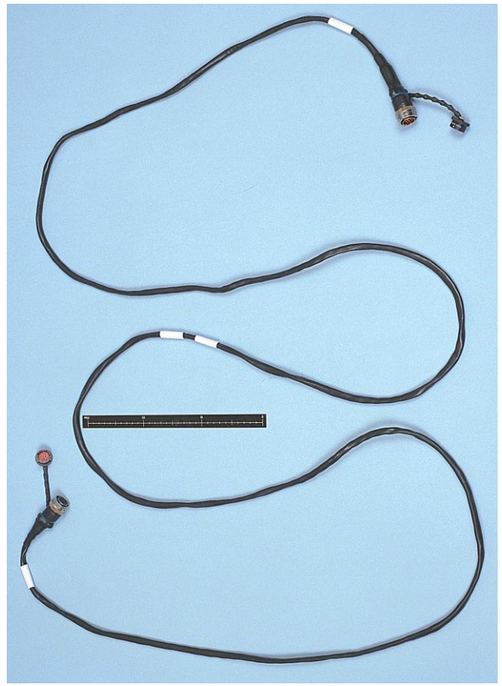
TABLE OPS.33
PARAMETER TABLE

Universal Battery Charger (UBC) Battery Tables Jan-96				
CABLE	RESISTOR	BATTERY NAME	PARAMETER	CHARGE TIME
98	2.80K	BPAS	099	3 HOURS
101	3.61K	BCR BATTERY	001	35 MINUTES
102	3.92K	MAS BATTERY	002	14 HOURS
104	4.53K	CD-4 CELL BATT	004	3-4 HOURS
105	4.87K	CD-4 CELL BATT	005	3-4 HOURS



S97-17394

Figure OPS-228 UBC Connector

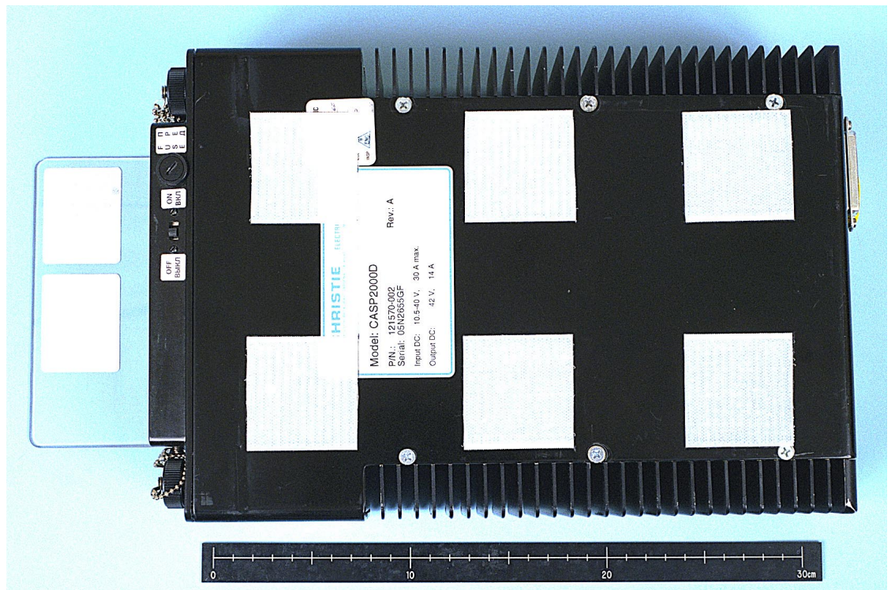


S97-17395

Figure OPS-230 UBC Cable

S97-17392

Figure OPS-227 UBC Front Panel



S97-17393

Figure OPS-229 UBC Top Panel

- Serial Data Connector:

  The 25-pin D-sub connector is an RS-232 serial interface to a printer, DOS computer, or another UBC.

Power Switch

The “ON” and “OFF” power switch is located under the right side of the front panel.

5-Amp Fuse

This is the main power fuse and it is located under the right side of the front panel. ❋