

Approved per signature page

SERVICE MODULE
ORLAN OPERATIONS
(Orlan Ops)
SM

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Revision Log

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INTRODUCTION

These crew procedures "Orlan Operations" contain information on Orlan-M Space Suit and Orlan Interface Unit operation.

These crew procedures are intended for trained crew members who have completed the full training course and simulations.

These crew procedures may be updated pending systems modification and procedure validation at simulators and training facilities.

Duration of operations is approximate.

LIST OF USED ABBREVIATIONS AND ACRONYMS

cb	circuit breaker
cnctr	connector
EVA	Extravehicular Activity
LED	Light-Emitting Diode
MCC-M	Mission Control Center - Moscow
pb	pushbutton
sw	switch
ЗВУК	acknowledge audio alarm from ПОВ or ПО-4
АСУ	toilet
АФУ	antenna feeder unit
БК-3	oxygen tank
БК-3(1-4)	onboard oxygen tanks
БНП	portable repress tank
БОС	Degassing pump unit
БРТА	Orlan telemetry unit
БСС	Orlan interface unit
ВС	moisture collector
ЗИП	spares kit
ИД	ПОВ pressure indicator
ИК	CO ₂ measurement unit
ИНЖ	injector
КВД	pressure equalization valve
КВО	liquid cooling garment
КСД	depress valve
ЛП	LiOH canister
МВ	pressure gauge
МН	pressure gauge
ПГПУ	Orlan pneumohydraulic control panel
ПКО-М	Orlan testing unit
ПО-4	Orlan electrical control panel
ПОВ	EVA support panel
ПРБ	accessory
ПРК-3А	oxygen testing assembly

ПрКл	safety valve
ПхО	transfer compartment
РБС	power outlet
РО	working compartment
ТОУ	thermoelectric cooling device
Т/Х	temperature control handle on ПГПУ
УДСК	Orlan pressure gauge
УСЭ	Orlan-M ORU kit
ФОР	feedwater line filter

Р.БНП(ИД)	portable repressurization tank pressure measured by ПОВ pressure indicator (ИД)
Р.О ₂	O ₂ pressure in Orlan tank
Р.ПхО(МВ)	ПхО pressure measured by pressure gauge (МВ)
Р.РО(ИД)	[РО] pressure measured by ПОВ pressure indicator (ИД)
Р.СК	Orlan pressure measured by Orlan pressure gauge (kg/cm ²)
ΔР.СК (00:00:30)	Orlan pressure delta measured over 30 sec
ΔР.СК (00:01:00)	Orlan pressure delta measured over 1 min

SYMBOLS

	illuminated
	blinking
	not illuminated
	possible false alarm
	check (in case of discrepancy, attempt a corrective action one time only)
	verify
	continuously monitor
	verify aurally
	place physical device in designated state
	connect
	disconnect
	press pushbutton
	press pushbutton to lock
	press pushbutton to release
	sw → On (i.e. up relative to label on panel)
	sw → Off (i.e. down relative to label on panel)
	rotate clockwise
	rotate counterclockwise
	rotate clockwise to stop
	rotate counterclockwise to stop
	adjust by rotating

***** ORLAN OPS 2.3.3 an anticipated off-nominal situation, if the condition left of the asterisks on the same line is not met, proceed per indicated reference

 O₂ flow selector → ИНЖ an anticipated off-nominal situation, if the condition left of the asterisks on the same line is not met, perform action(s) enclosed by asterisk lines



Position of BCC knob

1. GENERAL INFORMATION

In these crew procedures pressure unit of mmHg is indicated for briefness as mm, pressure unit of kgf/cm² is not indicated.

1.1. CREW RESPONSIBILITIES

While performing operations, the crew is responsible for the following actions:

1. Perform operations per these crew procedures and **MCC-M** instructions in accordance with the crew functional responsibilities and current status of the onboard systems.
2. **Report** completed operations to **MCC-M**.
3. Monitor systems operations per these crew procedures and **MCC-M** instructions.
4. When a deviation from nominal systems operation is detected, crew must:
 - record malfunction (deviation) detection time;
 - make a description of detected malfunction (deviation) in writing
 - report detected malfunction (deviation) to MCC-M during earliest available comm pass.
5. Upon detection of an off-nominal situation, listed in these crew procedures, perform independent troubleshooting actions recommended in the crew procedures.
6. Check nominal operation of all indicators on the control panels to be used.
7. Output commands from control panels using pushbuttons (w/o lockout feature) by pressing and holding them for 1—2 seconds.
8. Record time used to perform operations.
9. When working with hardware (control panels) equipped with protective caps or covers:
 - remove caps and covers before operations;
 - re-install caps and covers after operations.

1.2. SAFETY PRECAUTIONS

During Orlan operation, take extreme care so as not to damage any glass parts, visor, control handles, front side of ПО-4 control panel, or anything containing glass-enclosed instruments.

Observe safety precautions when working with backpack tension line, Orlan external cables, and БСС hoses. Avoid mechanical actions that may cause their kinking, over-extension, etc. Avoid sudden movements that may result in hitting station hardware.

When working with Orlan oxygen equipment and Orlan fluid connector, it is necessary to keep all devices, tubing, БК-3 pressure reducers and others clean. If necessary, use **lubricant** from ЗИП-1 kit.

EV crew wears **only** Orlan-certified accessories, all other items should be doffed prior to donning Orlan.

When issuing commands to open (close) КСД and КВД from ПОВ, confirm the command execution by monitoring ПхО pressure change (as seen on the pressure gauge).

If the pressure reading does not change, open (close) the valve manually.

The crew may operate the valves either from the ПОВ, or manually (crew preference).

False activation of the **БЕHT МАЛ** alarm may occur if humidity inside the Orlan is abnormally high.

Before mating the fluid umbilical connector, check the condition of O-rings of Orlan fluid connector [ОПК] (ventilation valves) and that of O-rings of fluid umbilical connector (water valves). If there are traces of water on Orlan fluid connector or fluid umbilical connector surface, remove using a clean wipe. If leakage is detected, **report to MCC-M**.

Restart Orlan fans and pumps only after they have completely stopped.

Change position of switch ПИТАНИЕ only after switches О.НАС (primary pump), Р.НАС (reserve pump), О.БЕHT (primary fan), Р.БЕHT (reserve fan) have been set to off.

Orlan leak check is performed by monitoring the position of the **red** arrow on Orlan pressure gauge (УДСК).

If pressure drop because of leak is abnormally great, **repeat** the seal check.

Do not open Orlan backpack when positive pressure delta exceeds 0.05 (if it is necessary to completely equalize Orlan pressure with the ambient pressure, use the Connector to ss depressurization from ЗИП-1 kit).

2. ORLAN SETUP FOR TRAINING AND EVA

2.1. ORLAN ACTIVATION AND VISUAL INSPECTION

1. Prepare ЗИП-1 kit
Secure Orlan using Orlan restraint probe
2. Unclasp shoulder straps on both sides of Orlan stowage cover, loosen straps and unfasten hooks on lower flaps
Unfold leg shells, remove boot covers
Unfasten Orlan electrical umbilical cover Velcro and pull out X6K connector
Unbuckle side flap, loosen strap, and unfasten hooks
Unbuckle arm pockets, loosen straps and take out arms
Remove stowage cover and helmet cover, secure them in airlock temporarily
3. Prior to the **first use** of Orlan
 - Discard foam-rubber packing:
 - from under light filter,
 - from emergency hose connector,
 - from safety tether hooks,
 - from safety tether attachment point
- ПГПУ 4. √ O₂ flow selector — ИНЖ
√ БАЛЛОН — РЕЗ
√ РЕГУЛЯТОР — ОСН
- ПО-4 √ Ⓢ О.НАС, О.ВЕНТ, Р.ВЕНТ, ПИТАНИЕ — БОРТ, Р.НАС
Open backpack and secure using ПРБ-11 accessory
Retrieve personal gear bag from Orlan, liquid cooling garment ←→ Orlan
5. Prior to the **first use** of Orlan
 - INSTALLATION OF ORLAN PRESSURE GAUGE ON ORLAN CASING:
 - Unstow Orlan pressure gauge from personal gear bag
 - Remove caps from Orlan pressure gauge bayonet connector and socket on Orlan casing and stow them in ЗИП-1 kit
 - Orlan pressure gauge fitting →← Orlan bracket socket
 - √ Bayonet connector is secured
 - √ Protective rubber cap is installed on Orlan pressure gauge
6. Carefully straighten Orlan arms and other soft shells
↙ (looking from inside Orlan) sun filter light-reflecting coating is not damaged
Visually inspect and feel for moisture in Orlan internal soft shells and whether Orlan drying is needed
Focus particular attention on boot soles and condition of vent ducts (tubes in legs and arms)
Open backpack internal cover
↙ Internal components and tubes in backpack are not damaged
Write reserve БК-3 serial number in table
in Orlan 1 = _____ in Orlan 2 = _____
7. Prior to the **first use** of Orlan
 - Remove wrapping from water tank connector, backpack connector and backpack tubing restraint lock
 - Discard removed wrapping in trash

8. Place X6K electrical umbilical connector and Orlan emergency hose connector in outer lining pocket
 Unstow liquid cooling garment from personal gear bag
 ↖ liquid cooling garment tubes have no bends and/or breaks
 Liquid cooling garment →|← Orlan
 Stow liquid cooling garment into Orlan
 Close backpack internal cover
 Remove ПРБ-11 and stow in ЗИП-1 kit
 Backpack tension line ring → on hook (do not close handle)
 Stow stowage cover and helmet cover into personal gear bag
9. **Report to MCC-M** the results of Orlan visual inspection and activation, and also the number of Orlan reserve БК-3 tank



2.2. БСС CHECKOUT

1. ↖ Fluid umbilical connectors →|← onboard caps
 Fluid umbilical connectors ←|→ onboard caps
 ↖ Fluid umbilical connectors, tubes and harness connector are not damaged
 Secure portable fluid umbilical connector caps on handrail using Velcro
2. ✓ Correct connection of hose harness and emergency oxygen hose to БСС (marks and labeling should match)
 ✓ БСС O₂ tubing →|← onboard БК-3 or metal caps
 ✓ one БСС O₂ tubing connector →|← rubber cap
 ✓ БСС water hoses (four) →|← onboard heat exchanger hoses
 ✓ ХБСС electrical connector →|← pigtail from 3.0 m electrical umbilical
3. Prior to the **first** EVA from airlock
 | tether connectors to ss depressurization (two) and special wrench БК-3
 | (from ЗИП-1 kit) to БСС so that wire length allows depressurization connector
 | to reach Orlan fluid connector, and it allows special wrench to reach the valves
 | of all onboard БК-3, connected to БСС

During subsequent EVAs:

- ✓ Depressurization connectors (two) and special wrench are tethered to БСС

БСС

4.  **O₂CLOSED**
 Verify БСС knob can be switched and secured in all 7 positions
 **O₂CLOSED**

2.3. ORLAN WATER SYSTEMS GAS/WATER SEPARATION

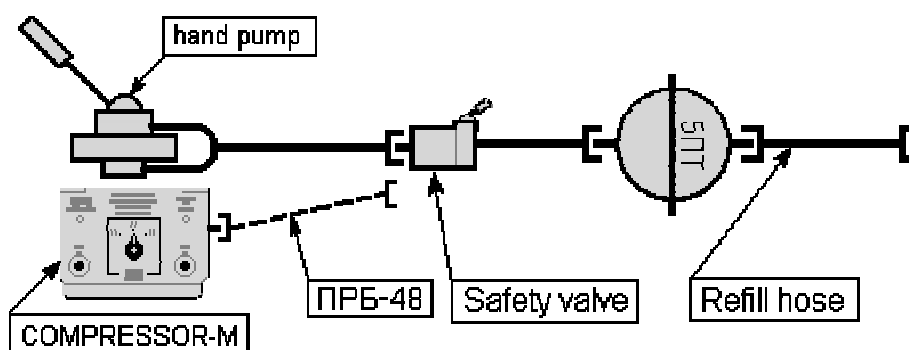
2.3.1. REFILL SYSTEM PREPARATION

(00:30:00)

Perform ПРБ-48 accessory and refill hose from ЗИП-5 kit
Configure refilling circuit:

NOTE

The crew may use the hand pump and the safety valve from CBO-3B

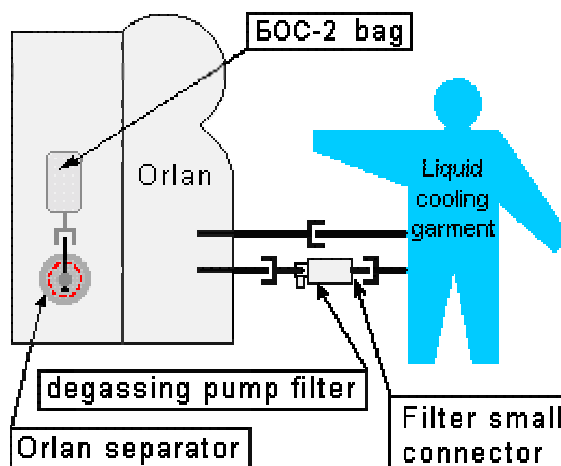


If COMPRESSOR-M is used for refilling
COMPRESSOR-M → cable AP-7141-4120 (from ЗИП-5) → РБС 10/3
sw PRESSURE SELECTION → 0.5


2.3.2. ORLAN PREPARATION FOR SEPARATION

(00:20:00)

- | | |
|-----------|--|
| ORU kit | 1. Unstow degassing pump filter
(√MCC-M for filter serial number) |
| ЗИП-1 kit | Unstow БОС-2 bag
Liquid cooling garment and БОС-2 bag
→ Orlan (see fig.) |
| | 2. Open backpack and backpack internal cover
√ Water bladder ↔ backpack water connector
Release tubing restraint in backpack
(to the right on the sublimator)
Move tubing restraint aside to allow
access to gas/water separator relief
valve
Place БОС-2 bag on gas/water separator
degas fitting |
| ПО-4 | 3. √ Ⓟ О.НАС, О.ВЕНТ, Р.ВЕНТ, ПИТАНИЕ — БОРТ, Р.НАС
√ √ all pb
Electrical umbilical → Orlan
Stow caps with X6K electrical connector and Orlan fluid connector into ЗИП-1 kit |



2.3.3. ORLAN WATER COOLING SYSTEM REFILLING

1. When refilling water cooling system during separation:
 | √ Refill hose →|← degassing pump filter
 When refilling water cooling system without separation:
 | one of liquid cooling garment connectors ↔ Orlan
 | refill hose →|← one of released connectors
- Safety valve 2. √ Handle — ОТКР
 Operate hand pump until safety valve activates (🔊)
 √ Clearance between red fill indicator and black mark < 5 mm
- less 5 mm 
- *****
- < No visible leak from water cooling system
 < No air bubbles in separator
 Proceed with procedure
 << Flow rate in water cooling system > 1.5 l/min
Report to MCC-M

3. Refill hose ↔ degassing pump filter

2.3.4. GAS/WATER SEPARATOR GAS REMOVAL

- backpack
 ПО-4 1. √ Refill hose ↔ degassing pump filter
 √ БОС-2 bag →|← degas fitting
 √ ⚙ O.НАС (P.НАС)

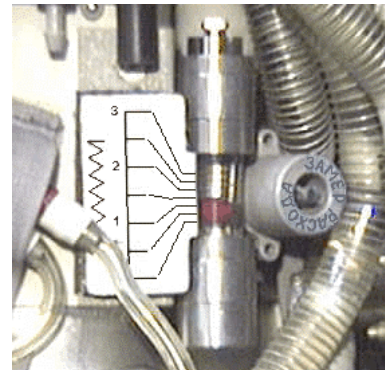
NOTE

Do not allow gas volume in the separator larger than the red dotted circle

- backpack 2. << Water system fill indicator position — normal ***** 2.3.3.
 Turn the relief valve until the degas fitting enters the gas bubble
 Press relief valve and release gas bubble
 Do not allow more than ~3 ml of water to enter the bag
 When degassing complete, БОС-2 bag ↔ degas fitting
 Empty gas/water in АСУ

2.3.5. WATER FLOW RATE MEASUREMENT

- ЗИП-1 Unstow special screwdriver
 ПГПУ Temperature control handle → 6 (ТО — ОТКЛ)
 ПО-4 √ ⚙ O.НАС (P.НАС)
 backpack Using special screwdriver ↓ ЗАМЕР РАСХОДА and hold
 Determine water flow rate by indicator ball position (see Fig on indicator scale)
 pb ЗАМЕР РАСХОДА → Release



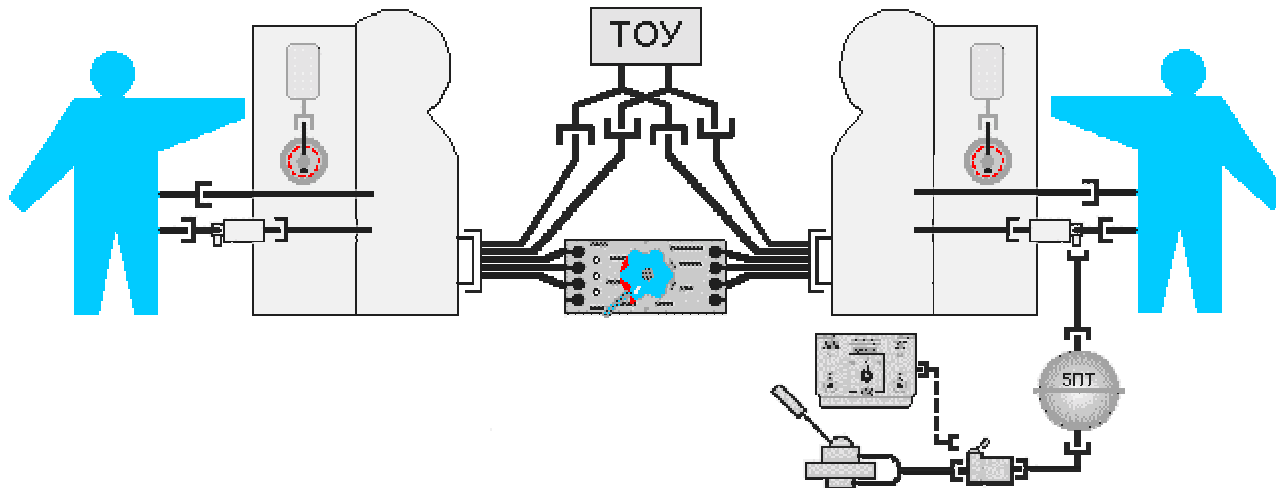
2.3.6. SIMULTANEOUS ORLAN AND BCC WATER SYSTEMS GAS/WATER SEPARATION

(01:00:00)

1. Perform Refill System Preparation per 2.3.1 and Orlan Preparation For Separation per 2.3.2 for two Orlans
 ✓ Fluid umbilical water hoses →← onboard heat exchanger hoses

BCC

O₂ CLOSED
 Fluid umbilical →← Orlan



2. ✓ Water system fill indicator position — normal ***** 2.3.3

ПГПУ

- ✓ Refill hose ↔ degassing pump filter
- ✓ TO — ОТКЛ

ПОВ

Temperature control handle → 6 (full down)

ПО-4

↓ PANEL ON (□ LED)

↓ SUIT 1,2 ON (□ LED)

backpack

✓ **П** ПИТАНИЕ — БОРТ **У** УТЕЧ, ВЕНТ МАЛ, ИНЖ, **ЗВУК**

О О.НАС, Р.НАС

↓ ЗАМЕР РАСХОДА **←** initial flow rate record in Table

Remove gas bubbles from separators (see 2.3.4 step 2)

←← Degassing pump filters are clear (if they are dark — replace)

←← water flow rate > 1.5 liter/min *****

П О.НАС, Р.НАС (for 5---10 sec)

О О.НАС, Р.НАС

← flow rate is > 1.5 liter/min

Table

Results	Orlan-1	Orlan-2
initial flow rate		
final flow rate		

00:00:00 < Gas bubble formation in separator has stopped
00:03:00 Temperature control handle → 0 (full up)
When necessary remove gas bubbles from separator (see 2.3.4)

00:00:00 3. < Gas bubble formation in separator has stopped
00:03:00 Temperature control handle → 6 (full down)
↓ ЗАМЕР РАСХОДА
< Water flow rate > 1.5 l/min (record in Table) ***** see up
⊕ О.НАС, Р.НАС
Refill water system (see 2.3.3)

ПО-4 √ ⊕ ПИТАНИЕ — БОРТ
ПОВ ↓ SUIT 1, 2 OFF (■ LED)
↓ PANEL OFF (■ LED)

ПО-4 ■ all annunciators
БОС-2 bags (two) ↔ degas fittings
Empty gas/water into АСУ
Stow empty bags into ЗИП-1 kit
Reinstall tubing restraint in backpack
Close backpack internal covers
Degassing pump filters ↔ from Orlan and liquid cooling garment
Liquid cooling garment →|← Orlan
Stow liquid cooling garment in Orlan
Remove ПРБ-11 and stow in ЗИП-1 kit
Backpack tension line ring → on hook
Fluid umbilicals ↔ Orlan
Fluid umbilicals →|← onboard caps
Disassemble refill system

2.4. OPERATIONS WITH ORLAN REPLACEABLE ELEMENTS

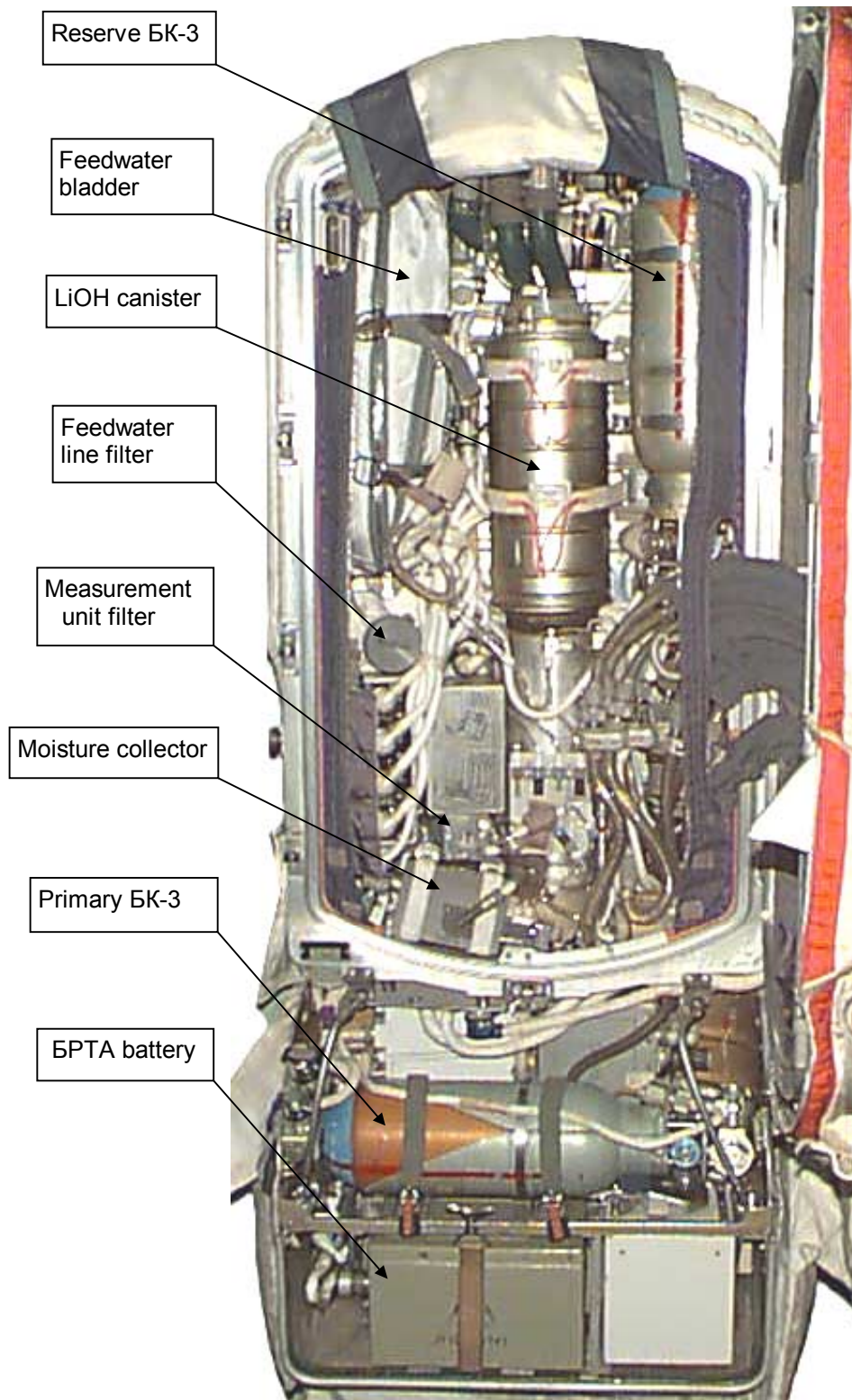


Fig. 2.4-1. Orlan-M replaceable elements.

NUMBERS OF REPLACEABLE ELEMENTS AND EQUIPMENT

EVA date		EVA #			
Name of replaceable elements	Numbers of replaceable elements				
	checks, training		EVA		
	Orlan-1	Orlan-2	Orlan-1	Orlan-2	
Primary БК-3					
Reserve БК-3					
LiOH canister					
Moisture collector					
measurement unit filter					
Feedwater line filter					
Degassing pump filter					
5ПТ tank					
БРТА battery					
Liquid cooling garment					
Gloves					
Gloves (spare)					
Onboard БК-3 (1)					
Onboard БК-3 (2)					
Onboard БК-3 (3)					
Onboard БК-3 (4)					

EVA date		EVA #			
Name of replaceable elements	Numbers of replaceable elements				
	checks, training		EVA		
	Orlan-1	Orlan-2	Orlan-1	Orlan-2	
Primary БК-3					
Reserve БК-3					
LiOH canister					
Moisture collector					
measurement unit filter					
Feedwater line filter					
Degassing pump filter					
5ПТ tank					
БРТА battery					
Liquid cooling garment					
Gloves					
Gloves (spare)					
Onboard БК-3 (1)					
Onboard БК-3 (2)					
Onboard БК-3 (3)					
Onboard БК-3 (4)					

EVA date		EVA #			
Name of replaceable elements	Numbers of replaceable elements				
	checks, training		EVA		
	Orlan-1	Orlan-2	Orlan-1	Orlan-2	
Primary БК-3					
Reserve БК-3					
LiOH canister					
Moisture collector					
measurement unit filter					
Feedwater line filter					
Degassing pump filter					
5ПТ tank					
БРТА battery					
Liquid cooling garment					
Gloves					
Gloves (spare)					
Onboard БК-3 (1)					
Onboard БК-3 (2)					
Onboard БК-3 (3)					
Onboard БК-3 (4)					

EVA date		EVA #			
Name of replaceable elements	Numbers of replaceable elements				
	checks, training		EVA		
	Orlan-1	Orlan-2	Orlan-1	Orlan-2	
Primary БК-3					
Reserve БК-3					
LiOH canister					
Moisture collector					
measurement unit filter					
Feedwater line filter					
Degassing pump filter					
5ПТ tank					
БРТА battery					
Liquid cooling garment					
Gloves					
Gloves (spare)					
Onboard БК-3 (1)					
Onboard БК-3 (2)					
Onboard БК-3 (3)					
Onboard БК-3 (4)					

EVA date		EVA #			
Name of replaceable elements	Numbers of replaceable elements				
	checks, training		EVA		
	Orlan-1	Orlan-2	Orlan-1	Orlan-2	
Primary БК-3					
Reserve БК-3					
LiOH canister					
Moisture collector					
measurement unit filter					
Feedwater line filter					
Degassing pump filter					
5ПТ tank					
БРТА battery					
Liquid cooling garment					
Gloves					
Gloves (spare)					
Onboard БК-3 (1)					
Onboard БК-3 (2)					
Onboard БК-3 (3)					
Onboard БК-3 (4)					

EVA date		EVA #			
Name of replaceable elements	Numbers of replaceable elements				
	checks, training		EVA		
	Orlan-1	Orlan-2	Orlan-1	Orlan-2	
Primary БК-3					
Reserve БК-3					
LiOH canister					
Moisture collector					
measurement unit filter					
Feedwater line filter					
Degassing pump filter					
5ПТ tank					
БРТА battery					
Liquid cooling garment					
Gloves					
Gloves (spare)					
Onboard БК-3 (1)					
Onboard БК-3 (2)					
Onboard БК-3 (3)					
Onboard БК-3 (4)					

2.4.1. MEASUREMENT UNIT FILTER REPLACEMENT

(00:10:00)

- Open backpack and secure using ПРБ-11 accessory (ЗИП-1 kit)
- Open backpack internal cover
- Disconnect filter tubes
- Loosen captive flag screw
- Remove measurement unit filter
- Unstow new measurement unit filter from Orlan-M ORU kit
- Remove caps from new filter, discard
- Install new measurement unit filter
- Secure measurement unit filter with flag screw (without applying much force)
- Flag → to secured position
- √ Measurement unit filter tubes are connected as shown in decal ХРАНЕНИЕ



2.4.2. LIOH CANISTER INSTALLATION

(00:10:00)

- Remove launch caps and rubber collars from new LiOH canister, stow in personal gear bag pocket
- Push restraints and open tabs in lower part of LiOH canister
- Insert top part of LiOH canister under valve cover, without closing locks
- Align red line on LiOH canister with red mark on sublimator
- Insert lower part of LiOH canister into upper inlet of sublimator and depress tabs
- Turn ring on valve cover to align three wedge locks with the corresponding connectors on top of LiOH canister
- √ Rubber tubes on valve cover are not twisted
- Tighten locks and insert pin into lock hole
- Secure LiOH canister with the two elastic straps



2.4.3. MOISTURE COLLECTOR INSTALLATION

(00:10:00)

- Retrieve new moisture collector from Orlan-M ORU kit (√ MCC-M for serial number)
- Remove transport casing from moisture collector and discard
- Insert new moisture collector into socket on sublimator
- Secure moisture collector with the two elastic straps using special screwdriver (from ЗИП-1 kit)
- Sublimator tube bayonet connector → ← moisture collector



2.4.4. FEEDWATER LINE FILTER INSTALLATION IN BACKPACK

(00:10:00)

Retrieve new feedwater line filter from Orlan-M ORU kit (√ **MCC-M** for serial number)

Discard plastic cap from filter

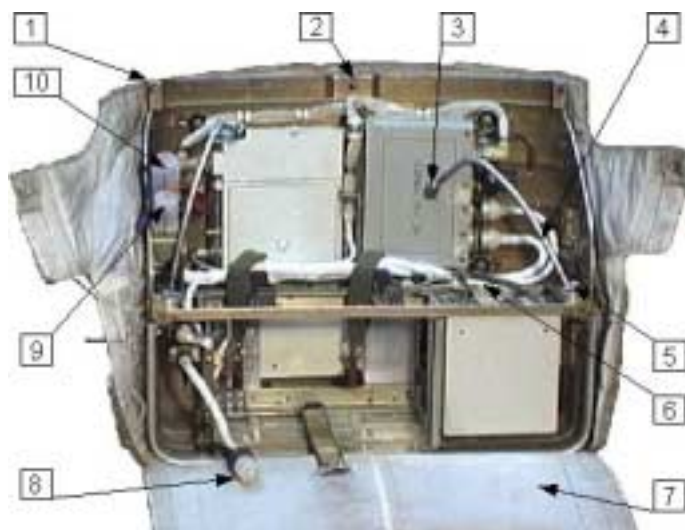
Remove ПРБ-43 cap from feedwater line filter socket and stow into ЗИП-6 kit

Lubricate feedwater line filter O-rings with lubricant from ЗИП-1 kit (if necessary)

Insert feedwater line filter into socket, ↻

2.4.5. БРТА (ORLAN TELEMETRY UNIT) INSTALLATION ON BACKPACK

(00:20:00)



1. Guide cones
(on the left and on the right)
2. Central screw
3. Right strut coupling nut
4. Right strut
(for БРТА additional attachment)
5. Height adjusting nut for right strut
6. XWA3, XWA4 connectors protective casing
7. БРТА thermal blanket flap
8. X21/1 electrical connector cap
9. X109 electrical connector cap
10. X107 electrical connector cap

1. БРТА PREPARATION FOR INSTALLATION:

Unfasten Velcro of БРТА cover

Remove locking nut from БРТА central screw, stow into ЗИП-1 kit

Remove caps from X109, X107 connectors (two)

Secure primary БК-3 tension straps with Velcro

√ ☐ ОРЛАН, УСК

⚠ БРТА for mechanical damage

For **first** using БРТА

| Remove wrapping from struts, discard

2. ORLAN PREPARATION FOR БРТА INSTALLATION:

Open backpack and secure with ПРБ-11

X107 connector ↔ primary БК-3 casing cap

Install cap X107 (removed from БРТА) on plug of primary БК-3 casing

Strut coupling nuts (two) ↔ backpack brackets

Open multilayer insulation and loosen central screw

Remove primary БК-3 casing from Orlan

X109 connector ↔ corresponding connector in lower part of backpack

Install X109 connector cap (removed from БРТА) on connector of backpack

ПО-4

3. √ ☐ О.НАС, О.ВЕНТ, Р.ВЕНТ, ПИТАНИЕ — БОРТ, Р.НАС

Insert БРТА guide cones into sockets on backpack housing

Secure БРТА on backpack housing with central screw

4. Unfasten pocket Velcro to stow AФУ high frequency cables under Orlan hatch
Remove caps from XWA3 and XWA4 connectors (two) and stow in ЗИП-1 kit



БРТА

5. Open AФУ connectors protective casing
XWA3, XWA4 connectors (two) →|← БРТА connectors
Stow AФУ high frequency cables per color marking on БРТА housing, secure with Velcro
Close casing and fasten Velcro
Fasten Velcro under Orlan hatch



6. X109, X107 backpack connectors (two) →|← corresponding БРТА connectors and secure with restraints
БРТА left strut →|← backpack left thread bracket (adjust height by using nut on the strut base)



Height adjusting nut

2.4.6. PRIMARY БК-3 INSTALLATION IN БРТА

(00:05:00)

√ БРТА right strut ↔ backpack thread bracket

√ Caps of oxygen tube and X3KP electrical connector are removed

√ Tension straps →|← Velcro on БРТА units

Caps (two) ↔ primary БК-3 oxygen tube and electrical connector, discard

Oxygen tube →|← БК-3

X3KP electrical connector →|← БК-3

Insert БК-3 into limiting plate from БРТА left side and place it into cradles on БРТА

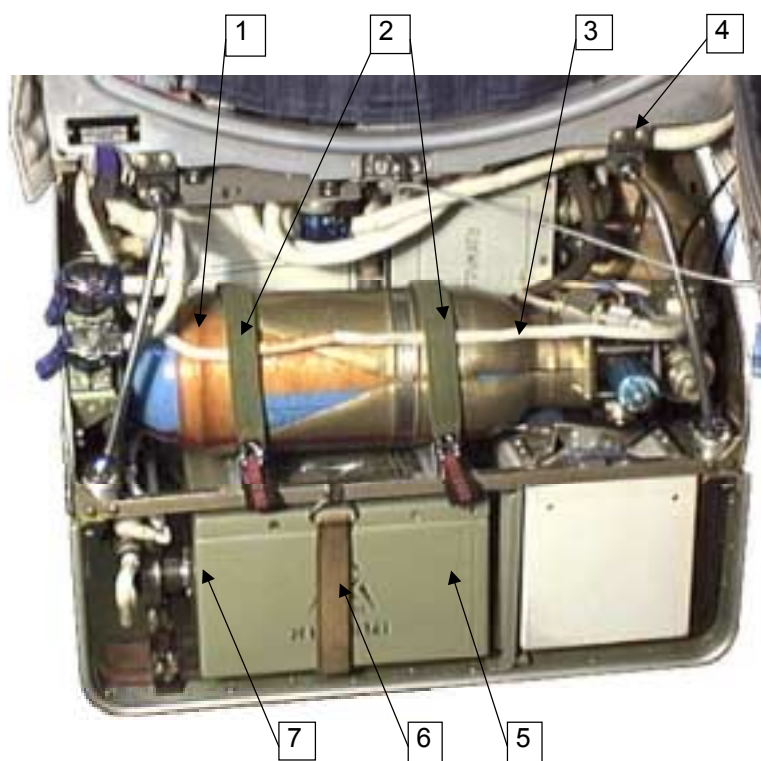
√ Alignment of red marks on limiting plate and БК-3

√ Oxygen tube is not twisted or kinked

Insert mated electrical connector into lirkа clip on БК-3 (per decal on БК-3)

Secure БК-3 with tension straps, and simultaneously insert cable from X3 KP connector under strap (to remove slack)

БРТА right strut →|← backpack right thread bracket (adjust height by using nut on the strut base)



1. Primary БК-3
2. Tension straps
3. X3KP electrical cable (from O₂ pressure sensor in БК-3)
4. Backpack thread bracket
5. Battery 825M1
6. Battery fastening strap
7. X21/1 electrical connector

2.4.7. BATTERY INSTALLATION IN БРТА

(00:05:00)

- БРТА 1. Remove battery rubber strap on БРТА and secure it to БРТА housing
Remove caps from battery electrical connector and БРТА X21/1 electrical connector
and stow them in ЗИП-1 kit
Install auxiliary strap (stowed in БРТА) onto battery
Insert battery into БРТА
X21/1 connector → battery
√ Conical guides on БРТА should enter apertures on battery
Secure battery with rubber strap in БРТА
Close Velcro and snap hooks on БРТА multilayer insulation
- ПО-4 2. ⚙ ОРЛАН
⚙ ПИТАНИЕ → АВТ
↓ U/ЗВУК ⚡ U ≥ 27 V
⚙ СВЕТ
⚡ All bulbs in helmet lights come on
- *****

Replace helmet lights per 4.10

- ПО-4 3. ⚙ СВЕТ, ПИТАНИЕ → БОРТ
БРТА ⚙ ОРЛАН, УСК
Attach БРТА multilayer insulation to backpack multilayer insulation using Velcro

2.4.8. PRIMARY БК-3 INSTALLATION IN BACKPACK (EVA WITHOUT БРТА)

1. If primary БК-3 casing →|← backpack
 | БК-3 casing multilayer insulation ↔ backpack multilayer
 | insulation (unfasten Velcro and snap hooks)
 | Loosen central captive screw on casing
 If primary БК-3 casing ↔ backpack
 | ✓ БРТА ↔ Orlan
 | Struts of additional restraining БК-3 casing →|← backpack
 | thread bracket
 Open casing still attached to additional restraining struts
2. Remove rubber caps from БК-3 and from bayonet connector
 of backpack oxygen tube
 Oxygen tube →|← БК-3
 БК-3 electrical connector →|← backpack X3KP connector,
 install mated electrical connector into lirka clip on БК-3
3. ✓ X107 connector in lower part of backpack →|← jumper plug
 on БК-3 casing
 ✓ X109 connector →|← corresponding connector in lower part
 of backpack
4. Place БК-3 into casing cradles, align БК-3 valve with opening
 in casing
 Secure БК-3 and electrical cable (remove slack) with rubber
 straps
 Insert casing conical pins in backpack opening
 Secure casing on backpack with central captive screw
 БК-3 casing multilayer insulation →|← backpack multilayer
 insulation (fasten Velcro and snap hooks)



2.4.9. БК-3 AND BATTERY REMOVAL FROM БРТА

Open backpack and secure using ПРБ-11 accessory (ЗИП-1 kit)
 Release multilayer insulation flap from БРТА
 БРТА right strut ↔ backpack
 БК-3 fastening straps ↔ БРТА casing
 Backpack oxygen tube ↔ БК-3
 БК-3 electrical connector ↔ backpack electrical connector
 Remove БК-3 from the БРТА cradle
 Install rubber caps (from ЗИП-1 kit) on oxygen connectors of БК-3 and backpack oxygen tube
 Disconnect battery fastening strap
 X21/1 connector ↔ battery
 Caps from ЗИП-1 kit →← БРТА and battery X21/1 electrical connectors
 Pull auxiliary ring and remove battery from БРТА
 Remove auxiliary ring from battery and stow ring into БРТА

2.4.10. БРТА REMOVAL FROM ORLAN BACKPACK

(00:15:00)

БРТА √ ⊕ ОРЛАН, УСК
 √ Backpack is secured with ПРБ-11 accessory (ЗИП-1 kit)
 √ БК-3 and battery are removed
 БРТА multilayer insulation ↔ backpack multilayer insulation
 БРТА fastening struts (two) ↔ backpack
 X107, X109 electrical connectors (two) ↔ БРТА
 Open АФУ connectors protective casing
 Demate XWA3, XWA4 connectors (two) and cap (from ЗИП-1 kit)
 Stow XWA3, XWA4 connectors into multilayer insulation pocket under Orlan hatch
 Secure pocket with Velcro
 Loosen central captive screw
 Remove БРТА
 Retrieve X107 cap from connectors of БРТА to be installed or from primary БК-3 casing connector (during preparation for EVA without БРТА)
 Retrieve X109 cap from backpack bottom
 Install caps on X107, X109 connectors of removed БРТА

2.4.11. LIOH CANISTER, MOISTURE COLLECTOR AND FEEDWATER LINE FILTER REMOVAL FROM ORLAN

(00:10:00)

Prepare ЗИП-1 and ЗИП-6 kits

Open backpack and secure using ПРБ-11 accessory (from ЗИП-1 kit)

Open backpack internal cover

1. LiOH CANISTER REMOVAL


After the first use of Orlan

Remove LiOH canister launch fasteners together with pads, discard


Unclasp LiOH canister rubber straps (two)

Disengage pin from wedge lock, rotate ring and open valve cover

Pull tabs on bottom of LiOH canister and remove LiOH canister from sublimator


Press stops and  tabs in lower part of LiOH

Install caps on LiOH canister (from personal gear bag pocket)

Label LiOH canister "USED" ( **MCC-M** for further usage)


(If LiOH canister is removed after training, label it "USED DURING TRAINING" adding training date and usage time)


2. MOISTURE COLLECTOR REMOVAL

Tube  moisture collector

Release two moisture collector fastening straps (using screwdriver from ЗИП-1 kit)

Remove moisture collector, discard

ПРБ-41 accessory (from ЗИП-6 kit)  moisture connector socket and secure it with two straps

Tube for connection sublimator to moisture connector  under straps


3. FEEDWATER LINE FILTER REMOVAL (only after EVA)

Press stops,  feedwater line filter and remove from socket, discard

ПРБ-43 accessory (from ЗИП-6 kit)  feedwater line filter socket

2.4.12. ONBOARD БК-3 REPLACEMENT

(00:20:00)


БСС  Onboard БК-3 valves — closed

 **PRESS**  O₂ OPEN

 **O₂ CLOSED**


БСС O₂ tube bayonet connectors  БК-3 to be replaced


Cap connectors


Electrical connector  БК-3 to be removed

Remove БК-3 from cradle

Install new БК-3 ( **MCC-M** for БК-3 serial number(s))

Rubber caps  from new БК-3

Rubber caps  onto removed БК-3

Bayonet and electrical connectors  БК-3 (per decal on БК-3)

Do not mate БСС oxygen tube bayonet connector (with **rubber** cap) to БК-3

ПОВ  PANEL ON ( LED)

Р.БК-3(1) (ИД) = _____ (≥ 50)

Р.БК-3(2) (ИД) = _____

Р.БК-3(3) (ИД) = _____

Р.БК-3(4) (ИД) = _____

 PANEL OFF ( LED)

2.4.13. DETERMINATION OF WATER QUANTITY IN FEEDWATER BLADDER

(00:10:00)

- √ Backpack and internal backpack cover are opened
- Unstow ПРБ-13 accessory from ЗИП-5 kit
- Release fastening straps and open long zipper on feedwater bladder restraint
- Unstow feedwater bladder connector from pocket on lower strap of feedwater bladder restraint
- Remove feedwater bladder from restraint
- Insert feedwater bladder strap into slot of ПРБ-13 accessory
- Evenly and tightly roll up bladder towards fitting (while rolling, ensure that lines on both sides of bladder are aligned)
- Determine water quantity using scale provided on bladder
- Unroll bladder, remove ПРБ-13 accessory
- Place feedwater bladder into restraint
- Align feedwater bladder fitting with opening in feedwater bladder restraint
- Place visible glued seam of feedwater bladder under left half of feedwater bladder restraint
- √ Feedwater bladder is not twisted or kinked
- Fasten long zipper and straps on feedwater bladder restraint
- Stow ПРБ-13 accessory in ЗИП-5 kit



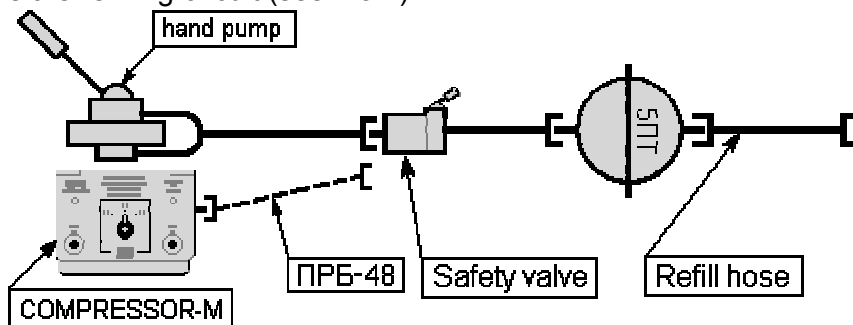
2.4.14. ORLAN FEEDWATER BLADDER REFILL

1. FEEDWATER BLADDER SETUP FOR REFILL (00:05:00)

- Unstow feedwater bladder connector from pocket on lower strap of feedwater bladder restraint
- Loosen fastening straps of feedwater bladder restraint
- Unfasten long zipper on feedwater bladder restraint
- √ Feedwater bladder is not twisted or broken
- √ Feedwater bladder fitting is aligned with opening in bladder restraint
- √ Feedwater bladder glued seam is located to the left of long zipper opening
- Fasten long zipper on feedwater bladder restraint

2. FEEDWATER BLADDER REFILL FROM ONBOARD CONTAINER (00:45:00 for two Orlans)

Configure the refilling circuit (see 2.3.1):



- Fully close short zipper on feedwater bladder restraint
- Filling hose →|← feedwater bladder connector
- Operate hand pump until safety valve activation
- Pump five more times with 1 min intervals
- ↙ Feedwater bladder is filled (by touch)
- Filling hose ←|→ feedwater bladder
- Fully open short zipper on feedwater bladder restraint
- Tighten fastening straps of feedwater bladder restraint
- Stow water bladder connector in pocket on lower strap of feedwater bladder restraint

2.4.15. FINAL INSPECTION OF ORLAN AFTER PARTS REPLACEMENT

(00:10:00)

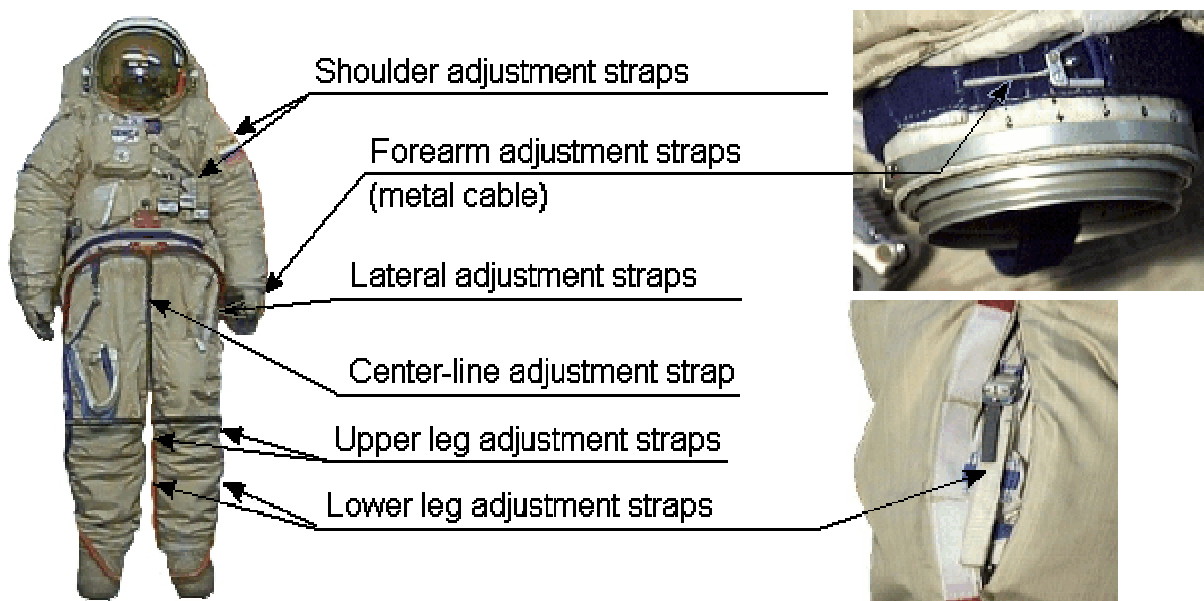
1. Open backpack internal cover
 - √ All three wedge locks of valve cover are closed and safety pin is engaged
 - √ Moisture collector tube →|← correponding connector of backpack
 - √ Measurement unit tubes are in position ХРАНЕНИЕ (stowage)
 - √ Feedwater line filter is installed into socket
 - √ Oxygen and electrical connectors →|← primary and reserve БК-3
 - √ Mating of all connectors, no bends or visible damage to tubes and hoses
 - √ Feedwater bladder tube ←|→ backpack tube
- БРТА 2. √ Electrical connector X21/1 →|← battery
 - √ X107, X109, XWA3, XWA4 connectors (four) →|← БРТА
 - √ ⚙ ОРЛАН, УСК
3. <| Backpack rubber seal and ventilation manifolds on Orlan housing, ensure there are no debris on backpack manifold mesh screen
Close backpack internal cover
- ПГПУ 4. <| Integrity of safety tether umbilical segment
 - √ Temperature control handle — 3
 - √ ТО — ОТКЛ
 - √ Orlan pressure gauge →|← OrlanBackpack tension line ring → on hook (**do not close** backpack sealing handle)

2.5. ORLAN SIZE ADJUSTMENT

(01:00:00)

Orlan adjustment data

Place of adjustment		EV1 Orlan		EV2 Orlan	
		exterior	interior	exterior	interior
Arm	Forearm adjustment straps				
	Shoulder adjustment straps				
Body	Lateral adjustment straps				
	Center-line adjustment straps				
Leg	Upper leg adjustment straps				
	Lower leg adjustment straps				



2.5.1. LEG SHELL ADJUSTMENT

- Open flaps of Orlan leg multilayer insulation near adjustment straps
- Adjust length of center-line adjustment strap and lateral straps (see Table)
- Adjust upper and lower leg adjustment straps
- Route straps tips through strap loops and secure them with Velcro
- Close flaps of Orlan leg multilayer insulation with Velcro

2.5.2. ARM ADJUSTMENT

Open flaps of Orlan arm multilayer insulation near adjustment straps
Install metal cable buckle on arm cuff and shoulder straps (see Table)
If necessary, tighten or loosen transverse elbow cords
Close flaps of Orlan arm multilayer insulation with Velcro

2.5.3. COMM CAP ADJUSTMENT

Don comm cap (size 1 for head sizes 55---58,
size 2 for head sizes 59---62)

Adjust comm cap using cord and straps

CAUTION

Microphones are fragile. Adjust their position only by holding microphone bracket.

NOTE

Adjust microphone position by selecting required adjustment holes in microphone bracket, then secure microphone bracket with 2 screws.
Microphone vertical position can be varied by microphone bracket rotation. When necessary, tighten microphone bracket locking nut
Microphone horizontal position can be varied by bending microphone bracket

Place microphones at a distance of 1.0---1.5 cm from corners of mouth

On MCC-M GO, perform comm check after comm cap adjustment

2.6. EQUIPMENT SETUP

(00:20:00)

1. Retrieve personal gear bag from Orlan
Unfasten personal gear bag Velcro
Unstow liquid cooling garment, Orlan thermal comfort undergarment, socks, hygienic gloves, hygienic trunks from personal gear bag
Stow hygienic gloves in pockets on housing lining inside Orlan
Straighten liquid cooling garment with foam dummy and stow into Orlan
(insert liquid cooling garment arms and legs into Orlan arms and legs)
Liquid cooling garment connectors (two) →|← Orlan connectors
Roll up Orlan cover-container and stow into personal gear bag
2. Remove comm cap, gloves, and mirrors from personal gear bag pocket
Remove safety caps from arm connectors and stow into bag
Gloves →|← Orlan
√ Bladder or straps do not interfere with latches
√ ~ 1 mm clearance near each of four yellow marks
√ Lock restraints — closed
Cover connector on each glove with protective cover (multilayer insulation)
3. Secure mirrors on Orlan left and right arms
Secure watch on Orlan right arm
Temporarily stow comm cap near Orlan
4. Remove cover from helmet and stow into personal gear bag
Open and close light filter
Remove rubber cap from Orlan pressure gauge and stow in ЗИП-1 kit
Launch cap ←|→ from Orlan fluid umbilical connector and stow in ЗИП-1 kit
5. Unstow towing tether from kit (length is 1.5 m)
Engage small hook on Orlan 2 backpack strap
Route tether under Orlan left arm
Stow large hook in Orlan left pocket

2.7. ORLAN AND БСС LEAK CHECK AND ORLAN VALVES FUNCTIONAL CHECK

2.7.1. ORLAN LEAK CHECK WITH ORLAN PRESSURE = 0.12

(00:30:00)










- | | | |
|--|---|---|
| ПГПУ | <p>1. Prepare ЗИП-1 kit and personal gear bag
Remove rubber rings from Orlan arm connectors and stow into personal gear bag
Gloves → ← Orlan arms
√ ~ 1 mm clearance near each of four yellow marks
√ Lock restraints — closed
√ Orlan pressure gauge, moisture collector, LiOH canister and feedwater line filter are installed on Orlan
√ Moisture collector → ← backpack tube
Remove cap from Orlan pressure gauge and stow in ЗИП-1 kit</p> <p>2. O₂ flow selector → ОТКЛ
БАЛЛОН → ОЧН
√ ТО — ОТКЛ
Red cap ↔ Orlan fluid connector
Fluid umbilical → ← Orlan
√ Fluid umbilical ↔ other Orlan
Stow cap with X6K electrical connector in ЗИП-1 kit
Electrical umbilical → ← Orlan
Close backpack internal cover
Backpack tension line ring → on hook
Seal Orlan with locking handle</p> | |
| БСС
ПОВ | <p>3. ⚙ O₂ OPEN-EVA
↓ PANEL ON (□ LED)
↓ SUIT 1 (2) ON (□ LED)
Ⓢ ПИТАНИЕ → БОРТ</p> | <p>■ УТЕЧ, ВЕНТ МАЛ, ЗВУК
⊕ НАДДУВ ПРОДУВКА ОРЛАН I, II
⊕ O₂ OPEN</p> |
| ПО-4
БСС | <p>4. If rubber cap → ← БСС O₂ tube
 Rubber cap ↔ БСС O₂ tube
 Metal cap → ← free end of БСС O₂ tube
Open an onboard БК-3 valve (number per MCC-M instruction)</p> | |
| БСС
ПО-4
БСС
00:00:00

00:01:00 | <p>5. ⚙ PRESS until Orlan pressure = 0.12
⚙ LEAK CHECK</p> <p>√ Orlan pressure ≥ 0.08
∠ Orlan ΔP (00:00:30) < 1.5 increments
Record results in Table of 2.7.4</p> | <p>⊕ O₂ OPEN
■ УТЕЧ
⊕ НАДДУВ ПРОДУВКА ОРЛАН I, II
⊕ НАДДУВ ПРОДУВКА ОРЛАН I, II
■ УТЕЧ, ЗВУК
⊕ O₂ OPEN</p> |

2.7.2. DUMP VALVE FUNCTIONAL CHECK

CAUTION







Do not allow Orlan pressure > 0.5

- БСС  **PRESS** until Orlan pressure = 0.3---0.36  НАДДУВ ПРОДУВКА ОРЛАН I, II
 ПО-4  **O₂ OPEN-EVA**  НАДДУВ ПРОДУВКА ОРЛАН I, II
 ПГПУ O₂ flow selector → ИНЖ  ВЕНТ МАЛ
 ПО-4  ИНЖ,  ВЕНТ МАЛ
 УДСК << Dump valve activation pressure = 0.38---0.45
 < Orlan pressure after dump valve activation = 0.38---0.41
 Record results in Table of 2.7.4
 ПГПУ O₂ flow selector → ОТКЛ
 ПО-4  ИНЖ,  ВЕНТ МАЛ













2.7.3. SAFETY VALVE ПК-0.45 FUNCTIONAL CHECK

CAUTION


Do not allow Orlan pressure > 0.55

- БСС  **PRESS**  НАДДУВ ПРОДУВКА ОРЛАН I, II
 ПО-4  ВЕНТ МАЛ
 УДСК << ПК-0.45 valve opening pressure = 0.42---0.50
 < Orlan pressure after ПК-0.45 valve activation = 0.42---0.45
 Record results in Table of 2.7.4
 БСС  **O₂ OPEN-EVA**  НАДДУВ ПРОДУВКА ОРЛАН I, II
 ПО-4  ВЕНТ МАЛ
 УДСК < ПК-0.45 valve closing pressure ≥ 0.42
 Record results in Table of 2.7.4










2.7.4. ORLAN LEAK CHECK WITH ORLAN PRESSURE ≥ 0.4 AND ORLAN OXYGEN HOSES LEAK CHECK

1. If Orlan pressure < 0.42
- БСС
ПО-4
00:00:00
00:01:00
-  **PRESS** until Orlan pressure = 0.42  НАДДУВ ПРОДУВКА ОРЛАН I, II
 БЕНТ МАЛ
 НАДДУВ ПРОДУВКА ОРЛАН I, II
 O₂ OPEN
-  **LEAK CHECK**
-  Δ Orlan pressure (over 00:01:00) < 2 increments
 Fluid umbilical \leftrightarrow Orlan
 Δ Orlan pressure (over 00:01:00) < 2.5 increments
 Record results in Valve Functional Check Table
 Fluid umbilical \rightarrow Orlan
- БСС
-  **SUIT DEPRESS**  O₂ OPEN
2. When Orlan pressure < 0.04
- 00:00:00
ПО-4
- Fluid umbilical \leftrightarrow Orlan
 Perform Orlan oxygen hoses leak check:
 T (until  УТЕЧ) $> 00:03:00$

Valve Functional Check Table

Check name		Orlan 1	Orlan 2
Leak check when Orlan pressure = 0.12 (2.7.1)			
Dump valve check (2.7.2)	Opening pressure		
	Pressure after valve activation		
Safety valve check (2.7.3)	Opening pressure		
	Pressure after valve activation		
	Closing pressure		
Leak check when Orlan pressure = 0.4 (2.7.4)	Δ Orlan pressure (with БСС)		
	Δ Orlan pressure (without БСС)		
Oxygen hoses leak check T (until  УТЕЧ)			

2.7.5. ORLAN CHECK FINAL OPERATIONS

- БСС
- Close onboard БК-3 valve
 Fluid umbilical \rightarrow Orlan
 **PURGE**  all annunciators
 **O₂ CLOSED**
- Fluid umbilical \leftrightarrow Orlan
 Fluid umbilical \rightarrow onboard cap
 Red cap (from ЗИП-1 kit) \rightarrow Orlan fluid connector
 O₂ flow selector \rightarrow ИНЖ
-  ИНЖ, УТЕЧ, БЕНТ МАЛ
- БАЛЛОН \rightarrow РЕЗ
 SUIT 1(2) OFF ( LED)  ИНЖ, УТЕЧ, БЕНТ МАЛ
 PANEL OFF ( LED)
- ПГПУ
ПО-4
ПГПУ
ПОВ
- Install Orlan helmet visor cover
 Install rubber cap on БСС O₂ tube in place of metal cap
 Open Orlan sealing handle

3. ORLAN AND БСС STORAGE MODE

3.1. ORLAN PREPARATION FOR DRYING

- Prepare ЗИП-1 and ЗИП-6 kits
- Perform LiOH Canister, Moisture Collector And Feedwater Line Filter Removal From ORLAN per 2.4.11
- Measurement unit tubes → ХРАНЕНИЕ (stowage)
- Feedwater bladder connector ↔ backpack water connector and stow into pocket on feedwater bladder restraint strap (water might leak from tube)
- Open liner flap (right side)
- Suit drying handle → perpendicular to cuirass (drying)



3.2. DRYING OF SUBLIMATOR WATER SUPPLY LINE

(01:00:00)

- | | |
|------------------|--|
| ЗИП-1 kit | <ol style="list-style-type: none"> 1. Configure drying circuit (Fig. 3.2-1): <ul style="list-style-type: none"> ПРБ-31 accessory → ← valve cover ПРБ-33 accessory → ← water bladder connector ПРБ-33 accessory → ← ПРБ-31 accessory Unstow dry wipes |
| ПГПУ | <ol style="list-style-type: none"> 2. O₂ flow selector → ОТКЛ БАЛЛОН → ОСН Open primary БК-3 valve Sublimator → On <ul style="list-style-type: none"> (← ТО — ОТКЛ tab is hidden) √ Electrical umbilical → ← Orlan |
| ПОВ | <ol style="list-style-type: none"> 3. ↓ PANEL ON (□ LED) ↓ SUIT 1, 2 ON (□ LED) |
| ПО-4
00:00:00 | <ul style="list-style-type: none"> √ Ⓢ ПИТАНИЕ — БОРТ Ⓢ О.ВЕНТ Blot water from feedwater line filter socket using wipe |

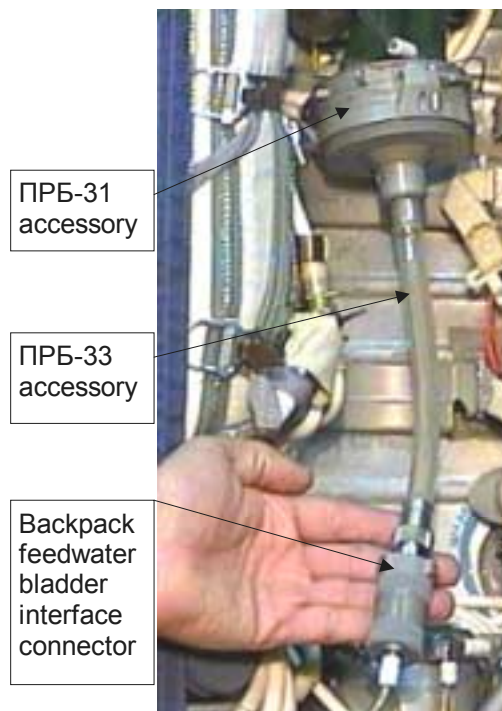


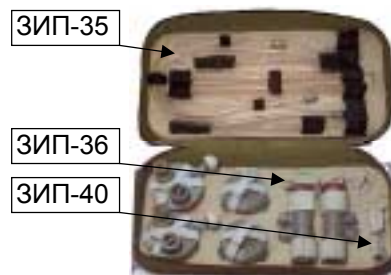
Fig. 3.2-1

CAUTION

Do not operate O.BEHT and P.BEHT simultaneously.

00:15:00 4. ⚙ O.BEHT

5. Reconfigure drying circuit:
 ПРБ-33 accessory ↔ ПРБ-31
 accessory and water bladder
 interface connector
 Stow ПРБ-33 in ЗИП-6 kit
 Do not remove ПРБ-31
 (for subsequent Orlan drying)
 ПРБ-40 →|← water bladder interface
 connector and secure connector
 using lirka clip
 Additionally install (Fig. 3.2-2):
 ПРБ-36 →|← ПРБ-35
 Install ПРБ-35 on backpack collector
 (with mesh screen)
 ПРБ-36 →|← moisture collector socket
 ПРБ-43 ↔ feedwater line filter
 socket



00:00:00
 ПО-4

6. ⚙ O.BEHT
 Perform drying
 00:15:00 ПРБ-43 →|← feedwater line filter
 socket
 Continue drying

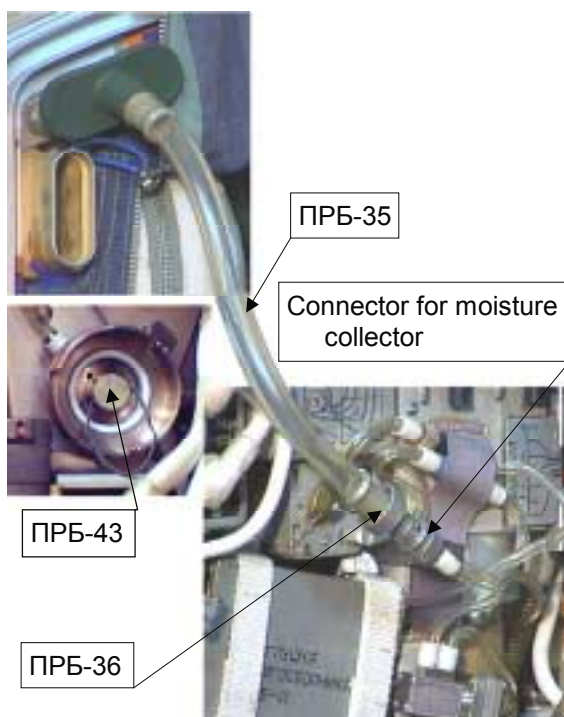


Fig. 3.2-2

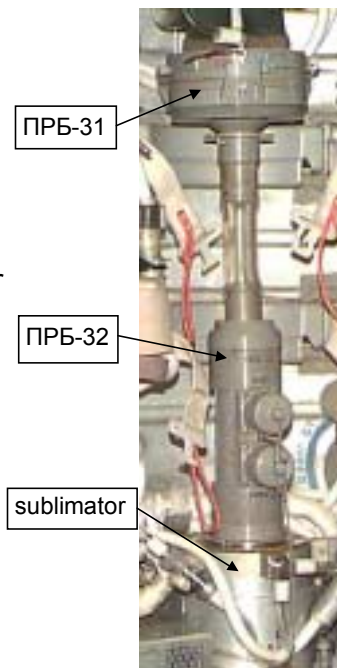
00:30:00
 ПОВ

7. ⚙ O.BEHT
 ↓ SUIT1(2) OFF (■ LED)
 ↓ PANEL OFF (■ LED)
 Close primary БК-3 valve
 ПГПУ O₂ flow selector → ИЖ (to bleed excess of oxygen from Orlan tubes)
 Sublimator → Off
 Disassemble drying circuit (**Do not remove** ПРБ-43 and ПРБ-31 accessories)
 Stow removed ПРБ accessories in ЗИП-6 kit

3.3. ORLAN DRYING

(00:20:00)

1. √ Gloves →|← Orlan
 √ ПРБ-31 →|← valve cover
 √ ПРБ-41 →|← moisture collector socket
 √ Suit drying handle → perpendicular to cuirass (drying)
2. Configure drying circuit:
 ПРБ-32 →|← ПРБ-31 accessory
 ПРБ-32 →|← Orlan sublimator ventilation manifold
 Remove red cap from ПРБ-30 accessory
 √ Red combined connector plug ↔ Orlan fluid connector
 ПРБ-30 →|← Orlan fluid connector
3. Remove ПРБ-11 accessory (backpack restraint)
 and stow it in ЗИП-1 kit
 Close backpack internal cover
 Backpack tension line ring → on hook
 Seal Orlan by locking **handle**
- ПОВ 4. ↓ PANEL ON (□ LED)
 ↓ SUIT 1, 2 ON (□ LED)
 ПО-4 ⚙ ПИТАНИЕ → БОРТ
 00:00:00 ⚙ О.ВЕНТ
 02:00:00 ⚙ О.ВЕНТ, ⚙ Р.ВЕНТ
- 04:00:00 5. ⚙ Р.ВЕНТ
 Open Orlan backpack and backpack internal cover
 Remove ПРБ-32 accessory and stow it in ЗИП-6 kit
 ◀ Orlan is completely dry
- ПО-4 6. If **additional drying** is required:
 ПРБ-37 →|← ПРБ-31
 ПРБ-33 →|← ПРБ37
 ⚙ О.ВЕНТ
 Blow air on damp areas
 ⚙ О.ВЕНТ
7. Gloves ↔ Orlan
 Unstow protective caps from personal gear bag and install them on arm connectors
 ◀ Gloves are completely dry
 If **additional drying** is required
 ПРБ-37 →|← ПРБ-31
 ПРБ-33 →|← ПРБ37
 ПРБ accessory (from СОКОЛ КВ-2 kit) →|← ПРБ-33
 ПО-4 ⚙ О.ВЕНТ
 Perform final drying of gloves
 ⚙ О.ВЕНТ
- ПОВ 8. ↓ SUIT 1, 2 OFF (■ LED)
 ↓ PANEL OFF (■ LED)
 Remove all accessories (except ПРБ-41 and ПРБ-43) and stow in ЗИП-6 kit
 Suit drying handle → parallel to cuirass (operation)
 Close backpack internal cover
 Backpack tension line ring → on hook




3.4. ORLAN AND ECC STORAGE MODE

(00:30:00)

1. Electrical umbilical ↔ Orlan
Electrical connector caps (from ЗИП-1 kit) (two) →← X6K electrical connectors of Orlan and electrical umbilical
Cover electrical umbilical connector with multilayer insulation shroud
 2. Install Orlan pressure gauge rubber cap (from ЗИП-1 kit pocket) on Orlan pressure gauge
Red cap (from ЗИП-1 kit) →← Orlan fluid connector
Perform БК-3 And Battery Removal From БРТА per 2.4.9
 3. Unstow helmet and boots cloth covers, stowage cover from personal gear bag
Lower sun filter
Install helmet and boot covers
 4. Don liquid cooling garment (after complete drying) onto foam-rubber mannequin
Place liquid cooling garment cap on mannequin's chest
Roll up liquid cooling garment (starting from legs)
Wrap liquid cooling garment arms around rolled-up liquid cooling garment
Ensure liquid cooling garment tubes are not twisted or kinked
Stow liquid cooling garment in personal gear bag, let the water connectors hang from the bag side opposite to pocket
 5. Stow hygienic trunks, cotton suit, socks in personal gear bag
Zip personal gear bag so that liquid cooling garment connectors remain outside
Stow in personal gear bag pocket:
gloves,
comm cap (putting earphone pads together),
mirrors
Liquid cooling garment water connectors →← Orlan water connectors
↙ water hoses are not twisted and kinked
Stow personal gear bag inside Orlan (ensure pocket is facing upwards)
 6. ✓ Protective caps (two for each Orlan) are installed on arm connectors
✓ X3, X9 electrical connectors (two) are stowed in Orlan chest pocket
Open backpack internal cover
✓ Measurement unit filter tubes — ХРАНЕНИЕ
✓ ПРБ-43 accessory is installed in feedwater line filter socket
✓ Feedwater bladder connector — in pocket on bladder restraint lower strap
✓ LiOH canister is removed from backpack
✓ ПРБ-41 cap is installed into moisture collector socket
✓ Suit drying handle is parallel to cuirass
✓ Protective cap →← Orlan fluid connector
✓ Reserve БК-3 valve – **closed**
- ПГПУ
✓ O₂ flow selector — ИНЖ
✓ БАЛЛОН — РЕЗ
✓ РЕГУЛЯТОР — ОСН
✓ ТО — ОТКЛ
- ПО-4
✓ Ⓢ О.НАС, О.ВЕНТ, Р.НАС, Р.ВЕНТ, ПИТАНИЕ — БОРТ
Close backpack internal cover
✓ Sealing interfaces are free of any foreign objects and backpack internal cover
✓ ПРБ-11 ↔ Orlan
Backpack tension line ring → on hook (**do not close** locking handle)
Stow Orlan electrical connector and safety tether hooks in pockets of Orlan legs

7. Cover Orlan helmet and backpack with Orlan stowage cover
 Rotate Orlan arms up to stop and insert into stowage cover pockets
 Cover both ПО-4 and ПГПУ panels with stowage cover side flap (see Fig. 3.4-1)
 Fasten side flap of stowage cover
 Fold leg shells in half, placing boots on БРТА next to backpack bottom (with toes facing outside)
 Route 0.7 m long strap (from ЗИП-1 kit) through loops on longitudinal and transverse straps of Orlan stowage cover and tighten leg shells
 Return Orlan attachment node to its storage position

БСС

8. ✓  **O₂ CLOSED**
 ✓ Rubber cap → ← connector of БСС oxygen tube
 ✓ Fluid umbilicals → ← caps
 Attach БСС fluid umbilicals to ПхО handrails

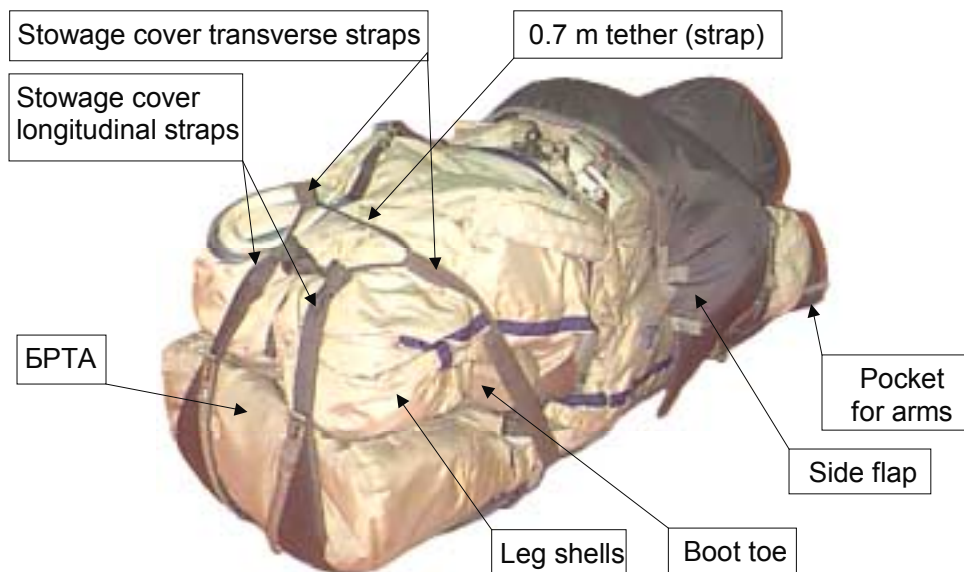


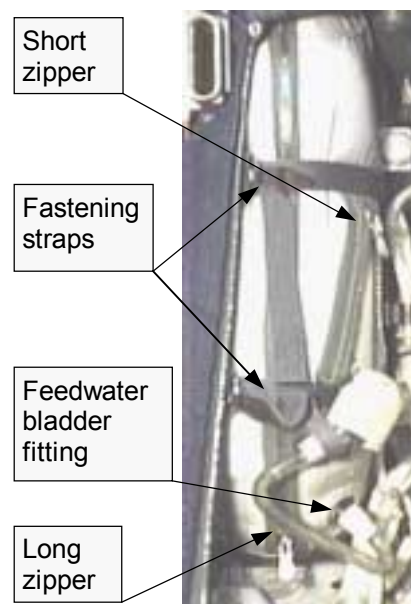
Fig. 3.4-1. Orlan stowage configuration

4. ORLAN MAINTENANCE AND REPAIR

4.1. ORLAN FEEDWATER BLADDER REPLACEMENT

(00:30:00)

1. ORLAN WATER BLADDER REMOVAL
 - √ Feedwater bladder ↔ backpack connector
 - Loosen fastening straps of feedwater bladder restraint
 - Unzip long zipper of feedwater bladder restraint
 - Grasp top end of feedwater bladder and remove from feedwater bladder restraint
2. NEW FEEDWATER BLADDER INSTALLATION
 - Route feedwater bladder connector through opening in feedwater bladder restraint to face outside
 - Insert bladder into feedwater bladder restraint
 - Align feedwater bladder fitting with opening in feedwater bladder restraint
 - Place visible glued seam of feedwater bladder under left half of feedwater bladder restraint
 - √ Feedwater bladder is not twisted or kinked
 - Zip long zipper of feedwater bladder restraint
 - √ Short zipper on feedwater bladder restraint is completely unzipped
3. Refill feedwater bladder per 2.4.14
 - Feedwater bladder connector → pocket on lower fastening strap of feedwater bladder restraint



4.2. RESERVE БК-3 REPLACEMENT

(00:30:00)

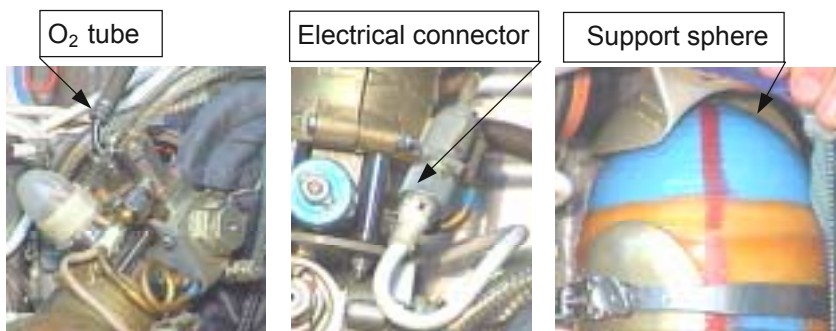
NOTE

Reserve БК-3 may be replaced **on MCC-M GO**, if БК-3 pressure < 360

1. RESERVE БК-3 REMOVAL

ПГПУ

- Remove LiOH canister (see 2.4.11)
- Close reserve БК-3 valve (using special wrench from ЗИП-1 kit)
- БАЛЛОН → РЕЗ
- O₂ flow selector → ИНЖ (to bleed excess of oxygen from Orlan)
- O₂ flow selector → ОТКЛ
- Disconnect rubber straps and clamps securing БК-3 (if any)
- Rotate БК-3 a quarter of a turn in direction of blue arrow on БК-3, remove БК-3 from cradles
- O₂ tube ←→ БК-3
- Remove electrical connector from lirka clip
- Electrical connector ←→ БК-3



During the first replacement of reserve БК-3, remove clamps:

- Remove rubber stickers from inside of clamps next to winged screws
- Straighten clamp straps and remove winged screws
- Remove clamps from brackets
- Discard clamps in trash

2. INSTALLATION OF RESERVE БК-3

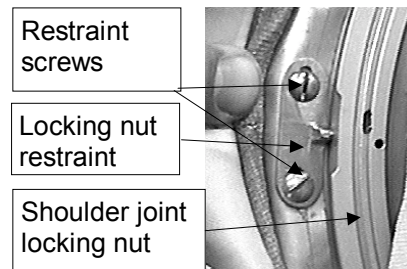
- O₂ tube →← new БК-3
- БК-3 electrical connector →← backpack electrical connector, install mated connector in lirka clip
- Set БК-3 bottom against backpack support sphere so that red stripe on БК-3 is rotated a quarter of a turn relative to stripe on backpack
- ↻ БК-3 a quarter of a turn in the opposite direction of blue arrow and install БК-3 onto backpack cradles so that both red stripes are aligned
- Secure БК-3 with clamps
- √ БК-3 valve does not press against Orlan housing during backpack closure

4.3. ORLAN ARMS REPLACEMENT

(02:00:00 for two arms)

1. ARM REMOVAL

- Remove Orlan stowage cover from Orlan
- Secure Orlan using Orlan restraint probe (if necessary, use extension)
- Prepare ЗИП-3 kit and screwdriver
- Open backpack
- Liquid cooling garment \leftrightarrow Orlan
- Unstow personal gear bag from Orlan
- Arm vent tubes \leftrightarrow Orlan vent tubes
- Remove two restraint screws and remove shoulder joint locking nut restraint from Orlan housing
- Loosen screw (2 ---2.5 turns) on shoulder joint locking nut



NOTE

If it is difficult to start nuts, pressurize Orlan with БСС until Orlan pressure =0.4 and start nuts (1.5---2 turns). Then depress Orlan and continue

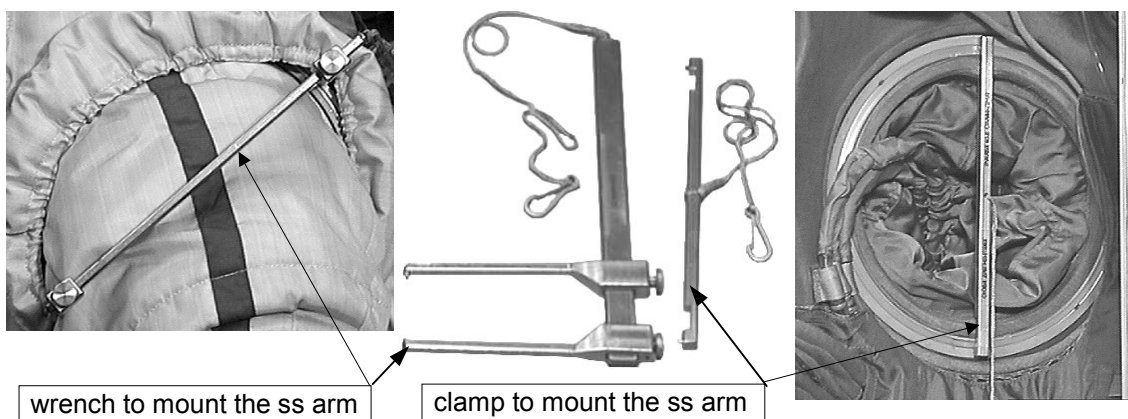
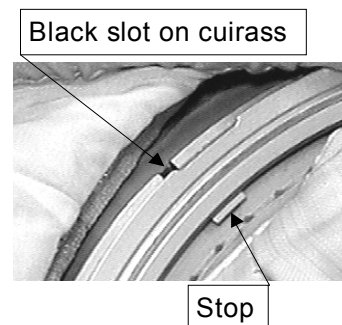


Fig. 4.3-1

- Insert the ss arm mounting wrench (from ЗИП-3 kit) into opposite slots on shoulder joint locking nut and loosen it, while restraining exterior part of shoulder joint from inside of cuirass using the ss arm mounting clamp
- Remove arm inside by gently tapping with hand on shoulder joint perimeter from outside of cuirass

2. NEW ARM INSTALLATION

- Unstow new arm from stowage cover
- Insert arm from inside of cuirass:
 - One operator (inside Orlan) inserts shoulder joint into front part of socket, then, by gently tapping on shoulder joint perimeter, fully inserts it into socket;
 - Other operator (outside Orlan) monitors, so the stop on shoulder joint aligns with black slot on cuirass ring and ensures shoulder joint is properly aligned



Lubricate shoulder joint thread using lubricant for sealing rings from ЗИП-1 kit
Fully tighten locking nut screw, then slightly loosen it (half of a turn)

CAUTION

When screwing locking nut in shoulder joint, make sure both threads are aligned, do not cross-thread.

Engage locking nut on shoulder joint with nut number outwards
(seams on Orlan multilayer insulation may be unlaced for better access to locking nut)
Insert ss arm mounting clamp into opposite slots on interior shoulder joint locking nut
Fully tighten locking nut using ss arm mounting wrench; simultaneously prevent shoulder joint rotation using ss arm mounting clamp
↙ Stop aligned relative to black slot on cuirass ring
Expand vent tubes on Orlan arms using expander
Arm vent tubes →|← Orlan vent tubes, do not cross

3. FINAL OPERATIONS

Perform Orlan pressurization check per 4.7
After pressurizing, tighten locking nut and screw to the hard stop
If nut restraint holes did not align with previously used mounting holes on locking nut, use other two holes to install nut restraint and secure with two screws
Using cord needle (from ЗИП-3 kit), lace up seams on Orlan multilayer insulation (if previously undone) and on Orlan internal liner where arm and Orlan vent tubes are connected
Perform Orlan Leak Check with Orlan Pressure = 0.4 and Orlan Oxygen Hoses Leak Check per 2.7.4 step 1 and Orlan Valve Check Final Operations 2.7.5

Open backpack
Liquid cooling garment →|← Orlan
Stow personal gear bag in Orlan
Backpack tension line ring → on hook
Install Orlan stowage cover on Orlan

4.4. ORLAN LEG BLADDER REPLACEMENT

(02:00:00)

1. LEG BLADDER REMOVAL

Remove stowage cover from Orlan
Secure Orlan using Orlan restraint probe
Prepare ЗИП-3 kit
Open Orlan backpack
Liquid cooling garment ↔ Orlan
Unstow personal gear bag from Orlan
Unlace liner inside Orlan along leg bladder perimeter
Leg bladder vent tubes ↔ Orlan vent tubes
Unlace Orlan multilayer insulation along legs and crotch internal seam
Unlace Orlan multilayer insulation from boots, leg bladder (along belt, leg multilayer insulation should remain connected to cuirass multilayer insulation)
Roll up leg multilayer insulation to provide access to bolts fastening legs flange to cuirass flange
Using leg bladder mounting wrench (from ЗИП-3 kit), loosen twenty captive bolts
(ascending order of bolt numbers)
Remove leg bladder

2. NEW LEG BLADDER INSTALLATION

Unzip new Orlan legs stowage cover
Using leg bladder mounting wrench, loosen twenty captive bolts
Unstow new legs bladder from stowage cover
New legs bladder flange →← cuirass flange
√ Both cuirass and legs bladder flanges are clear of foreign objects and of multilayer insulation
Tighten bolts in a cross fashion to remove the slack between flanges
Perform final tightening (ascending order of bolt numbers) using **only** the leg bladder mounting wrench
Lace up leg shell multilayer insulation from inner thigh and crotch area; tie to boots
Leg bladder vent tubes →← Orlan vent tubes
Fasten cuirass liner to legs bladder using Velcro

3. FINAL OPERATIONS

Perform Orlan Pressurization per 4.7
Perform Orlan Leak Check per 2.7.4 step 1 and Orlan Check Final Operations per 2.7.5
Perform Orlan Size Adjustment per 2.5
Open backpack
Liquid cooling garment →← Orlan
Stow personal gear bag into Orlan
Close backpack
Install Orlan stowage cover onto Orlan

4.5. VISOR PROTECTIVE SHIELD REPLACEMENT

Unstow:

new visor protective shield;

40---50 cm kapron gray cord from ЗИП-3 kit, or any available analog

Fold kapron cord in two, forming a loop. Route folded cord underneath spring-loaded hook attached to screw on either side of protective shield

Use cord to assist in removing hooks from screws (first one side, then the other)

Detach Orlan multilayer insulation from Velcro under lower edge of visor protective shield

Unsecure central clip of visor protective shield (attached with Velcro)

Remove visor protective shield

Install new visor protective shield and secure central clip on Velcro

√ LEDs plates on helmet's lower edge should be aligned with slots in visor protective shield

Use kapron cord to assist in securing spring-loaded hooks to shield screws

Attach multilayer insulation to Velcro under lower edge of helmet visor

4.6. ORLAN SUN VISOR REPLACEMENT

Unstow:

new sun visor from ЗИП-3 kit

standard screwdriver

Remove old sun visor by removing four screws

Install new sun visor by tightening four screws

4.7. ORLAN PRESSURIZATION CHECK

(00:15:00)

1. Prepare ЗИП-3 kit
 - √ Gloves →|← Orlan arms
 - √ Feedwater line filter and moisture collector are installed in backpack
 - √ Sublimator tube connector →|← moisture collector
 - Rubber cap (from ЗИП-3 kit) →|← ПК-0.45 safety valve (under cuirass liner behind right shoulder joint)
 - Fluid umbilical →|← Orlan fluid connector
 - Backpack tension line ring → onto hook
 - Seal Orlan by locking **handle**
 - √ All БСС oxygen tube connectors →|← onboard БК-3 or metal caps



Cap

CAUTION

Do not allow Orlan pressure > 0.6

- БСС
2. Open onboard БК-3 valve (√ **MCC-M** for serial number)
 - ✿ **PRESS** until Orlan pressure = 0.55 *****
 - *****
 - Close onboard БК-3 valve
 - ✿ **SUIT DEPRESS**
 - When Orlan pressure < 0.05 open backpack
 - √ Cap →|← ПК-0.45 safety valve **hermetically**
 - Seal Orlan by locking **handle**
 - Repeat step 2
 - *****
- 00:00:00 Fluid umbilical ↔ Orlan
Close onboard БК-3 valve
- 00:05:00 ✿ **SUIT DEPRESS**
3. Fluid umbilical →|← Orlan
 - When Orlan pressure = 0.02---0.04, open backpack
 - Rubber cap ↔ ПК-0.45 safety valve
 - Stow cap in ЗИП-3 kit

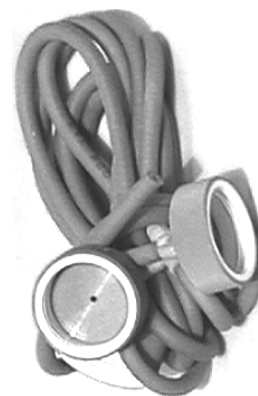
4.8. ORLAN RESERVE PRESSURE BLADDER LEAK CHECK

(00:10:00)

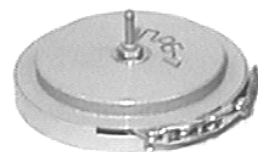
1. Prepare ЗИП-3 kit
Open Orlan
Liquid cooling garment ↔ Orlan
Unstow personal gear bag from Orlan
Remove protective caps from both arms and stow caps in personal gear bag
Glove →|← any arm
Install moisture collector and feedwater line filter in backpack
(see 2.4.3, 2.4.4)

ЗИП-3

2. Unstow ПРК-3А and ПРБ-17 accessories
Lubricate O-rings of ПРК-3А with lubricant from ЗИП-1 kit
ПРК-3А caps →|← relief valves (three) of Orlan arms and legs
Route free tube of ПРК-3А through Orlan arm without glove
Free tube of ПРК-3А →|← inner fitting of ПРБ-17
ПРБ-17 →|← Orlan arm without glove
Fluid umbilical →|← Orlan
√ Other fluid umbilical →|← onboard cap
On MCC-M GO perform reserve bladder pressurization check



ПРК-3А



ПРБ-17

3. Backpack tension line ring → on hook
Seal Orlan by locking **handle**

БСС

√ **O₂ CLOSED**⊕ O₂ OPEN

00:00:00

Open onboard БК-3 valve (√ **MCC-M** for serial number)√ **PRESS** until Orlan pressure = 0.42

⊕ НАДДУВ ПРОДУВКА ОРЛАН I, II

⊕ O₂ OPEN

00:02:00

✋ Via ПРБ-17 fitting leak air

✋ There is no more air leak

Close onboard БК-3 valve

√ **SUIT DEPRESS**

When Orlan pressure < 0.05 open backpack

ПРК-3А ↔ and again →|← relief valves

Repeat step 3

√ **LEAK CHECK**

⊕ НАДДУВ ПРОДУВКА ОРЛАН I, II

⊕ O₂ OPEN

УДСК

4. < Δ Orlan pressure (00:01:00) < 2 increments

***** √ **MCC-M**√ **SUIT DEPRESS**⊕ O₂ OPEN

When Orlan pressure < 0.04, open backpack

Remove ПРК-3А caps and ПРК-17 fitting from Orlan and stow in ЗИП-3 kit

Close onboard БК-3 valve

БСС

√ **PURGE**⊕ O₂ OPEN√ **O₂ CLOSED**

Fluid umbilical ↔ Orlan

Fluid umbilical →|← onboard cap

Glove ↔ Orlan arm

Protective caps →|← both Orlan arms

Liquid cooling garment →|← Orlan

Stow personal gear bag in Orlan

Backpack tension line ring → on hook

4.9. ORLAN INTERBLADDER VOLUME LEAK CHECK

(00:40:00)

1. Open backpack and secure using ПРБ-11 accessory
Liquid cooling garment ↔ Orlan
Unstow personal gear bag from Orlan
Open backpack internal cover
If LiOH is installed in Orlan, remove it (see 2.4.11 step 1)

ЗИП-1

Unstow ПРБ-11,
ПРБ-12, ПРБ-15
accessories, tongs

tongs

ПРБ-11

ПРБ-12

ПРБ-15

ЗИП-6

Unstow ПРБ-31, ПРБ-37
accessories

ПРБ-37

ПРБ-31

Valve cover

ПРБ-31

ПРБ-37

ПРБ-12

ПРБ-15

Relief valve

2. Assemble leak check circuit:
ПРБ-31 →← ПРБ-37
ПРБ-31 →← valve cover
Tube of ПРБ-12 →← ПРБ-37
Cap of ПРБ-12 →← any of three relief valves of arms and legs
ПРБ-15 →← ПРБ-12

ПОВ

3. ↓ PANEL ON (□ LED)
↓ SUIT 1 (2) ON (□ LED)

ПО-4

√ Ⓢ ПИТАНИЕ → БОРТ Ⓢ УТЕЧ, ВЕНТ МАЛ
Take tongs
Ⓢ О.ВЕНТ

ПРБ-15

When pressure = 14---16 increments pinch tube
ПРБ-12 with tongs

CAUTION

During leak check, avoid contact of pressure bladders with any sharp objects.

ПО-4

Ⓢ О.ВЕНТ
Straighten folds of innerbladders (by patting them gently)

ПРБ-15

If pressure drop < 10 increments:

ПО-4

Remove fongs from tube
Ⓢ О.ВЕНТ
When pressure = 10---13 increments, pinch tube again
Ⓢ О.ВЕНТ

ПРБ-15

4. When pressure = 10---13 increments
↖ Δ pressure (00:05:00) < 0.5 inc for Orlan arms
↖ Δ pressure (00:10:00) < 0.5 inc for Orlan legs
Repeat leak check for two remaining relief valves of Orlan

***** Report to **MCC-M**

ПОВ

5. Disassemble leak check circuit
↓ SUIT 1 (2) OFF (■ LED)
↓ PANEL OFF (■ LED)
ПРБ-11 ↔ Orlan
Stow tongs, ПРБ-11, ПРБ-12, ПРБ-15 in ЗИП-1 kit
Stow ПРБ-31, ПРБ-37 in ЗИП-6 kit
Stow personal gear bag into Orlan
Liquid cooling garment →← Orlan
Close Orlan

4.10. ORLAN LIGHT MAINTENANCE

1. ORLAN LIGHT REMOVAL (00:10:00)

Cover Orlan visor with helmet cloth cover (to avoid scratches while working with screwdriver)

Prepare small-tip screwdriver for M3 screws

⊕ ПИТАНИЕ → БОРТ

↓ SUIT 1 (2) OFF

Demate light X01 (X02) electrical connector in back part of helmet housing (hidden behind multilayer insulation)

Remove adjustment nut (3) from threaded pin (4) (see Fig. 4.10-1)

Remove captive screws (1), (2) from sockets (6)

Remove light and discard

ПО-4
ПОВ

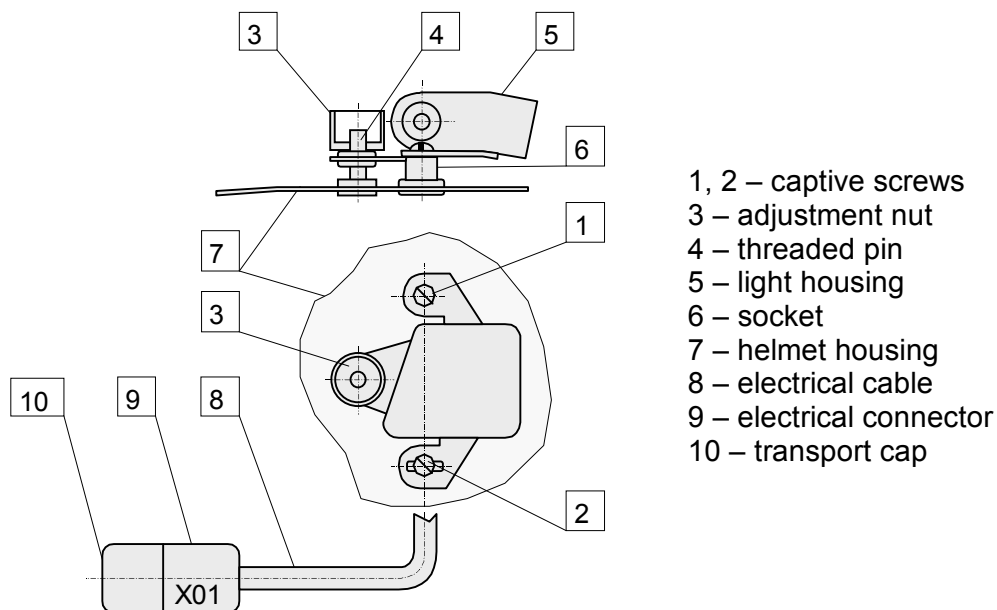


Fig. 4.10-1 Helmet Right Light CM-2П

(Helmet Left Light CM-2Л is a mirror image of CM-2П)

2. LIGHT CM-2П (CM-2Л) INSTALLATION

Unstow new light from kit (√ **MCC-M** for kit number)

Unpack light

Transport cap ↔ electrical connector

Light X01 (X02) electrical connector →|← X01 (X02) connector of Orlan cable on right (left) side of helmet back part

Engage adjustment nut (3) on threaded pin (4) so that pin's end is flush with nut

Tighten screws (1), (2) (two) in sockets 6 (3---4 turns)

Rotate light around screw (1) so that screw (2) aligned with the middle of the light lug slot

Tighten screws (1), (2) (two) to the hard stop

Cover adjustment nut (3) with flap of multilayer insulation

3. LIGHT FUNCTIONAL CHECK (00:10:00)
 Electrical umbilical →|← Orlan
 ПОВ ↓ SUIT 1 (2) ON
 ПО-4 Ⓢ ПИТАНИЕ → БОРТ, Ⓢ СВЕТ
 ⚡ Both bulbs in each light come on
 ⚡ Illumination is sufficient (extinguish all other light sources):
 switches, symbols and labels on ПО-4 are clearly visible;
 small objects (tools, etc.) in working zone are clearly seen
 Working zone is a 1 m circle with its center located in front of Orlan at a distance of
 25 cm from ПО-4 lower edge
 If necessary, adjust light beam direction:
 | Loosen two screws (1), (2) (2---3 turns)
 | Adjust vertically by rotating around screw (1) axis
 | Adjust horizontally by rotating nut (3)
 | Retighten two screws (1), (2) to the hard stop
 ПО-4 Ⓢ СВЕТ
 ПОВ ↓ SUIT 1 (2) OFF
 Electrical umbilical ←|→ Orlan (**on MCC-M GO**)

4.11. ORLAN AND БСС CHECK USING ORLAN TESTING UNIT (ПКО-М)

4.11.1. ORLAN INITIAL STATUS CHECK

- ПО-4 √ LiOH canister, moisture collector, primary and reserve БК-3 are installed in Orlan
 ⚡ БК-3 pressure ≥ 150
 √ БК-3 valves — **closed**
 √ X107, X109 connectors (two) ←|→ БРТА
 Orlan X107 connector →|← X107 cap from ПКО-М kit
 √ Gloves ←|→ Orlan
 ПО-4 √ Ⓢ О.НАС, О.ВЕНТ, Р.НАС, Р.ВЕНТ
 √ Ⓢ ПИТАНИЕ — АВТ
 √ √ ТАНГ, ОСН, РЕЗ
 ПГПУ √ O₂ flow selector — ОТКЛ
 √ БАЛЛОН — ОСН
 √ Fluid umbilical ←|→ Orlan

4.11.2. ORLAN TESTING UNIT (ПКО-М) SETUP

- Unstow ПКО-М from stowage bag
 Remove cover from ПКО-М by releasing two locks
 Remove X6K electrical connector from lirk clip
 Cover → ПКО-М stowage bag
 ПКО-М √ Ⓢ СЕТЬ
 √ sw SA1 — ВЫКЛ
 √ sw SA2 — Јдв ОРЛ
 √ Ⓢ SA3 — ПИТАНИЕ
 √ sw SA4 — 1
 Unstow ground strap from foam cover
 Caps (two) ←|→ ХТ-1 electrical connector and ground strap connector
 Caps → foam cover
 Foam cover → ПКО-М stowage bag

Assemble circuit:

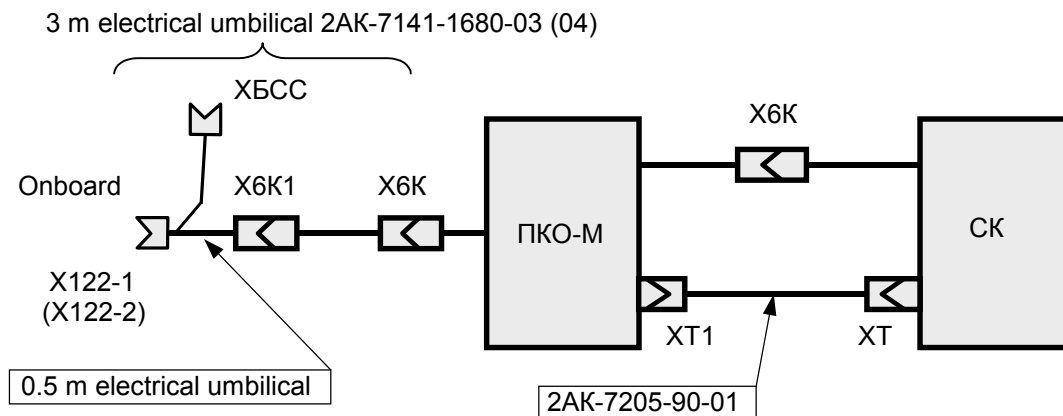


Fig. 4.11-1. Electrical connection diagram for Orlan check using ПКО-М.

Route ground strap through Orlan arm with XT1 connector remaining outside
 Ground strap XT1 connector →|← XT1 electrical connector of ПКО-М
 Cap ↔ XT electrical connector (in backpack, to the right of feedwater bladder)
 Stow cap in ПКО-М stowage bag
 Ground strap XT connector →|← backpack XT electrical connector
 ПКО-М X6K male connector →|← electrical umbilical
 ПКО-М X6K female connector →|← Orlan X6K electrical connector
 ✓ Electrical umbilical →|← onboard X122 electrical connector

Backpack tension line ring → on hook

Seal Orlan by locking **handle**

↓ PANEL ON (□ LED)

↓ SUIT 1(2) ON (□ LED)

ПОВ

4.11.3. FAN AND PUMP ELECTRIC MOTORS FUNCTIONAL CHECK. ELECTRIC MOTOR CIRCUIT BREAKER FUNCTIONAL CHECK

CAUTION

If ammeter constantly goes off-scale:
Discontinue Orlan testing unit operation
☎ СЕТЬ
Report to MCC-M

- | | | |
|----------|----|--------------------------------------|
| ПКО-М | 1. | sw SA1 → OCH. ВЕНТ |
| | | ☎ СЕТЬ |
| ПО-4 | | ☎ ПИТАНИЕ → БОРТ |
| ПКО-М | | ☐ УТЕЧКА ГАЗА, ПИТАНИЕ |
| ПО-4 | | ☑ УТЕЧ, ВЕНТ МАЛ |
| ПКО-М | | ◀ reading < 23 |
| ПО-4 | | ◀ presence of pressure reading |
| | | ☎ O. ВЕНТ ■ ВЕНТ МАЛ |
| | | ☎ fan operation |
| ПКО-М | | ◀ reading stays within 26---31 range |
| | | ↓ SB1 |
| | | ☎ fan switchover and operation |
| ПО-4 | | ◀ annunciation does not change |
| ПКО-М | 2. | sw SA1 → РЕЗ. ВЕНТ |
| | | ↓ SB1 |
| | | ☎ fan stops |
| ПО-4 | | ☑ ВЕНТ МАЛ |
| ПКО-М | | ◀ reading < 23 |
| ПО-4 | 3. | ☎ O. ВЕНТ |
| 00:00:00 | | ☎ P. ВЕНТ ■ ВЕНТ МАЛ |
| 00:10:00 | | ☎ fan operation |
| ПКО-М | | ◀ reading stays within 26---30 range |
| ПО-4 | | ☎ P. ВЕНТ ☑ ВЕНТ МАЛ |
| | | ☎ fan stops |
| ПКО-М | | ◀ reading < 23 |
| ПО-4 | | ☎ O. НАС |
| | | ☎ pump operation |
| ПКО-М | | ◀ reading < 23 |
| | 4. | Open backpack |
| | | sw SA1 → OCH. НАС |
| | | ↓ SB1 |
| | | ☎ pump switchover and operation |
| | | ◀ reading < 25 |
| | | sw SA1 → РЕЗ. НАС |
| | | ↓ SB1 |
| | | ☎ pump stops |
| | | ◀ reading < 23 |

00:00:00
 ПО-4 5. ⚙ O.HAC
 ПКO-M ⚡ annunciation and readings do not change
 00:10:00
 ПО-4 ⚙ P.HAC
 ⚙ pump operation
 ПКO-M ⚡ reading < 25
 ПО-4 ⚙ P.HAC
 ⚙ pump stops
 ПКO-M ⚡ reading < 23
 sw SA1 → ВЫКЛ
 ⚡ annunciation and readings do not change
 Close Orlan backpack

4.11.4. LIGHT SYSTEM CIRCUIT CHECK

ПО-4 ⚙ CBET
 ⚡ both bulbs in each Orlan light come on
 ПКO-M ⚡ reading < 26
 ПО-4 ⚙ CBET
 ⚡ both Orlan lights go off
 ПКO-M ⚡ reading < 23

4.11.5. MEASUREMENT UNIT FUNCTIONAL CHECK

ПКO-M 1. sw SA2 → Вик, БЕТА
 ⚡ reading stays within 20---21 range
 sw SA4 → 2
 ⚡ reading stays within 23---28 range
 sw SA4 → 3
 ⚡ reading stays within 24---31 range
 sw SA4 → 5
 ⚡ reading < 22
 sw SA4 → 6
 ⚡ reading < 22
 sw SA4 → 7
 ⚡ reading < 22
 ПО-4 2. ⚙ O.БЕHT ■ БЕHT МАЛ
 ⚙ fan operation
 ПКO-M ⚡ reading stays within 27---34 increments
 ПО-4 ⚙ O.БЕHT ■ БЕHT МАЛ
 ⚙ fan stops
 ПКO-M ⚡ reading stays within < 22 range
 sw SA4 → 8
 ⚡ reading stays within 20---25 range (needle fluctuates in this range)
 sw SA4 → 9
 ⚡ reading stays within 24---27 range
 sw SA4 → 10
 ⚡ reading 20

4.11.9. WIRING INSULATION RESISTANCE CHECK

Panel	Operation	ИП ПКО-М reading	ПО-4 alarm
ПКО-М	sw SA2, SA3 → R изоляции √ sw SA4 — 3 □ ПИТАНИЕ	< 25	■ all annunciators
ПО-4	⊕ O.ВЕНТ, P.ВЕНТ, O.НАС, P.НАС, СВЕТ	< 25	■ all annunciators
	⊕ O.ВЕНТ, P.ВЕНТ, O.НАС, P.НАС, СВЕТ	< 25	■ all annunciators
ПКО-М	sw SA4 → 2	< 25	■ all annunciators
	sw SA4 → 1	< 25	■ all annunciators
backpack ПГПУ ПО-4 ПОВ	⊕ СЕТЬ sw SA1 → ВЫКЛ sw SA2 → Jдв ОРЛ ⊕ SA3 → ПИТАНИЕ ■ ПИТАНИЕ Close reserve БК-3 valve O ₂ flow selector → ИНЖ БАЛЛОН → РЕЗ ⊕ ПИТАНИЕ → АВТ ↓ SUIT 1 (2) OFF (■ LED) ↓ PANEL OFF (■ LED) X3, X3KP caps (two) ↔ Orlan electrical connector Stow X3, X3KP caps in ПКО-М cover pockets Disassemble check circuit		

4.11.10. ORLAN INTERFACE UNIT (БСС) CHECK

БСС

 **O₂ CLOSED**

Configure circuit:

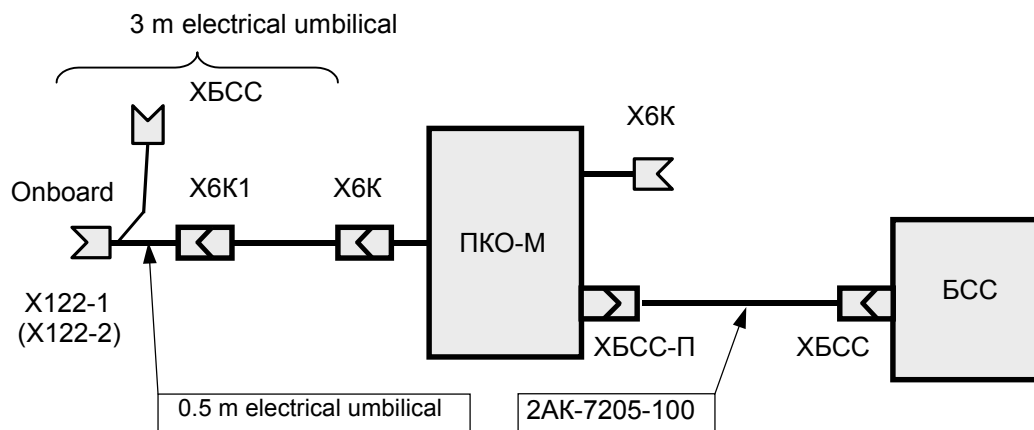









Fig. 4.11-2. Electrical connection diagram for БСС check using ПКО-М

Panel	Operation	ИП ПКО-М reading
ПКО-М	Ⓢ СЕТЬ sw SA2 → У ик, БЕТА sw SA4 → 4 □ ПИТАНИЕ	22---24
БСС	 PRESS  LEAK CHECK Safety pin → UNLK  SUIT DEPRESS  PURGE  PREBREATHE-A/L DEPRESS  O₂ OPEN-EVA  O₂ CLOSED	22---24 22---24 25---27 27---30 22---24 21---22 22---24
ПКО-М	Ⓢ СЕТЬ sw SA2 → Јдв ОРЛ sw SA4 → 1 ■ ПИТАНИЕ Disassemble check circuit	20

4.12. KORONA VOLUME LEVEL CONTROL

(00:30:00)

1. ORLAN AND БРТА SETUP

Secure Orlan in ПхО

Install БРТА on Orlan (2.4.5)

Do not install БК-3 in БРТА, if installed – remove (2.4.9)

Install battery in БРТА (2.4.7)

Open cover that protects XWA3 and XWA4 connectors

Open rubber cap covering potentiometers

Comm cap →← Orlan X3 connector

2. COMM SYSTEM ACTIVATION

EV1

ИНПУ

SM: SM COMM CONTROL

SM COMM READY UNIT

EVA COMM

ON

EVA COMM

VHF2 duplex

ON

VHF2 duplex

Don low noise headset

EV2

ПА ПхО

↓ CHANNEL 3 (LED)

↓ XMIT XMIT3 LED

Don comm cap

БРТА

⊕ ОРЛАН

ПО-4

⊕ ПИТАНИЕ → АВТ

↓ ОСНОВ, ТАИГ

3. VOLUME LEVEL CONTROL

NOTE

1. Right potentiometer screw is used to change volume of primary Korona set, left potentiometer screw is used to change volume of reserve Korona set
2. Rotate potentiometer screw ↻ to increase volume level, and ↻ to decrease volume level
3. Use jeweler's screwdriver from ISS tool kit for sound volume adjustment

CAUTION

When adjusting volume level, **do not change** position of dip switches that configure alarm signal generator and transmitter's frequency

БРТА

While EV1 counts aloud in normal voice

ПО-4

EV2 adjusts right potentiometer screw to achieve best sound quality

↓ РЕЗЕРВ

Adjust left potentiometer screw

4. FINAL OPERATIONS
- ПО-4 √ РЕЗЕРВ, ТАИГ
 БРТА Ⓢ ПИТАНИЕ → БОРТ
 ПА ПхО Ⓢ ОРЛАН
 ИнПУ √ ХМИТ, CHANNEL 3 (■ LED)
 SM: SM COMM CONTROL
 БРТА EVA COMM **OFF** ■ EVA COMM
- Close rubber cap covering potentiometers
 Close protective cover of XWA3, XWA4 connectors
 Comm cap ←→ Orlan X3 connector
 Stow comm cap in personal gear bag
 Remove БРТА from Orlan
 Install Orlan stowage cover onto Orlan and secure in attachment node
 Stow jeweler's screwdriver in ISS tool kit

4.13. WATER SYSTEM CLEANING USING DEGASSING PUMP UNIT

4.13.1. DEGASSING PUMP UNIT (БОС) SETUP

(00:30:00)

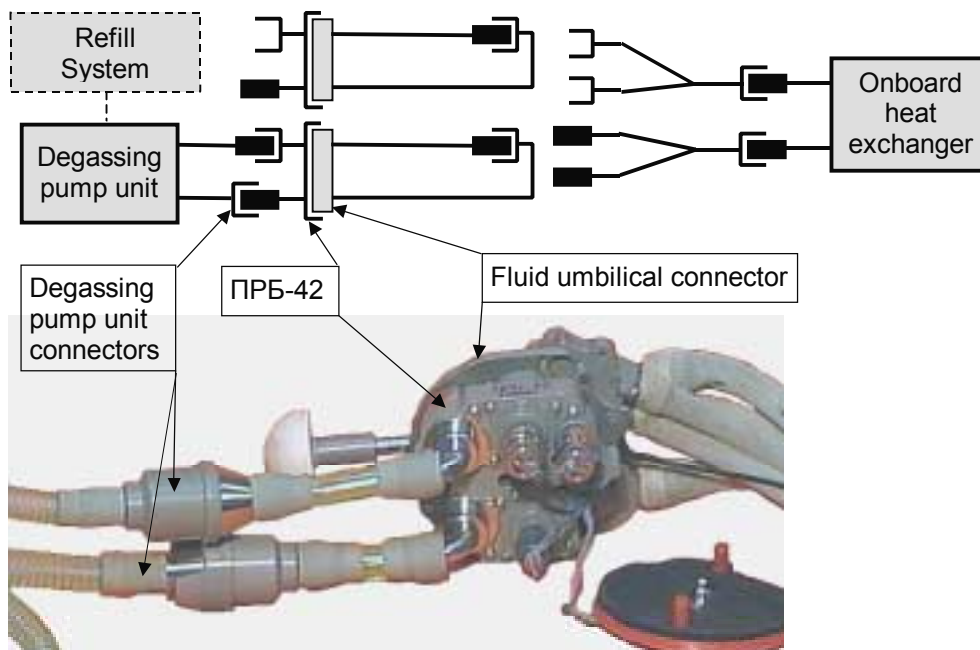
1. Prepare ЗИП-1 and ЗИП-5 kits
- БОС Remove cover
 If degassing pump filter is dark, replace it:
 | release filter from fastener;
 | demate water connector;
 | insert new filter onto degassing pump unit (√ **MCC-M** for serial number)
 Install БОС-2 bag (from ЗИП-1 kit) on degassing pump unit degas fitting
 √ Ⓢ ПИТАНИЕ — ВЫКЛ
 √ Degassing pump filter water connectors (two) →|← inner degassing pump unit
 water connectors
- ЗИП-5 kit Unstow 17КС.250Ю-8175А-30 electrical cable from
 ≠250Ю=А13-ШП connector →|← degassing pump unit electrical connector
 ≠10Ю=А339-Х1 connector →|← РБС 10/3
2. Perform Refill System Preparation per 2.3.1
- safety valve Refill hose →|← fitting on degassing pump filter housing
 √ Handle — ОТКР
 Operate hand pump until safety valve activates

4.13.2. CLEANING AND SEPARATION OF BCC FLUID UMBILICAL

(00:30:00)

1. Perform Degassing Pump Unit (БОО) Setup (see 4.13.1)
Prepare ЗИП-5 kit
2. БСС water hoses (four) ↔ onboard heat exchanger tubes
Mate together connectors of both БСС water hoses
Unstow ПРБ-42 accessories (two)
Remove red caps from ПРБ-42 accessories, stow caps in ЗИП-5 kit
ПРБ-42 accessories (two) →|← fluid umbilical connectors
Degassing pump unit water connectors →|← any ПРБ-42 accessory

ЗИП-5 kit



Operate manual pump until safety valve activates

РБС 10/3 3. √ ON

БОО

⊕ ПИТАНИЕ → ВКЛ
↓ white pb < Water flow rate > 1.5 L/min

⊕ ПИТАНИЕ → ВЫКЛ (for 5---10 sec)
⊕ ПИТАНИЕ → ВКЛ
< Water flow rate > 1.5 L/min

<< Degassing pump filter is clear (if it is dark, replace)

When necessary remove gas bubbles from separator

<< water flow rate > 1.5 L/min

< No gas bubbles are left in separator

⊕ ПИТАНИЕ → ВЫКЛ

4. Operate hand pump until safety valve activates

Degassing pump unit ↔ ПРБ-42

Degassing pump unit →|← other ПРБ-42

Repeat step 3

00:00:00

00:03:00

- РБС 10/3 5. ☞ OFF
 Degassing pump unit ↔ ПРБ-42
 ПРБ-42 (two) ↔ fluid umbilical connector
 Red caps (ЗИП-5 kit) →|← ПРБ-42
 Stow ПРБ-42 in ЗИП-5 kit
 Disconnect fluid umbilical water connectors
 БСС water hoses (four) →|← onboard heat exchanger tubes

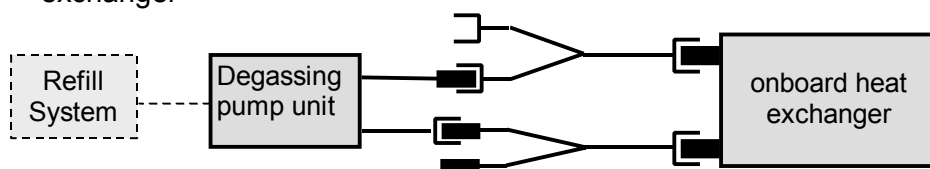
4.13.3. THERMOELECTRIC COOLING DEVICE CLEANING. LIQUID COOLING GARMENT AUTONOMOUS CLEANING

(00:30:00)

NOTE

Liquid cooling garment autonomous cleaning is performed according to the same procedure

1. Perform Degassing Pump Unit (БСС) Setup (see 4.13.1) and Refill System Preparation (see 2.3.1)
2. БСС water hoses (four) ↔ onboard heat exchanger tubes
 Degassing pump unit water connectors →|← water connectors of onboard heat exchanger



- РБС 10/3 3. Operate manual pump until safety valve activates
 БСС
 √ ☞ ON
 ☞ ПИТАНИЕ → ВКЛ
 << Degassing pump filter is clear (if it is dark, replace)
 When necessary remove gas bubbles from separator
 << water flow rate > 1.5 L/min
 00:00:00 < No gas bubbles are left in separator
 00:03:00 ☞ ПИТАНИЕ → ВЫКЛ
4. Degassing pump unit connectors ↔ water connectors of onboard heat exchanger
 Degassing pump unit connectors →|← water connectors of onboard heat exchanger
 Repeat step 3
- РБС 10/3 5. ☞ OFF
 Operate hand pump until safety valve activates
 Degassing pump unit ↔ tubes of thermoelectric cooling device
 БСС water hoses (four) →|← onboard heat exchanger tubes

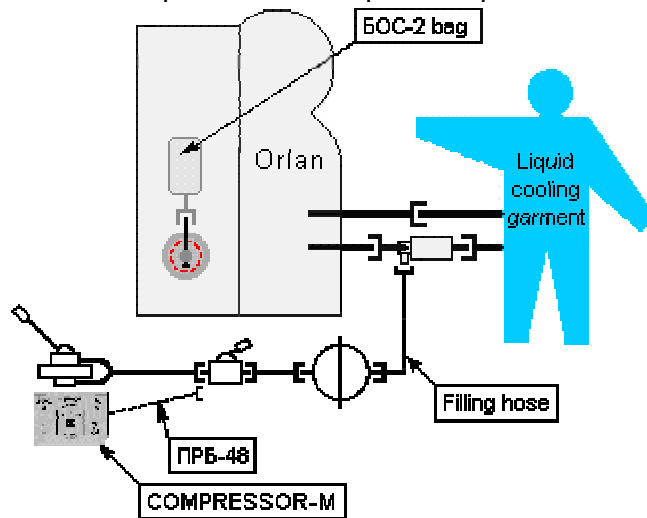
4.13.4. FINAL OPERATION

- БСС-2 bag ↔ degas fitting
 Empty gas/water into АСУ
 Stow empty bags into ЗИП-1 kit
 17КС.250Ю-8175А-30 cable ↔ degassing pump unit and РБС 10/3, stow cable in ЗИП-5 kit
 Mate together degassing pump unit connectors
 Cap degassing pump unit

4.14. CLEANING AND SEPARATION OF ORLAN WATER SYSTEM WITHOUT BCC

(01:00:00)

1. Perform Refill System Preparation per 2.3.1 and Orlan Preparation For Separation per 2.3.2



- backpack 2. \triangleleft Water system refill indicator position — normal ***** 2.3.3
 ПГПУ \checkmark Filling hose \leftrightarrow degassing pump filter
 ПОВ \checkmark TO — ОТКЛ
 ПОВ \checkmark temperature control handle — 6
 ПО-4 3. \downarrow PANEL ON (□ LED)
 ПО-4 \downarrow SUIT 1(2) ON (□ LED)
 ПО-4 \checkmark ПИТАНИЕ — БОРТ \blacksquare УТЕЧ, ИНЖ, ВЕНТ МАЛ, ЗВУК
 ПО-4 \odot О.НАС, Р.НАС
 backpack \downarrow ЗАМЕР РАСХОДА \triangleleft initial water flow rate = _____
 Remove gas bubbles from separator (see 2.3.4 step 2)
 \triangleleft Degassing pump filter is clear (if it is dark — replace)
 \triangleleft water flow rate > 1.5 L/min *****

 \odot О.НАС, Р.НАС (for 5---10 sec)
 \odot О.НАС, Р.НАС
 \triangleleft water flow rate > 1.5 L/min

 00:00:00 \triangleleft Gas bubble formation in separator has stopped
 00:03:00 Temperature control handle → 0
 When necessary remove gas bubbles from separator (see 2.3.4 step 2)
 00:00:00 \triangleleft Gas bubble formation in separator has stopped
 00:03:00 Temperature control handle → 6 (full down)
 \downarrow ЗАМЕР РАСХОДА \triangleleft water flow rate = _____ > 1.5 L/min ***** see up
 \odot О.НАС, Р.НАС
 Refill water system (see 2.3.3)

- ПОВ 4. ↓ SUIT 1 (2) OFF (■ LED)
↓ PANEL OFF (■ LED)
- ПО-4 ■ all annunciators
Remove БОС-2 bags from separator degas fittings, expel water from bags into АСУ
Stow empty bags in ЗИП-1 kit
Reinstall tubing restraint in backpack
Close backpack internal cover
Degassing pump filter ↔ Orlan and liquid cooling garment
Liquid cooling garment →|← Orlan
Stow liquid cooling garment in Orlan
Remove ПРБ-11 and stow in ЗИП-1 kit
Backpack tension line ring → onto hook
Disassemble refill system

4.15. БП-14 FUSE UNIT REPLACEMENT

- Unstow new БП-14 fuse unit from ЗИП-3 kit
Unfasten multilayer insulation Velcro under ПО-4
Remove two screws fastening БП-14 fuse unit and remove the unit
Install new БП-14 fuse unit, tighten two screws
Fasten multilayer insulation Velcro under ПО-4
On MCC-M GO perform Orlan checkout

4.16. BCC AND FLUID UMBILICAL CHECKOUT

BCC 1. Prepare ЗИП-3, ЗИП-5 kits
 ✓ Fluid umbilical →← BCC correctly (marks and labels should match)
 ✓ **O₂ CLOSED**

CK ✓ Fluid umbilical ↔ from Orlan
 Open onboard БК-3 valve

00:00:00 2. **O₂ OPEN-EVA**  O₂ OPEN

00:05:00 Close onboard БК-3 valve

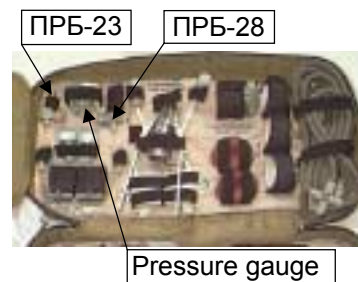
00:10:00  O₂ OPEN

3. ПРБ-42 accessory (two from ЗИП-5 kit) →← both fluid umbilical connectors
 Open onboard БК-3 valve

00:00:00 **PRESS**

00:05:00 Close onboard БК-3 valve

Prepare ПРБ-23, ПРБ-28 accessories and Orlan pressure gauge from ЗИП-3

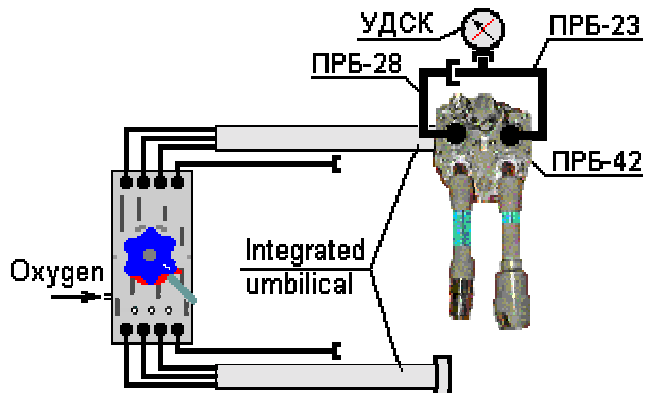


00:10:00  O₂ OPEN

00:00:00 4. **O₂ CLOSED**

00:01:00  O₂ OPEN

5. ПРБ-42 (two) ↔ from both fluid umbilical connectors
 ПРБ-42 + ПРБ-28 + ПРБ-23 accessories and Orlan pressure gauge →← one of fluid umbilical connectors



6. Open onboard БК-3 valve

PRESS until oxygen pressure (by Orlan pressure gauge) = 0.5---0.6

00:00:00

LEAK CHECK

00:03:00

◀ oxygen pressure (by Orlan pressure gauge) = 0.4---0.55

◀ Δ oxygen pressure (by Orlan pressure gauge) (00:01:00) ≤ 1 increment

00:00:00

7. **PREBREATHE-A/L DEPRESS**

00:05:00

◀ oxygen pressure (by Orlan pressure gauge) = 0.35---0.37

Close onboard БК-3 valve

PURGE until oxygen pressure (by Orlan pressure gauge) = 0

O₂ CLOSED

5. USE OF ORLAN AUXILIARY EQUIPMENT

5.1. БК-3 OXYGEN BLEED

ПРБ-10 (from ЗИП-3 kit) →|← БК-3 oxygen fitting
 Using special wrench from ЗИП-1 kit, open БК-3 valve
 Bleed oxygen from БК-3 until hissing stops
 Close БК-3 valve
 ПРБ-10 ←|→ БК-3
 Stow ПРБ 10 in ЗИП-3 kit

5.2. БК-3 CONNECTION TO OXYGEN EMERGENCY HOSE OF ORLAN

NOTE

Perform operation if it is necessary to increase Orlan autonomous O₂ supply

Prior to EVA

ПОВ Electrical connector А1Х3КР →|← electrical connector of БК-3 pressure sensor
 Adapter to pneumopanel hose (ЗИП-1 kit) →|← БК-3 bayonet connector
 √ БК-3 pressure = 350---400 ***** use other БК-3
 Temp stow БК-3 in A/L

During EVA in A/L

БК-3 (via adapter to pneumopanel hose) →|← emergency hose on Orlan
 Using special wrench, open БК-3 valve
 While moving, secure БК-3 (either holding by hand or by tethering)
 ПО-4 If □ O₂ МАЛО
 ПГПУ БАЛЛОН → РЕЗ

5.3. ORLAN FEEDWATER BLADDER REFILL FROM ANOTHER ORLAN FEEDWATER BLADDER

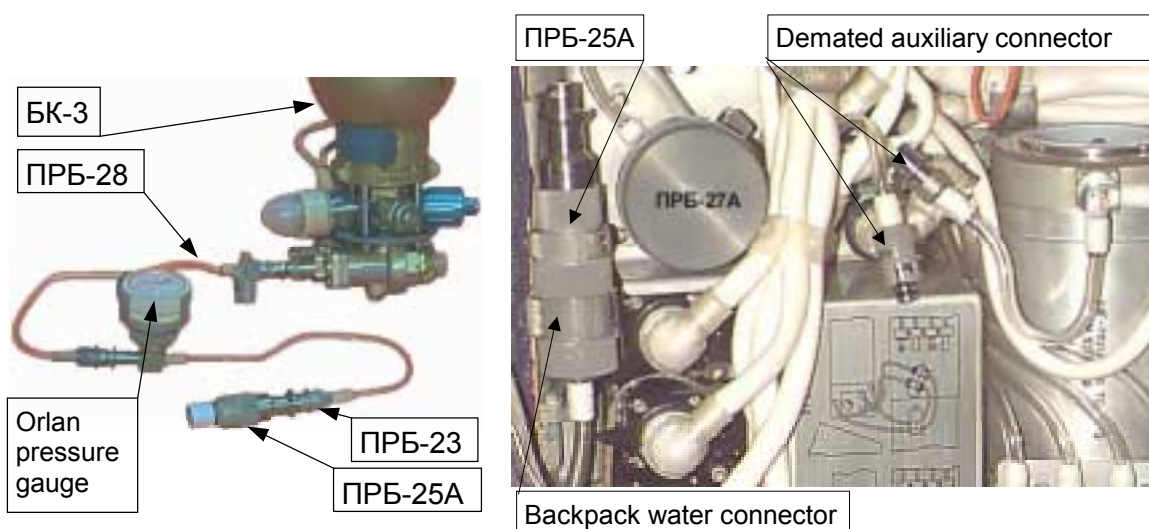
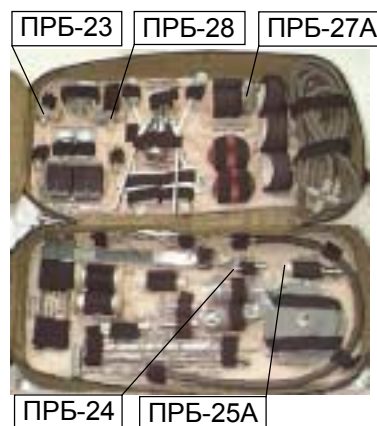
Unclasp straps and unfasten long zipper on Orlan feedwater bladder restraint
 √ Feedwater bladder shell is straightened
 Fasten long zipper and clasp straps
 Unfasten short zipper
 Unstow from ЗИП-5 kit ПРБ-16 and ПРБ-13 accessory
 ПРБ-16 →|← Orlan feedwater bladder and donor feedwater bladder
 Insert donor feedwater bladder strap into ПРБ-13 slot

 Squeeze donor feedwater bladder (by rolling it up on ПРБ-13) to refill Orlan feedwater bladder
 <| Water volume in Orlan bladder increases (visually and by touch)
 After refill is complete, ПРБ-16 ←|→ feedwater bladders
 Stow ПРБ-16 and ПРБ-13 accessory in ЗИП-5 kit

5.4. WATER SUPPLY LINE PURGE

5.4.1. PURGING LINES FROM FEEDWATER BLADDER TO HEAT EXCHANGER

- Assemble circuit:
 Unstow from ЗИП-3 kit ПРБ-28, ПРБ-23,
 ПРБ-25А, ПРБ-27А
 БК-3 (✓ **MCC-M** for serial number) →← ПРБ-28
 ПРБ-28 →← ПРБ-23
 Orlan pressure gauge ←+ Orlan
 Orlan pressure gauge →← ПРБ-23
 ПРБ-23 →← ПРБ-25А
 ПРБ-25А →← backpack water connector
- ПРБ-27А →← feedwater line filter socket
 Demate auxiliary connector between feedwater line filter
 and sublimator (secured in lirka clip above
 measurement unit)



ПГПУ

- ✓ БАЛЛОН — РЕЗ
 ✓ O₂ flow selector — ОТКЛ
 ✓ ТО — ОТКЛ
 Using special wrench (from ЗИП-1 kit), open reserve БК-3 valve
 Sublimator → On
 Open БК-3 valve (in the assembled circuit)
 ◀ oxygen pressure (by Orlan pressure gauge) < 0.45

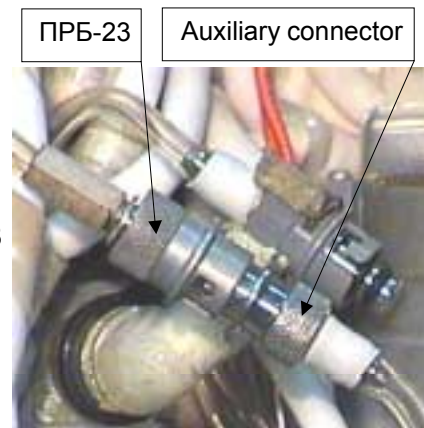
Close БК-3 valve
Report to MCC-M

ПГПУ

- ⚙ Oxygen supply from demated auxiliary connector
 Close valves of both БК-3
 Sublimator → Off
 O₂ flow selector → ИНЖ
 If operations per 5.4.2, 5.4.3 are not required by **MCC-M**:
 - Disassemble circuit
 - Mate auxiliary connector
 - Install auxiliary connector into lirka clip
 - ✓ **Auxiliary connector (after feedwater line filter) is mated**

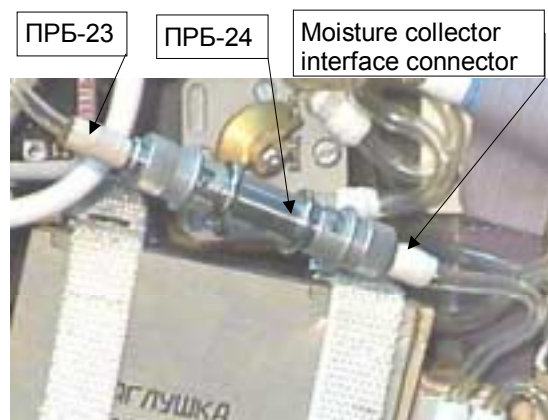
5.4.2. PURGING LINES FROM FEEDWATER LINE FILTER TO SUBLIMATOR

1. In the circuit, assembled per 5.4.1:
 ПРБ-25A ↔ ПРБ-23
 ПРБ-23 →|← demated auxiliary connector on the side of sublimator
- 00:00:00 2. Open БК-3 valve (in the assembled circuit)
 < Orlan pressure gauge reading < 0.45
 If pressure ≥ 0.45 or safety valve activates on ПРБ-28
 | Close БК-3
 | **Report to MCC-M**
- 00:01:00 3. < Orlan pressure gauge reading < 0.1
 Close БК-3 valve (in the assembled circuit)
 Mate auxiliary connector
 Install mated auxiliary connector into lirka clip
 If operations per 5.4.3 are not required by **MCC-M**
 | Disassemble circuit
 | **√ Auxiliary connector (after feedwater line filter) is mated**



5.4.3. MOISTURE COLLECTOR TO SUBLIMATOR LINE PURGE

1. In the circuit assembled per 5.4.2:
 ПРБ-24 (from ЗИП-3 kit) →|← ПРБ-23
 ПРБ-24 →|← moisture collector interface connector
- 00:00:00 2. Open БК-3 valve (in the assembled circuit)
 < Orlan pressure gauge reading < 0.45
 If pressure ≥ 0.45 or safety valve activates on ПРБ-28
 | Close БК-3
 | **Report to MCC-M**
- 00:01:00 3. < Orlan pressure gauge reading < 0.1
 Close БК-3 valve (in the assembled circuit)
 Disassemble circuit
 Mate auxiliary connector
 Stow all accessories in ЗИП-3 kit
 Orlan pressure gauge →|← Orlan
√ Auxiliary connector (after feedwater line filter) is mated



5.5. GLOVE LEAK CHECK

- Unstow Orlan pressure gauge from Orlan Assemble circuit:
Orlan pressure gauge →|← ПРБ-22 (from ЗИП-1 kit)
ПРБ-22 →|← emergency hose
Glove →|← ПРБ-22

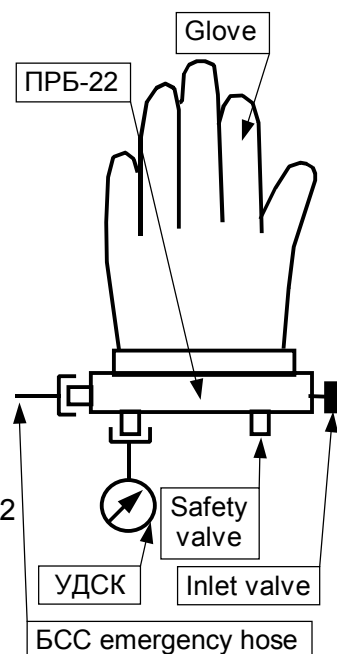
БСС
√ БК-3 (pressure > 50) is connected to БСС
√ Metal caps are installed on all free connectors of БСС tube

⚙️ **O₂ CLOSED**
Using special wrench, open БК-3 valve

⚙️ **O₂ OPEN-EVA** ⚙️ O₂ OPEN
- ПРБ-22 Press to open inlet valve until glove pressure (by Orlan pressure gauge) = 0.4
If glove pressure > 0.5 or safety valve activates on ПРБ-22

БСС
⚙️ **O₂ CLOSED**
√ **MCC-M**

00:00:00
00:01:00
 ⚠️ glove pressure (by Orlan pressure gauge) = 0.4
 ⚠️ glove pressure (by Orlan pressure gauge) ≥ 0.38
 ⚠️ Δ glove pressure (over 00:01:00) < 2.5 increments (use red arrow), **report to MCC-M**
- ПРБ-22 Depressurize glove, pulling aside safety valve cord
Glove ↔ ПРБ-22
Other glove →|← ПРБ-22
Perform step 2
Using special wrench, close БК-3 valve
- БСС
⚙️ **PURGE** ⚙️ O₂ OPEN
⚙️ **O₂ CLOSED**
Disassemble circuit
Install rubber cap on free БСС oxygen tube connector
Orlan pressure gauge →|← Orlan



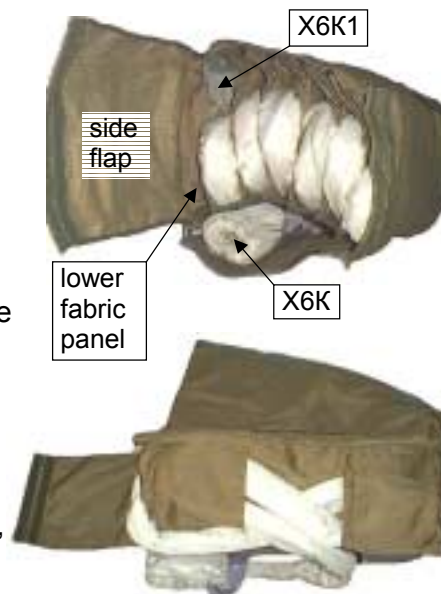
5.6. FINAL DRYING OF GLOVES

- Assemble circuit:
ПРБ-31 (from ЗИП-6 kit) →|← ПРБ-37 (from ЗИП-6 kit)
ПРБ-37 →|← gloves final drying accessory (Sokol kit)
Open Orlan backpack
ПРБ-31 →|← valve cover in backpack
Install glove onto final drying accessory (from Sokol kit)
- ПО-4
√ ⚙️ О.НАС, Р.НАС, О.ВЕНТ, Р.ВЕНТ, ПИТАНИЕ — БОРТ
√ Electrical umbilical →|← Orlan

ПОВ
↓ PANEL ON (□ LED)
↓ SUIT 1 (2) ON (□ LED)
- ПО-4
00:00:00
00:30:00
ПОВ
⚙️ Р.ВЕНТ
⚙️ Р.ВЕНТ
↓ SUIT 1 (2) OFF (■ LED)
↓ PANEL OFF (■ LED)

5.7. 25 M ELECTRICAL UMBILICAL SETUP

1. Demate X6K1 connector of 3 m electrical umbilical
2. Secure kit with 25 m electrical umbilical in A/L
 - Open side flap of kit
 - Undo metal zipper
 - Open lower fabric panel Velcro located under metal zipper
 - Unstow X6K1 male connector. X6K1 →← X6K1 female connector of 3 m umbilical
3. Open fabric panel #1 Velcro
 - Sequentially unstow coils (three) of 25 m umbilical and place them on top of panel pockets
 - Close fabric panel Velcro
 - √ umbilical restraint free from Velcro
4. Repeat step 3 the required number of times based on specific EVA task (required length)
5. After umbilical X6K connector has been connected to Orlan, close metal zipper on kit
 - Prior to EVA, undo metal zipper on kit
6. After EVA, coil umbilical and stow coils in panel pockets in the reverse order
 - Do not bend umbilical excessively when making coils
 - Close metal zipper on kit and side flap



5.8. USE OF ORLAN AS DECOMPRESSION CHAMBER

After appearance of symptoms of decompression disease during EVA:

Immediately return to A/L, avoiding physical strain

Able crewmember provides assistance to affected crewmember


WARNING

Able crewmember is not allowed to open Orlan backpack until fluid umbilical is demated to avoid Orlan depressurization of affected crewmember

When repress of A/L is complete, able crewmember demates fluid umbilical from Orlan and only then exits Orlan

Affected crewmember remains in Orlan (connected to onboard supply)



On MCC-M GO

BCC  **PRESS** to Orlan pressure = 0.2---0.4

 **O₂ OPEN-EVA**

WARNING

Total time of stay in Orlan should not exceed 9 hours (after donning Orlan)
If time needs to be increased, √ MCC-M (replace LiOH canister, БК-3 and other consummables)

	Transfer to ПхО
ПОВ	Activate thermoelectrical cooling device
backpack	Install new LiOH canister in Orlan
	√ Moisture collector is installed
	√ Feedwater line filter is installed (any)
	Measurement unit tubes → РАБОТА configuration (per decal)
BCC	√ БК-3 with total pressure ≥ 400 are connected to БСС
	Open valves of onboard БК-3
	√ Fluid umbilical is mated only to affected crewmember's Orlan
	Affected crewmember dons liquid cooling garment and comm cap
	Don Orlan
ПО-4	 O.BEHT, O.HAC
	Perform Orlan purge from БСС for 4 minutes
	 O.BEHT, O.HAC

5.9. NASA EVA GEAR

5.9.1. WATER DRINKING BAG

1. DRINKING BAG SETUP

Unstow the bag from storage location

Open Velcro clip on the bag soft cover and take the bag out

◀ bag, tube and mouthpiece are not damaged

If there is air in bag (bag is slightly inflated)

Place bag on a flat surface

Compress mouthpiece and open drinking valve

Flatten bag by hand to expel excess air through drinking valve



2. DRINKING BAG REFILLING

pnl 230

√ Dispenser hose → ← ЕДВ

√ Individual mouthpiece ↔ dispenser mouthpiece adapter

Insert dispenser cone through mouthpiece in drinking **tube**

Safety valve handle → ОТКР

Operate hand pump until safety valve activates (🔊)

Dispenser coupling → drinking position



00:00:00

↓ pb on dispenser and hold

Perform 2-3 pumping cycles using manual pump

00:00:20

Release pb on dispenser

◀ there is ~ 500 mL water in bag

Dispenser coupling → initial position

Pull out dispenser cone from drinking bag mouthpiece

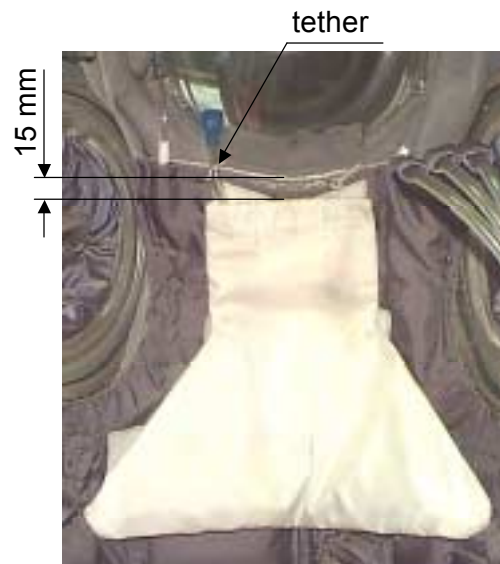
Place the bag into soft cover, insert straps of soft cover into slots of bag and secure

Close Velcro clip

3. DRINKING BAG INSTALLATION INTO ORLAN

Secure soft cover with bag inside on Orlan liner using Velcro (see Figure)

Tether drinking tube to Orlan liner-to-cuirass attachment cord, using ШКП cord from ЗИП-3 kit



4. DRINKING BAG REMOVAL FROM ORLAN

Untether drinking tube from Orlan liner-to-cuirass attachment cord

Soft cover with bag ↔ Orlan liner

Remove bag from Orlan and stow in storage location

5.9.2. FRESNEL LENS

1. LENS PREPARATION

Unstow lens from storage location

◀ lens surface is clean (no visible specs of dust or dirt)

If necessary, clean up the lens using the wipes from ЗИП-1 kit,
(first, the one moistened with potable water, and then a dry one)

2. HELMET GLASS COVER PREPARATION

◀ absence of grease, dust or dirt on the inside of helmet glass cover ,

If necessary, clean up the glass cover using either the shammy from ЗИП-1 kit
or the wipes from Orlan-M ORU kit (first, the one moistened with
potable water, and then a dry one)

3. LENS INSTALLATION

Install the lens on the bottom right portion of the inside of the helmet glass cover
so that the ПО-4 upper panel was clearly visible through the lens

Smooth out the lens using the shammy from ЗИП-1 kit

◀ absence of air bubbles between the lens and the helmet glass cover

Lubricate internal surface of the helmet glass cover, **except for the lens**,
using special grease from ЗИП-1 kit

4. LENS REMOVAL

Holding the lens by its corner, carefully separate it from the helmet glass cover

◀ lens surface is clean (no visible specs of dust or dirt)

Stow lens in storage location

5.9.3. HYGIENIC BRIEFS

1. Unstow briefs from storage location

◀ absorbent layer is not damaged

2. Prior to donning other EVA gear:

firmly press the front and rear parts of the briefs to the waist

engage side clasps

√ clasps hold reliably

If clasps do not hold - take another pair of briefs

3. After usage, stow the briefs in the wet waste container

5.9.4. HYGIENIC UNDERGLOVES FOR EVA GLOVES

1. Unstow pack with undergloves from storage location

NOTE

Medium-sized undergloves have orange trim
Larger-sized undergloves have red trim

2. Don undergloves after donning EVA overalls
3. After EVA is complete, dry out the undergloves and stow them in storage location

5.9.5. MOLESKIN TAPE

1. Unstow moleskin tape from storage location
Unstow a pair of scissors from the ISS Toolkit
2. At EV crewmember preference, cut several pieces of moleskin tape for protection of his/her palms and wrists during EVA operations
3. Prior to donning EVA undergloves:
remove protective film from cut pieces of moleskin tape,
apply pieces of tape on the parts of hand and wrist to be protected
against lesions,
press tape firmly, smoothing it out
4. After EVA is complete, remove moleskn tape from skin and discard

5.9.6. SOCKS

1. Unstow a pack of thin white socks and warm thick red-black socks

Sock Sizes	
S	39-42
M	42-45
L	45-48

2. Don regular socks prior to donning EVA overalls
After donning the liquid cooling garment, remove overalls straps from feet and don warm socks