SERVICE MODULE

MOTION CONTROL and NAVIGATION SYSTEM

(СУДН)

SM.0

Page Issue and Revision Log

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INTRODUCTION

These СУДН crew procedures are based on preliminary inputs and will be updated as the system is further developed and initial documentation is released.

These crew procedures contain СУДН operation procedures and reference data.

These СУДН crew procedures support БВС МО 4 (software release 4) for stage 1R – 9A.

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 ISS assembly, system modification and procedure validation at simulators and training facilities.

These crew procedures contain indications, required for monitoring. Crew can monitor other parameters at their discretion.

ACRONYMS AND ABBREVIATIONS

БВС	onboard computer system
БУ	control unit
ИнПУ	integrated control panel
КЦП	central post computer
МДМ	multiplexer/demultiplexer, MDM
ОЗУ	random access memory, RAM
ПВУ	program timing device
ПЗУ	read-only memory, ROM
СУБА	onboard equipment control system
ТВМ	terminal computer
УС	matching unit
ЦП	central post
ДнаЗ	**Report to MCC**
ДпоУЗ	√**MCC**
ЗвН	continuous sound
ЗвП	intermittent sound
ИнПУ	integrated control panel
СвД	light emitting diode, LED
клав	pushbutton, pb
кн	pushbutton, pb
поУЗ	**On MCC GO**, per **MCC** instructions
рзм	connector
тмб	switch, sw

Блок ЭПКГ	fuel tanks electropneumatic valves
Блок ЭПКО	oxidizer tanks electropneumatic valves
ТКГ	Progress cargo vehicle
АО	assembly compartment
БА	Nitrogen tank
БВДГ	high-pressure fuel tank
БВДО	high-pressure oxidizer tank
БГ	fuel tank
БК	compressor unit
БН БГ	fuel tanks pressurization unit
БН БО	oxidizer tanks pressurization unit
БН ДБГ	auxiliary fuel tanks pressurization unit
БН ДБО	auxiliary oxidizer tanks pressurization unit
БНДГ	low-pressure fuel tank
БНДО	low-pressure oxidizer tank
БО	oxidizer tank
БСКТ	propellant monitoring unit
БЭГК Г	fuel section electrohydraulic valve unit
БЭГК О	oxidizer section electrohydraulic valve unit
БЭПК ОН Г	fuel tanks evacuation and pressurization electropneumatic valve unit
БЭПК ОН О	oxidizer tanks evacuation and pressurization electropneumatic valve unit
Г	fuel
ДО	SM attitude control thrusters (13.3 kg)
ТБГ	FGB fuel tanks
ТБО	FGB oxidizer tanks
ДУ К	roll thrusters
ДУ	propulsion system
ЗУГ	fuel refilling device
ЗУО	oxidizer refilling device
КД	SM reboost engine (313 kg)
КДГ	fuel refilling valve
КДО	oxidizer refilling valve
ККГ	fuel manifold valve
ККО	oxidizer manifold valve
КМГ	SM reboost engine fuel line valve
КМИ	magnetic pulse valve
КМО	SM reboost engine oxidizer line valve
КОБ	tank cutoff valve
КОГ	fuel manifolds combining valve
КОКВ	high-pressure compressors combining valve
КОКГ	fuel line compressors opening valve
КОКН	low-pressure compressors combining valve
КОКО	oxidizer line compressors opening valve
КОКР	backup compressor opening valve
КОНВ	high-pressure pressurization comb. valve
КОНН	low-pressure pressurization combining valve
КОО	oxidizer manifolds combining valve
КП	refilling lines purging valve
КПАБГ	fuel tank Nitrogen starting valve
КПАБО	oxidizer tank Nitrogen starting valve
КПК	manifold pyrovalve
КТ	propellant components
МКС	International Space Station, ISS
НД	low pressure
НЭП	Science Power Platform, SPP

О	oxidizer
ОДУ	integrated propulsion system
ПГС	pneumo-hydraulic system
ПКАБГ	fuel tank Nitrogen pyrovalve
ПКАБО	oxidizer tank Nitrogen pyrovalve
ПКПГ	fuel tank starting pyrovalve
ПКПО	oxidizer tank starting pyrovalve
ППТ	propellant collection and transport
ПСВД	high pressure pneumatic system
СД	pressure indicator
СДГ	fuel pressure indicator
СДК	chamber pressure indicator
СДО	oxidizer pressure indicator
СМ	Service Module, SM
СПА	Nitrogen supply system
СПС	tank bellows position indicator
СПУ	pneumatic control system
СУ	control system
СУД	motion control system
ТБ	propellant tank
ТС	propellant system
УСМ	Universal Docking Module, UDM
ФГБ	Functional Cargo Block, FGB
ЭГК СОД Г	fuel refilling system electrohydraulic valves
ЭГК СОД О	oxidizer refilling system electrohydraulic valves
ЭГК	electrohydraulic valve
ЭГКД	dual-position electrohydraulic valve
ЭПК	electropneumatic valve
ЭПКД	dual-position electropneumatic valve

SYMBOLS

□	indicator illuminated (illuminates)
■	Indicator not illuminated (de-illuminates)
▚	indicator blinking
◨	indicator status changes momentarily when command is issued
↷	rotate clockwise
↶	rotate counterclockwise
↶̲	rotate counterclockwise to stop
↷̲	rotate clockwise to stop
↶↷	adjust by rotating
←┼→	disconnect, demate
→┼←	connect, mate
03:10:20	relative time (hours, minutes, seconds)
√	check, place the item into desired state if possible

1. GENERAL INSTRUCTIONS

1.1. CREW RESPONSIBILITIES

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

1. Perform operations per these crew procedures and **MCC** instructions (comm passes or radiograms), in accordance with the crew functional responsibilities and current status of the onboard systems.

2. Monitor systems operation per these crew procedures and **MCC** instructions.

3. Prior to operations, perform indicator checks on the control panels to be used.

4. Record actual time spent performing operations.

5. **Report to MCC** completed operations and any system problems at earliest available comm pass.

6. When there is a deviation from nominal systems operation, not documented in these crew procedures, crew is responsible for the following actions:
   - record the time when the deviation (malfunction) was detected;
   - record the nature of the deviation (malfunction);
   - **Report to MCC** at earliest available comm pass.

7. When working with hardware (panels, cables, etc.) equipped with protective caps and covers:
   - remove caps and covers before operations;
   - re-install caps and covers after operations.

1.2. SAFETY PRECAUTIONS

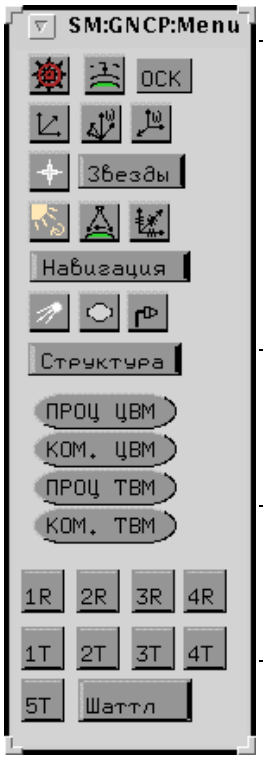
To ensure nominal systems operation and crew safety, the crew is responsible for the following actions:
- when working with the system, use only hardware, tools, and protective devices designated by these crew procedures or by **MCC**;
- upon detection of an off-nominal situation, not documented in these crew procedures, the crew is responsible for the following actions:
  - stop working with the system;
  - record time when the off-nominal situation was detected;
  - record the nature of the off-nominal situation;
  - **report to MCC** at earliest available comm pass.

2. СУДН MONITORING AND CONTROL FROM RS LAPTOP

2.1. BRINGING UP СУДН MENU

СУДН summary menu can be brought up from any display that has systems navigation menu.

RS Laptop Homepage:SM
sel 
СУДН menu appears



СУДН standard menu icons

Icons to access СУДН subsystems displays

Oval-shaped icons bring up system control windows (commands and procedures)

Icons to bring up technical support displays for the system (used only per **MCC** instructions)

2.2 NAVIGATION TO СУДН DISPLAYS

Menu icons are used to navigate to СУДН subsystem displays

 –СУДН main display;

 – maneuver;

 – ОСК;

 – БИНС;

 – GIVUS;

 – ОРТ-М (ORT-modified);

 – БОК3;

 – stars;

 – sun sensor;

 –infrared horizon sensors;

 – magnetometer;

– navigation;

 – ACH;

 –US CMG desaturation;

 – KURS-P;

– structure.

3. СУДН MODES

3.1. REBOOST

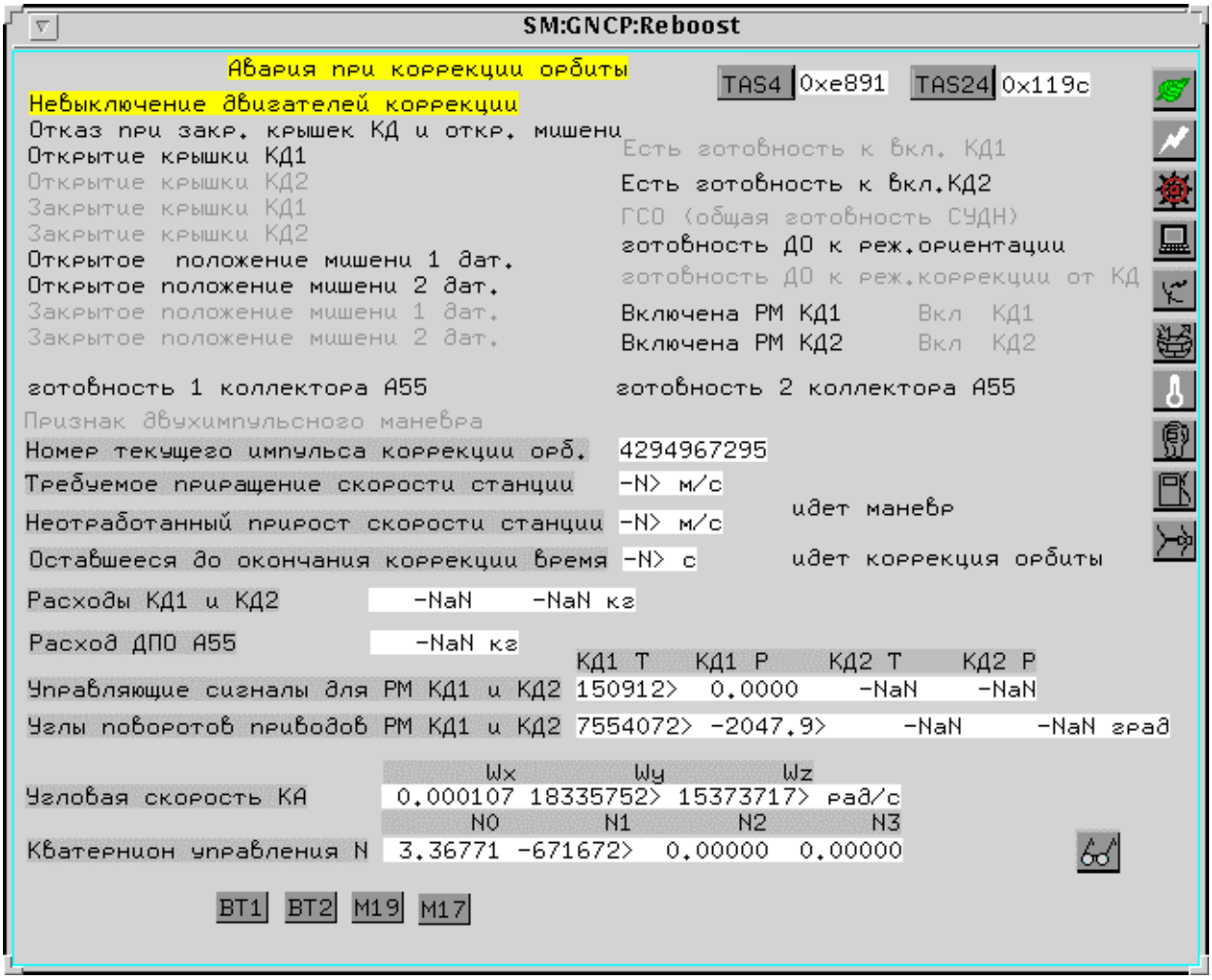
NOTE
Secure loose equipment prior to reboost.

3.1.1. Reboost using SM КД

Reboost process is monitored from SM:GNCP:Reboost display

RS Laptop 1. SM:GNCP:Reboost

T.pulse – 10 min 2. √ 'ГСО (общая готовность СУДН)' (In Attitude (СУДН general readiness))
√ 'Открытие крышки КД1' (SM reboost engine 1 cover open)
√ 'Есть готовность к вкл.КД1' (Ready for КД1 activation)



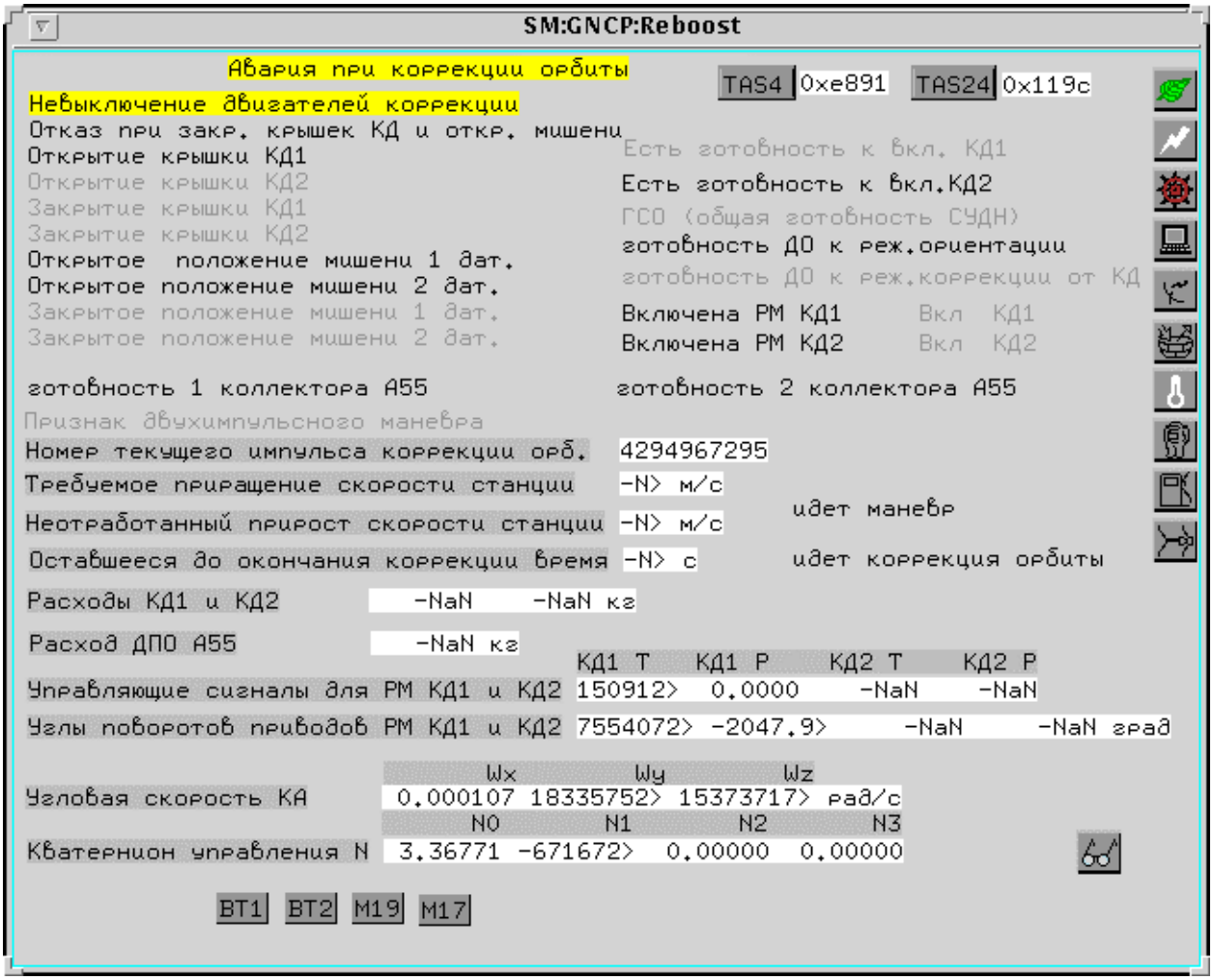
T.pulse = TBD

3.1.2. Reboost using Progress КДУ (Combined Propulsion System) ДПО (Approach and Attitude Control Thrusters)

Reboost process is monitored from SM:GNCP:Reboost display

RS Laptop 1. SM:GNCP:Reboost

T.pulse – 10 min 2. √ '1st Manifold A55 Readiness'
√ 'ГСО' (common)



T.pulse = TBD

3.2. DOCKING, UNDOCKING, REDOCKING

3.2.1. Soyuz docking with SM

3.2.1.1. Establishing communication with Soyuz

RS Laptop SM:C&T:STTS

1. **cmd:** U_ONUK2D(S)
   √ ВКЛ УКВ2д(с)
   Execute
2. pb CHANNEL 3 → Press
   √ □ CHANNEL 3

БТ Comm Panel

3. Press and hold push-to-talk button
   □ XMIT 3

NOTE

1. Use push-to-talk button for VHF2 simplex, do not use pb XMIT
2. Press and hold push-to-talk button to transmit information (□ XMIT 3)
3. Release push-to-talk button to listen to information (■ XMIT 3)

For communication from the modules

C A U T I O N

Select mode on Comm Panel-3 for comm on Channel 1 and on Comm Panel-2 for comm on Channel 2

Comm Panel 2(3)

4. pb CHANNEL 3→ Press
   √ □ CHANNEL 3

After end of communication

RS Laptop SM:C&T:STTS

1. **cmd:** U_OFUK2D(S)
   √ ОТКЛ УКВ2д(с)
   Execute

Comm Panel(All)

2. pb CHANNEL 3→ Release
   √ ■ CHANNEL 3
   √ ■ XMIT 3

3.2.1.2. Preparation for docking

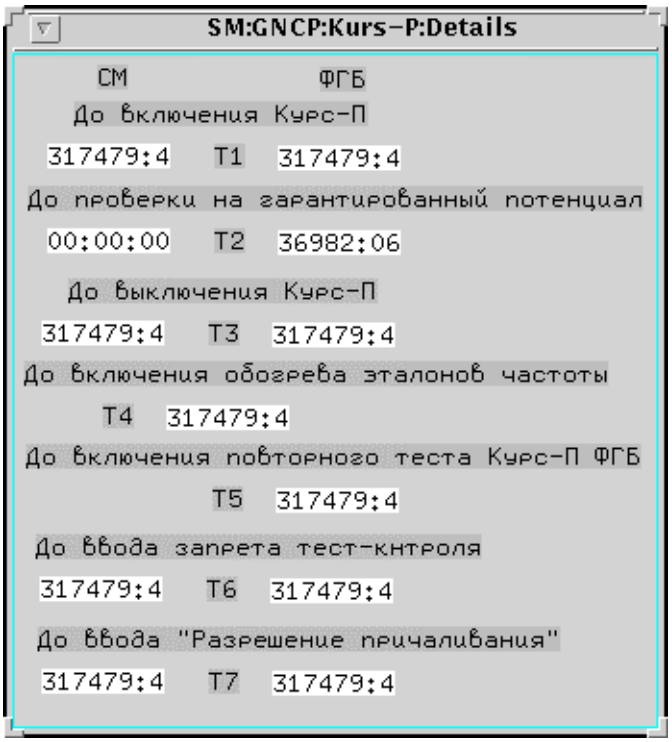
1. √ No foreign objects in ГА – БО, БО – СА hatch areas
2. Secure loose objects
3. Ensure access to connectors for possible need to disconnect cables in the hatches
4. √ RS Laptop — On

3.2.1.3. Rendezvous monitoring

NOTE

1. Rendezvous is automatically performed by БВС
2. Rendezvous program is monitored from SM:GNCP:Kurs-P:Details display

RS Laptop 1. SM:GNCP:Kurs-P:Details



On MCC GO:

T1 (Kurs-P On) _____

T2 (Full Operation Mode)_____

T3 (Kurs-P Off)_____

T6 (Test Inhibit) _____

T7 (Final Approach and Dock Enabled)___

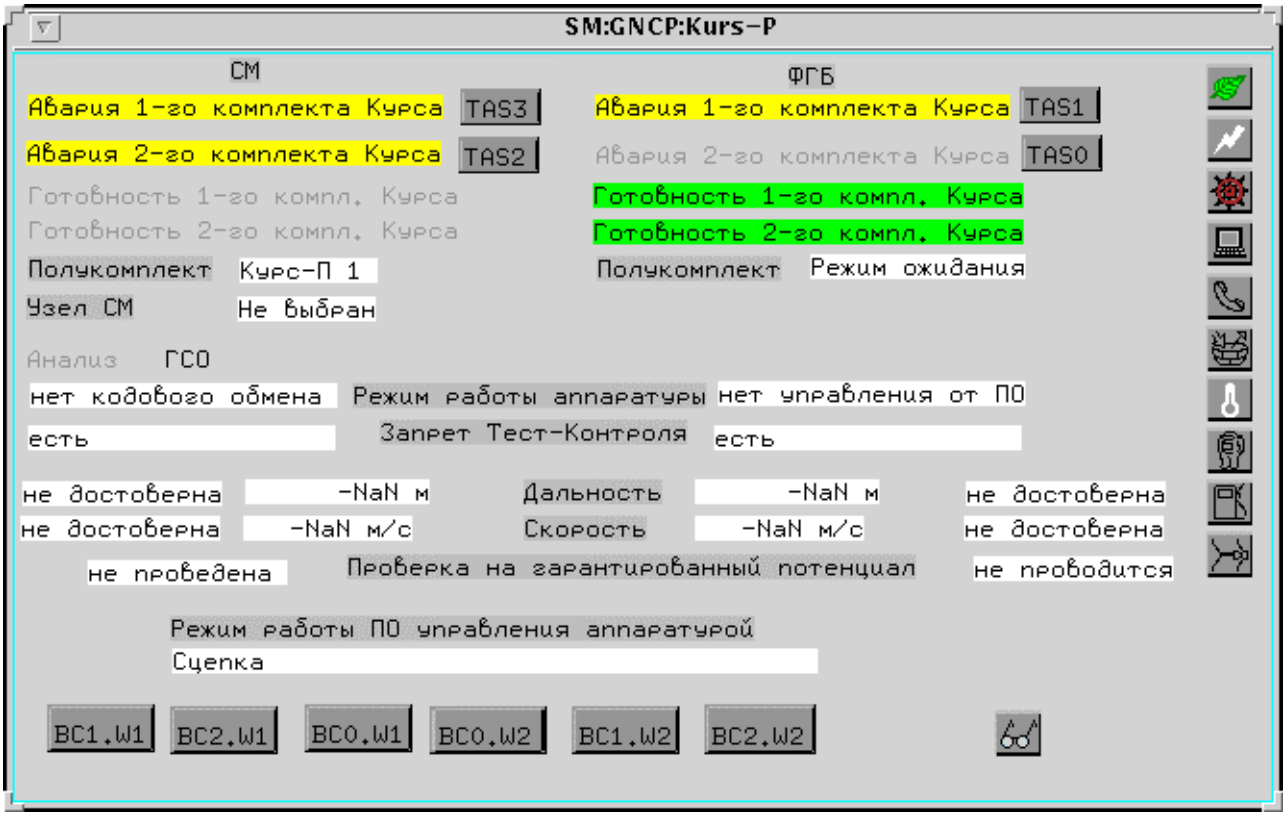
T8 (Solar Array Initial Position 1)_____

T9 (Mechanical Capture)_____

RS Laptop

SM:GNCP:Kurs-P

√ 'ГСО' (In Attitude)



T1 00:00:00

√ Полукомплект (Half-Set) — Курс-П 1 (Kurs-P 1)

√ Узел СМ (SM Port) — АО (Assembly Compartment)

√ Режим работы аппаратуры (Equipment Operation Mode) — Тест (Test)

00:03:00 √ Готовность 1-го комплекта Курса (1st Kurs Set Ready)

√ Проверка на гарантированный потенциал (Full Operation Mode Test) — Проведена (Done)

√ Режим работы аппаратуры (Equipment Operation Mode) — Круговой поиск (Circular Search)

RS Laptop T2 SM:GNCP:Kurs-P

√ Режим работы аппаратуры = Секторный поиск (Equip. Op. Mode = Sector Search)
√ Режим работы ПО управления аппаратурой = Сближение на Курс-П СМ (Equipment Control Software Operation Mode = Rendezvous by SM Kurs-P)
√ Режим работы аппаратуры = Сигнал наличия цели (Equipment Operation Mode = Target Acquired)
Monitor:
Дальность = (Range =)
Скорость = (Velocity =)

If range ≤ 10000 m

Monitor Режим работы аппаратуры = Захват (Equipment Operation Mode = Capture)
Visually monitor activation of lights

T8 Locking СБ (Solar Arrays) in Initial Postion 1 (for docking)

RS Laptop SM:EPS:SOSB

√ 'Режим' = 'Исх1' (Mode = Initial1)

On MCC GO:
TV survey (per radiogram)

RS Laptop T7 SM:GNCP:Kurs-P

√ Режим работы ПО управления аппаратурой = Разрешение причаливания на Курс-П СМ (Equipment Control Software Operation Mode = Final Approach and Dock by SM Kurs-P Enabled)

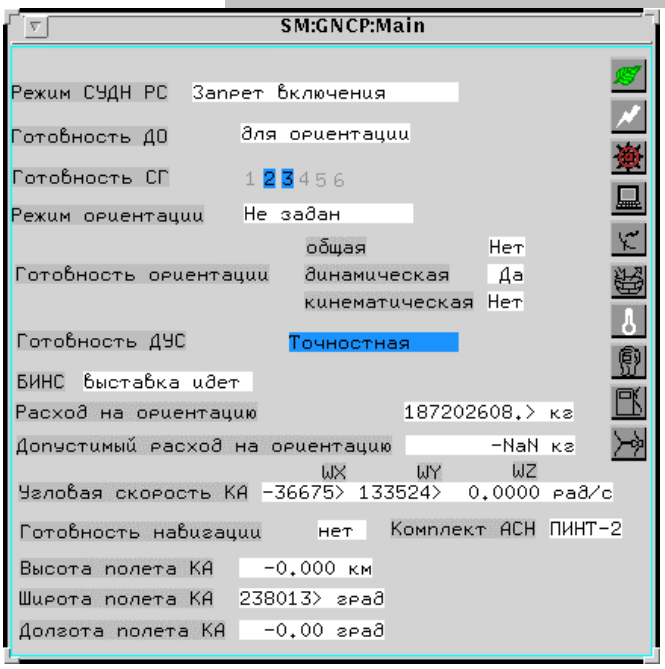
On MCC GO:
Go to CA (Descent module)

RS Laptop T8 SM:GNCP:Kurs-P

√ Режим работы ПО управления аппаратурой = Сцепка (Equipment Control Software Operation Mode = Docking Mechanism Engaged)

RS Laptop SM:GNCP:Main

√ Режим СУДН РС (RS СУДН Mode) — Индикаторный режим (Indicator Mode)



3.2.2. Soyuz rendezvous and docking with FGB

3.2.2.1. Establishing communication with Soyuz

RS Laptop SM:C&T:STTS

1. **cmd:** U_ONUK2D(S)
   √ ВКЛ УКВ2д(с)
   Execute
2. pb CHANNEL 3→ Press

Comm Panel √ □ CHANNEL 3

БТ 3. Press and hold push-to-talk button

Comm Panel □ XMIT 3

NOTE

1. Use push-to-talk button for VHF2 simplex, do not use pb XMIT
2. Press and hold push-to-talk button to transmit information (□XMIT 3)
3. Release push-to-talk button to listen to information (■ XMIT 3)

For communication from the modules

C A U T I O N

Select mode on Comm Panel-3 for comm on Channel 1 and on Comm Panel-2 for comm on Channel 2

Comm Panel 2(3) 4. pb CHANNEL 3→ Press
√ □ CHANNEL 3

After end of communication

RS Laptop SM:C&T:STTS

1. **cmd:** U_OFUK2D(S)
   √ ОТКЛ УКВ2д(с)
   Execute

Comm Panel(All) 2. pb CHANNEL 3→ Release
√ ■ CHANNEL 3
√ ■ XMIT 3

3.2.2.2. Preparation for docking

5.√ No foreign objects in ПрК – БО, БО – СА hatch areas

6.Secure loose objects

7.Ensure access to connectors for possible need to disconnect cables in the hatches

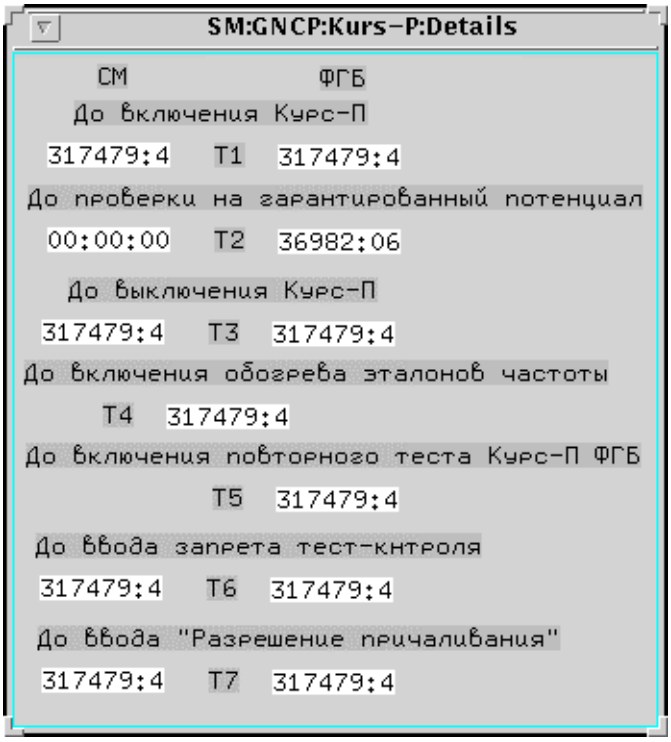
8.√ RS Laptop — On

3.2.2.3. Rendezvous monitoring

NOTE

1. Rendezvous is automatically performed by БВС
2. Rendezvous program is monitored from SM:GNCP:Kurs-P:Details display

RS Laptop 1. SM:GNCP:Kurs-P:Details



On MCC GO:

T1. (SM Kurs-P On)_____

T1. (FGB Kurs-P On)_____

T2 (Full Operation Mode)_____

T3. (Kurs-P Off)_____

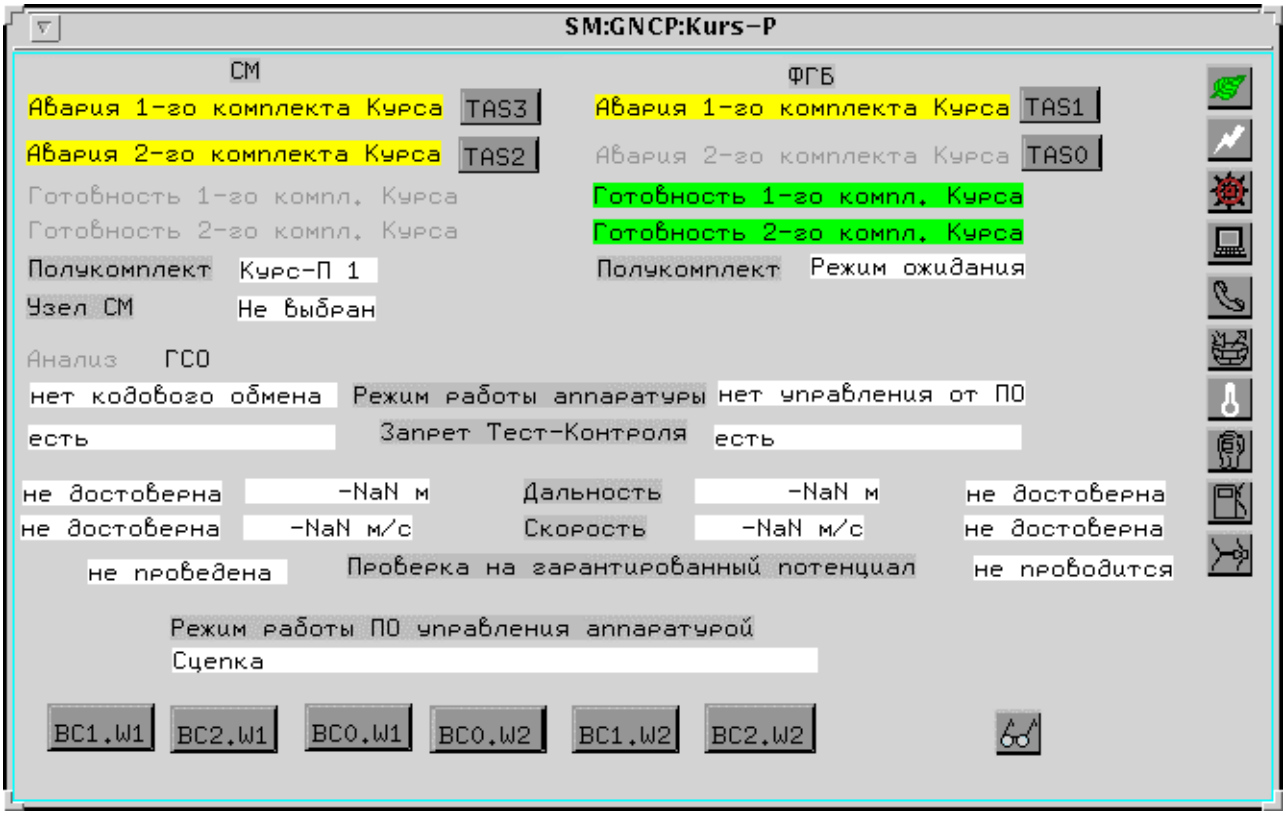
T6 (Test Inhibit)_____

T7 (Final Approach and Dock Enabled)_____

T8 (Solar Array Initial Position 1)_____

T9 (Mechanical Capture)_____

RS Laptop SM:GNCP:Kurs-P
√ 'ГСО'



T1 00:00:00 √ Полукомплект (Half-Set) = Курс-П1 (Kurs-P1)
√ Узел СМ (SM Port) = Не выбран (Not selected)
√ Режим работы аппаратуры = Тест (Equipment Operation Mode = Test)

00:03:00 √ 'Готовность 1-го комплекта Курса' (1st Kurs Set Ready)
√ Проверка на гарантированный потенциал = Проведена (Full Operation Mode Test = Complete)
√ Режим работы аппаратуры = Круговой поиск (Equipment Operation Mode = Circular Search)

RS Laptop T2 SM:GNCP:Kurs-P
√ Режим работы аппаратуры = Секторный поиск (Equipment Operation Mode = Sector Search)
√ Режим работы ПО управления аппаратурой = Сближение на Курс-П СМ (Equipment Control Software Operation Mode = Rendezvous by SM Kurs-P)
√ Режим работы аппаратуры = Сигнал наличия цели (Equipment Operation Mode = Target Acquired)
Monitor:
Дальность = (Range =)
Скорость = (Velocity =)

If range ≤ 10000 m

Monitor Режим работы аппаратуры = Захват (Equipment Operation Mode = Capture)
Visually monitor activation of lights

T8 Locking СБ (Solar Arrays) in Initial Postion 1 (for docking)

RS Laptop SM:EPS:SOSB

√ 'Mode' = 'Init. Pos. 1'

RS Laptop T7 SM:GNCP:Kurs-P

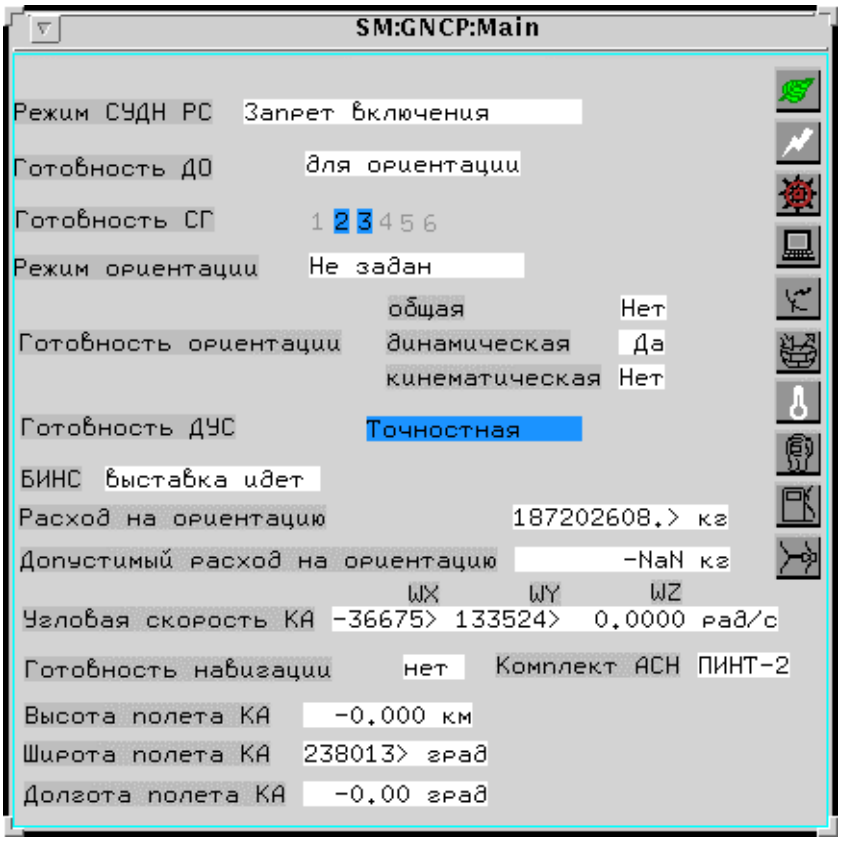
√ Режим работы ПО управления аппаратурой = Разрешение причаливания на Курс-П СМ (Equipment Control Software Operation Mode = Final Approach and Dock by SM Kurs-P Enabled)

RS Laptop T8 SM:GNCP:Kurs-P

√ Режим работы ПО управления аппаратурой = Сцепка (Equipment Control Software Operation Mode = Docking Mechanism Engaged)

RS Laptop SM:GNCP:Main

√	Режим СУДН РС (RS GNC Mode)	Индикаторный режим (Indicator Mode)



3.2.3. Progress rendezvous and docking with SM

3.2.3.1. Preparation for docking

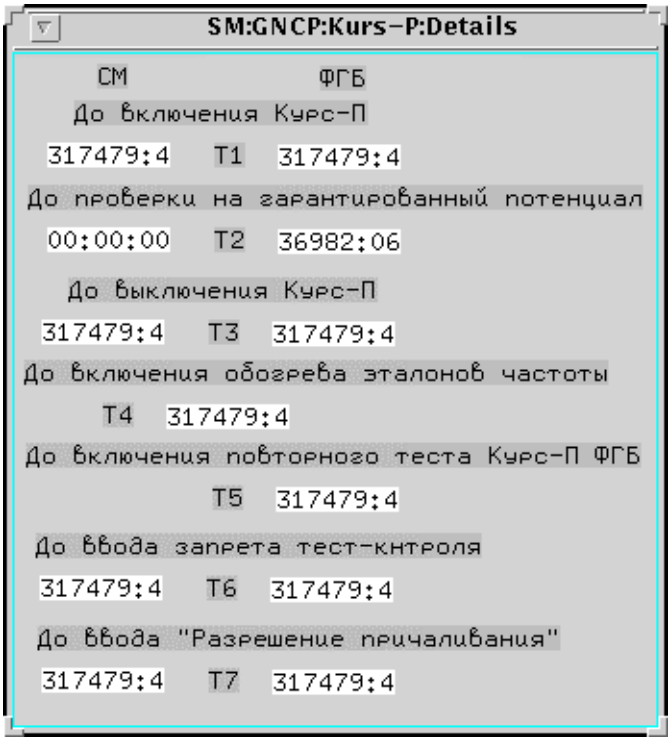
1. √ No foreign objects in ГА – БО, БО – СА hatch areas
2. Secure loose objects
3. Ensure access to connectors for possible need to disconnect cables in the hatches
4. √ RS Laptop — On

3.2.3.2. Rendezvous monitoring

NOTE

1. Rendezvous is automatically performed by БВС
2. Rendezvous program is monitored from SM:GNCP:Kurs-P:Details

RS Laptop 1. SM:GNCP:Kurs-P:Details



On MCC GO:

T1.СМ (SM Kurs-P On)_____

T2 (Full Operation Mode)_____

T3. (Kurs-P Off) _____

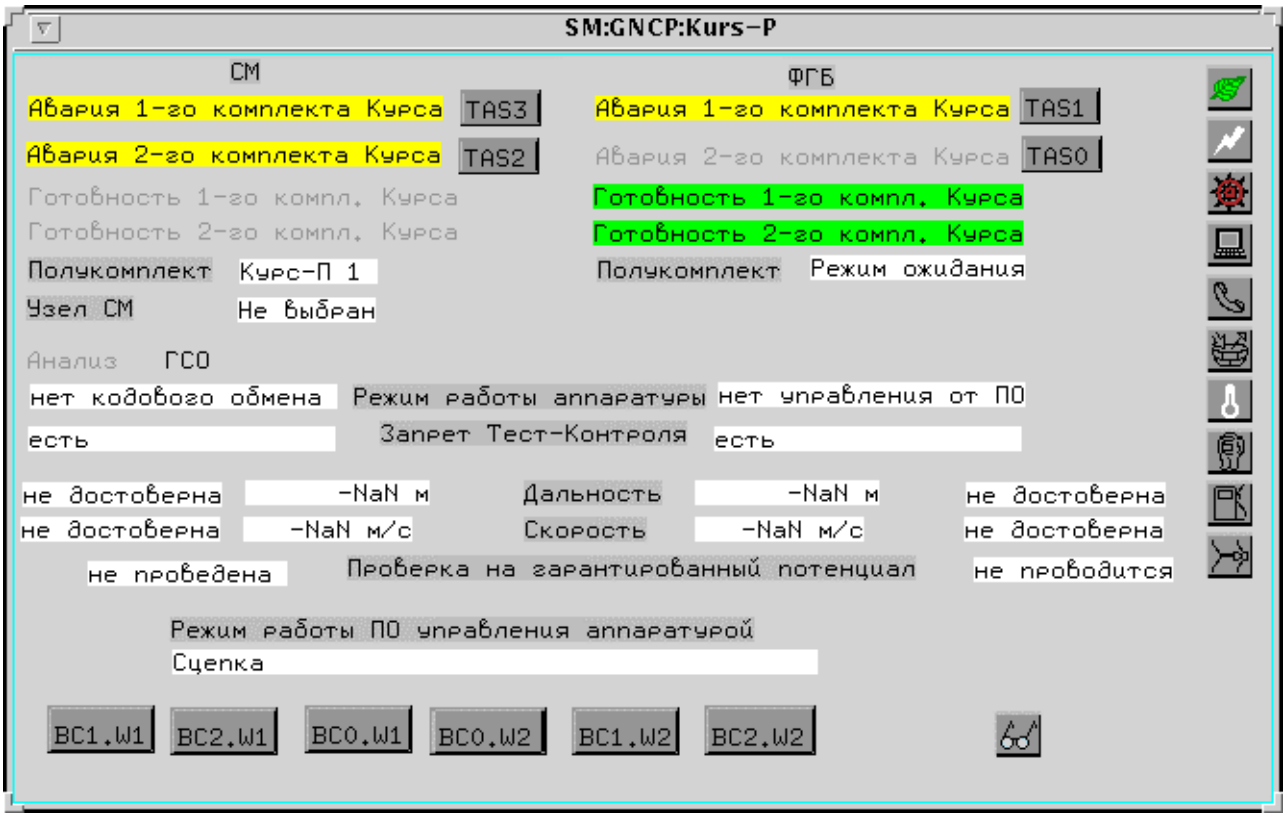
T6 (Test Inhibit)_____

T7 (Final Approach and Dock Enabled)_____

T8 (Solar Array Initial Position 1)_____

T9 (Mechanical Capture)_____

RS Laptop SM:GNCP:Kurs-P
√ 'ГСО'



T1 00:00:00 √ Полукомплект = Курс-П1 (Half-Set = Kurs-P1)
√ Узел СМ = АО (SM Port = Assembly Compartment)
√ Режим работы аппаратуры = Тест (Equipment Operation Mode = Test)

00:03:00 √ 'Готовность 1-го комплекта Курса' (1st Kurs Set Ready)
√ Проверка на гарантированный потенциал = Проведена (Full Operation Mode Test = Complete)
√ Режим работы аппаратуры = Круговой поиск (Equipment Operation Mode = Circular Search)

RS Laptop T2 SM:GNCP:Kurs-P
√ Режим работы аппаратуры = Секторный поиск (Equipment Operation Mode = Sector Search)
√ Режим работы ПО управления аппаратурой = Сближение на Курс-П СМ (Equipment Control Software Operation Mode = Rendezvous by SM Kurs-P)
√ Режим работы аппаратуры = Сигнал наличия цели (Equipment Operation Mode = Target Acquired)
Monitor:
Дальность = (Range =)
Скорость = (Velocity =)

If range ≤ 10000 m

Monitor Режим работы аппаратуры = Захват (Equipment Operation Mode = Capture)
Visually monitor activation of lights

T8 Locking СБ (Solar Arrays) in Initial Postion 1 (for docking)

RS Laptop SM:EPS:SOSB

√ 'Mode' = 'Init. Ps. 1'

RS Laptop T7 SM:GNCP:Kurs-P

√ Режим работы ПО управления аппаратурой = Разрешение причаливания на Курс-П СМ (Equipment Control Software Operation Mode = Final Approach and Dock by SM Kurs-P Enabled)

On MCC GO:
Proceed to TORU operations
Operate per TORU procedures

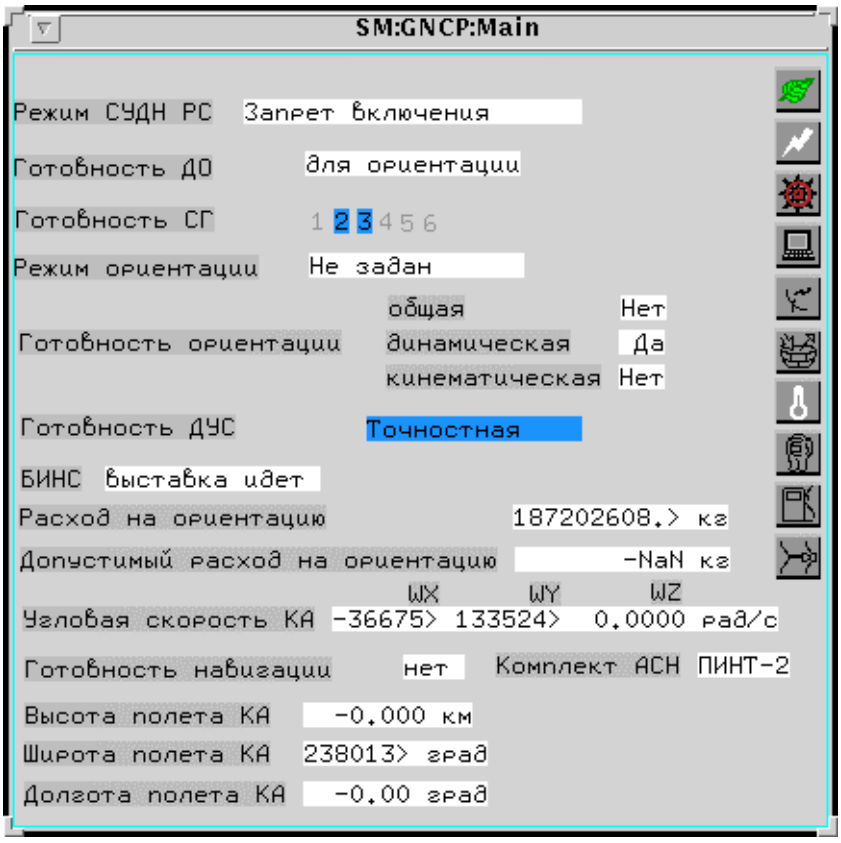
On MCC GO:
Go to CA (Descent Module)

RS Laptop T8 SM:GNCP:Kurs-P

√ Режим работы ПО управления аппаратурой = Сцепка (Equipment Control Software Operation Mode = Docking Mechanism Engaged)

RS Laptop SM:GNCP:Main

√	Режим СУДН РС RS GNC Mode	Индикаторный режим (Indicator Mode)



3.2.4. Progress rendezvous and docking with FGB

3.2.4.1. Preparation for docking

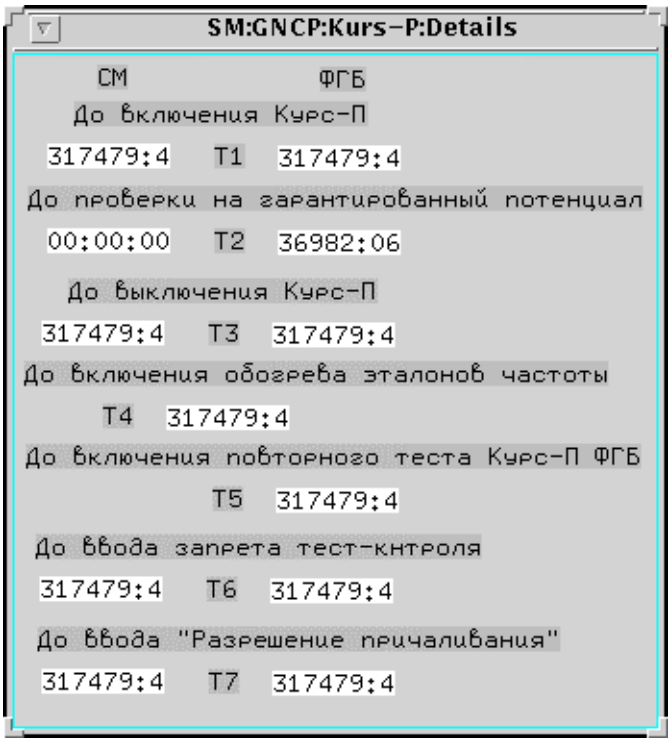
1. √ No foreign objects in ПрК – БО, БО – СА hatch areas
2. Secure loose objects
3. Ensure access to connectors for possible need to disconnect cables in the hatches
4. √ RS Laptop — On

3.2.4.2. Rendezvous monitoring

NOTE

1. Rendezvous is automatically performed by БВС
2. Rendezvous program is monitored from SM:GNCP:Kurs-P:Details

RS Laptop 1. SM:GNCP:Kurs-P:Details



On MCC GO:

T1 (SM Kurs-P On)_____

T1 (FGB Kurs-P On)_____

T2 (Full Operation Mode)_____

T3. (Kurs-P Off) _____

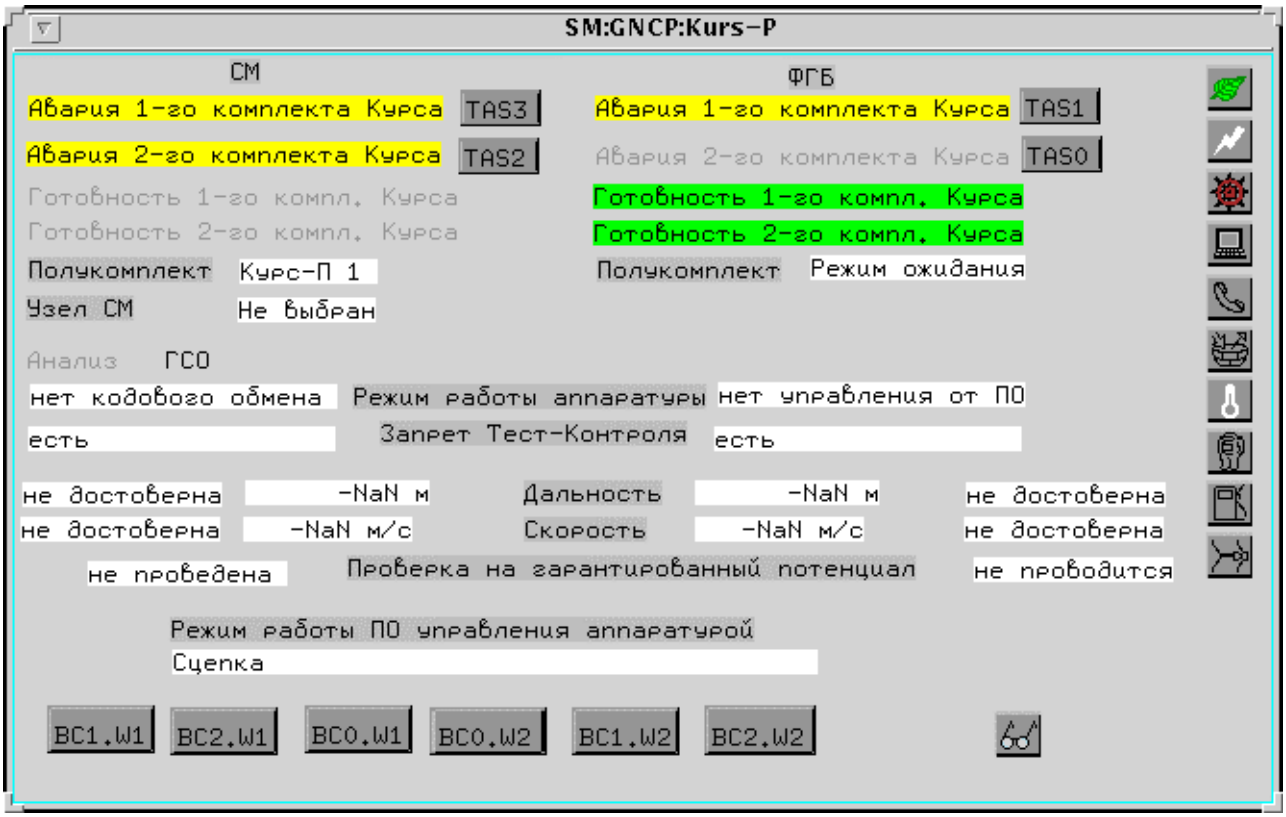
T6 (Test Inhibit) _____

T7 (Final Approach and Dock Enabled)_____

T8 (Solar Array Initial Position 1)_____

T9 (Mechanical Capture)_____

RS Laptop SM:GNCP:Kurs-P
√ 'ГСО'



T1 00:00:00 √ Полукомплект = Курс-П1 (Half-Set = Kurs-P1)
√ Узел СМ = АО (SM Port = Assembly Compartment)
√ Режим работы аппаратуры = Тест (Equipment Operation Mode = Test)

00:03:00 √ 'Готовность 1-го комплекта Курса' (1st Kurs Set Ready)
√ Проверка на гарантированный потенциал = Проведена (Full Operation Mode Test = Done)
√ Режим работы аппаратуры = Круговой поиск (Equipment Operation Mode = Circular Search)

RS Laptop T2 SM:GNCP:Kurs-P
√ Режим работы аппаратуры = Секторный поиск (Equipment Operation Mode = Sector Search)
√ Режим работы ПО управления аппаратурой = Сближение на Курс-П СМ (Equipment Control Software Operation Mode = Rendezvous by SM Kurs-P)
√ Режим работы аппаратуры = Сигнал наличия цели (Equipment Operation Mode = Target Acquired)
Monitor:
Дальность = (Range =)
Скорость = (Velocity =)

If range ≤ 10000 m

Monitor Режим работы аппаратуры = Захват (Equipment Operation Mode = Capture)
Visually monitor activation of lights

T8 Locking СБ (Solar Arrays) in Initial Postion 1 (for docking)

RS Laptop SM:EPS:SOSB

√ 'Mode' = 'Init. Pos. 1'

RS Laptop T7 SM:GNCP:Kurs-P

√ Режим работы ПО управления аппаратурой =
Разрешение причаливания на Курс-П СМ (Equipment Control Software Operation Mode = Final Approach and Dock by SM Kurs-P Enabled)

On MCC GO:
Proceed to TORU operations
Operate per TORU procedures

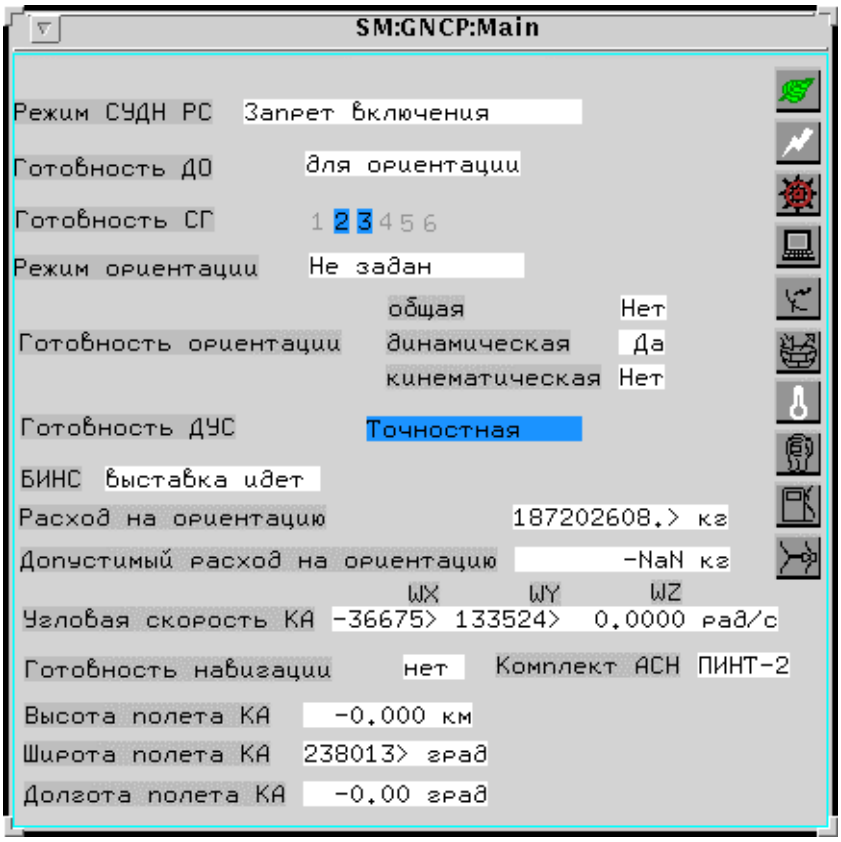
On MCC GO:
Go to CA (Descent Module)

RS Laptop T8 SM:GNCP:Main

√ Сцепка (Equipment Control Software Operation Mode = Docking Mechanism Engaged)

RS Laptop SM:GNCP:Main

√	Режим СУДН РС RS GNC Mode	Индикаторный режим (Indicator Mode)



3.2.5. Rendezvous and docking with Orbiter

3.2.5.1. Establishing communication

RS Laptop SM:C&T:STTS

1. **cmd:** U_ONUK2D
   √ ВКЛ УКВ2д
   Execute
2. pb CHANNEL 3→ Press
   √ □ CHANNEL 3

БТ 3. Press and hold push-to-talk button
Comm Panel □ XMIT 3

> NOTE
>
> 1. Use push-to-talk button for VHF2 simplex, do not use pb XMIT
> 2. Press and hold push-to-talk button to transmit information (□ XMIT 3)
> 3. Release push-to-talk button to listen to information (■ XMIT 3)

For communication from the modules

> **C A U T I O N**
>
> Select mode on Comm Panel-3 for comm on Channel and on Comm Panel-2 for comm on Channel 2

Comm Panel 2(3)4. pb CHANNEL 3→ Press
√ □ CHANNEL 3

After end of communication

RS Laptop SM:C&T:STTS

1. **cmd:** U_OFUK2D(S)
   √ ОТКЛ УКВ2д(с)
   Execute

All Comm Panels 2. pb CHANNEL 3→ Release
√ ■ CHANNEL 3
√ ■ XMIT 3

3.2.5.2. Preparation for docking

Verify no foreign objects in БО – СА hatch area
Secure loose objects
Ensure access to connectors for possible need to disconnect cables in the hatches
Verify КВД (Pressure Equalization Valve)

3.2.5.3. Rendezvous monitoring

Ti = _____

Ti - 01:20:00 = _____ range ~ 76 km

Expect call from Orbiter

* If comm not established before Ti +45 min: *
* go to ДЕЙСТВИЯ ПРИ ОТКАЗЕ РАДИОСВЯЗИ (COMM FAILURE RESPONSE) *
* (go to p. 3-5 step 3.1) *

Monitoring lights
Locking СБ in Initial
Verify attitude
Monitor gyrodine desaturation
Video survey (if needed)
Monitor Indicator Mode

3.3. SPINNING UP GYRODINES

TBD

3.4. MODE TRANSITIONS

TBD

3.4.1. Transitioning to mode РАЗГРУЗКА НА ДО (Desaturation using attitude control thrusters)

TBD

3.4.2. Initiating transition from RS Laptop

TBD

3.5. MONITORING MODE EXECUTION

TBD

4. RS СУДН INTERACTION WITH USOS

4.1. RS СУДН ATTITUDE CONTROL HANDOVER TO USOS

TBD

4.2. RS СУДН ATTITUDE CONTROL TAKEOVER FROM USOS

TBD

5. VISUAL OPTICAL DEVICES

5.1. WIDE ANGLE VERTICAL SIGHT (ВШТВ)

This device is used for the observation of space within the hemisphere, attitude monitoring (yaw, pitch, roll), visual search for set reference points, and observation of stars of up to +1.0 magnitude.

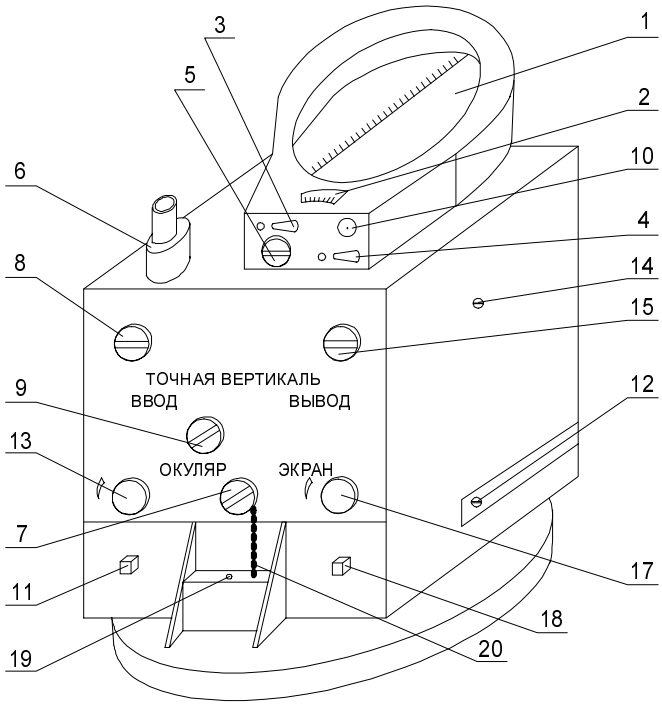
5.1.1. TECHNICAL PARAMETERS

Screen channel viewing field, degs	185-190
Screen diameter, mm	144
Eyepiece channel viewing field, degs	185-190
Eyepiece channel magnification, times	0.55-0.65
Exact vertical viewing field:	
in radial direction, degs	20
in tangential direction, degs	5
Vertical build error (instrumentation):	
in screen channel, degs	≤1
in eyepiece channel, min	≤10
in exact vertical system, min	≤3
Yaw build error (instrumentation):	
in screen channel, degs	≤2
in screen channel, min	≤10
Angular dimensions of grid concentric circles:	
ВШТВ-СБ.13-1, degs	140, 150, 160
ВШТВ-СБ.13-2, degs	140, 160
Voltage, V	23-34
Power consumption, W	≤12

NOTE

When working with an attitude of small angular dimensions, install ВШТВ-СБ.14 Spares kit magnifier into the mounting socket on screen frame.

5.1.2. EXTERNAL VIEW



1 - Replaceable screens:
ВШТВ-СБ.13-1, ВШТВ-СБ.13-2,
ВШТВ-СБ.13-3, ВШТВ-СБ.13-4
2 - Screen yaw scale
3 - sw ПОДСВЕТ ШКАЛЫ КУРСА (Yaw Scale Backlight)
4 - backup sw ПОДСВЕТ ШКАЛЫ КУРСА
5 - Screen rotation locking screw
6 - Eyepiece
7 - sw ЭКРАН-ОКУЛЯР (screen—eyepiece)
8 - Eyepiece yaw setting knob
9 - sw ВВОД-ВЫВОД ТОЧНОЙ ВЕРТИКАЛИ (Exact vertical input-output)
10 – Lamp ПОДСВЕТ ШКАЛЫ КУРСА (Yaw Scale Backlight) holder
11 and 18 - pb ПОДСВЕТ МЕТКИ (mark backlight)
12 – Protective cover screw
13 and 17 – control knob ПОДСВЕТ МЕТКИ (mark backlight)
14 – Lamp locking screw ПОДСВЕТ МЕТКИ (mark backlight)
15 – Mark movement knob
16 – Screw with chain
19 – Lamps from ЗИП (Spares kit)
20 - Screw

5.1.3. INITIAL STATE

pb ПОДСВЕТ МЕТКИ (mark backlight)	→ВЫКЛ (Off)
sw ЭКРАН-ОКУЛЯР (screen-eyepiece)	→ЭКРАН (Screen)
sw ПОДСВЕТ ШКАЛЫ КУРСА (yaw scale backlight)	→ВЫКЛ (Off)
sw ВВОД-ВЫВОД ТОЧНОЙ ВЕРТИКАЛИ (exact vertical input-output)	→ВЫВОД (Output)
Screen rotation locking screw	→ФИКСАЦИЯ (Lock)
Lamp ПОДСВЕТ МЕТКИ (mark backllight) locking screw	↷
Protective cover screw	↷

5.1.4. SETUP

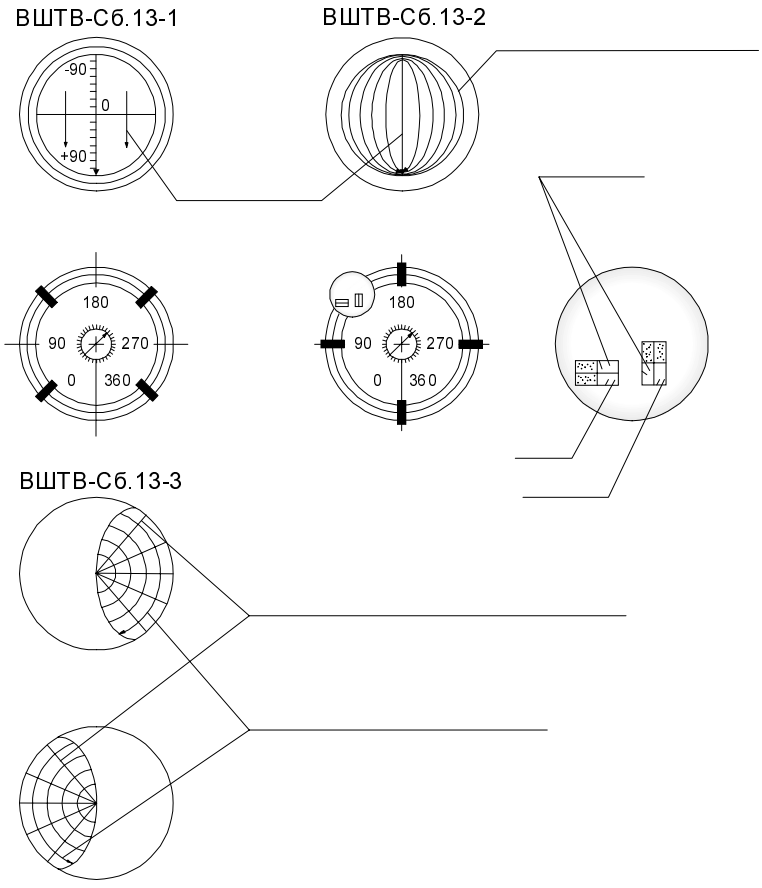
	Remove screw from sw ЭКРАН-ОКУЛЯР (screen-eyepiece), place into hole near screw 20 (once during activaiton)	
	Install required screen	
ППС-21	sw ВШТВ (wide angle sight)	→ On
ВШТВ	sw ПОДСВЕТ ШКАЛЫ КУРСА (yaw scale backlight)	→ ВКЛ (On)
	□ ПОДСВЕТ ШКАЛЫ КУРСА (yaw scale backlight)	
	Input КУ (yaw angle) (per radiogram)	
	Lock screen into position with locking screw	

sw ЭКРАН-ОКУЛЯР (screen-eyepiece) → ОКУЛЯР (eyepiece) (to use eyepiece)
sw ВВОД-ВЫВОД ТОЧНОЙ ВЕРТИКАЛИ (exact vertical input-output) → ВВОД (Input) (to use exact vertical)
pb ПОДСВЕТ МЕТКИ (mark backlight) → ON (to use mark)

5.1.5. VIEWING FIELDS

ORBITAL ATTITUDE
-Y axis towards the Earth center
- X axis towards flight vector
КУ (yaw angle) - 0

КУ (yaw angle) – 210



-Z axis towards the Earth center
-X axis towards flight vector

+Z axis towards the Earth center
-X axis towards flight

5.1.6. CLOSEOUT OPERATIONS

	ВШТВ (wide angle sight)	→ ИСХ (Initial)
ППС-21	sw ВШТВ	→ Off

5.1.7. OFF-NOMINAL SITUATIONS

1. NO SCALE IMAGE UPON SCALE BACKLIGHT ACTIVATION

■ Heading scale

backup sw ПОДСВЕТ ШКАЛЫ КУРСА (yaw scale backlight) → ВКЛ (On)

□ yaw scale

* *

■ Yaw scale

Replace lamp with a new one from Spares kit

* *

2. NO MARK IMAGE UPON PUSHBUTTON ПОДСВЕТ МЕТКИ (MARK BACKLIGHT) ACTIVATION

■ Mark

Lamp ПОДСВЕТ МЕТКИ (mark backlight) locking screw → into other secured position

□ mark

* *

■ Mark

Replace lamp frame with a new one from Spares kit

* *

5.2. PILOT SIGHT 240K (ВП-2)

Pilot sight is designed to determine direction to observed reference points relative to the station coordinate system for the following purposes:

- geographical reference of observed terrestrial objects;
- to determine direction vector to controlled and uncontrolled objects and measure their angular sizes.

5.2.1. TECHNICAL PARAMETERS

Sight viewing field, degs	20
Line of sight pitch and roll rotation angle, degs	±30
Grid rotation angle range, degs	0-360
Grid circular scale graduation, degs	2
Rotation counter scale graduation, degs	1
Moving scale graduation, degs	5
Resolution, sec	5
Optical transmission factor	0.7
Attenuator filters, times	10 and 100
Power consumption, W	15

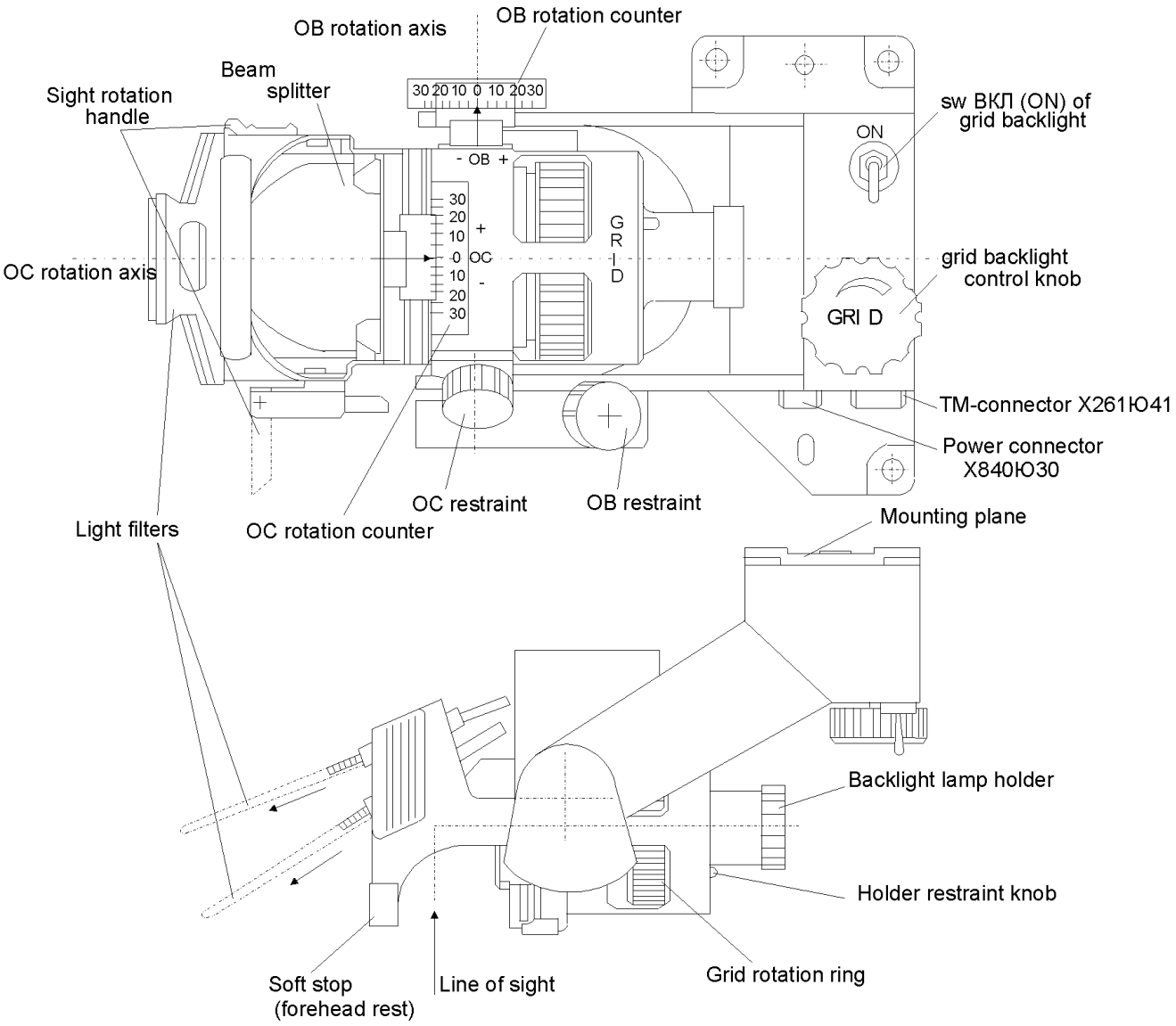
Sight continuous operation time is 5 hours with subsequent 30 min interval.

Pilot sight is a collimator type sight.

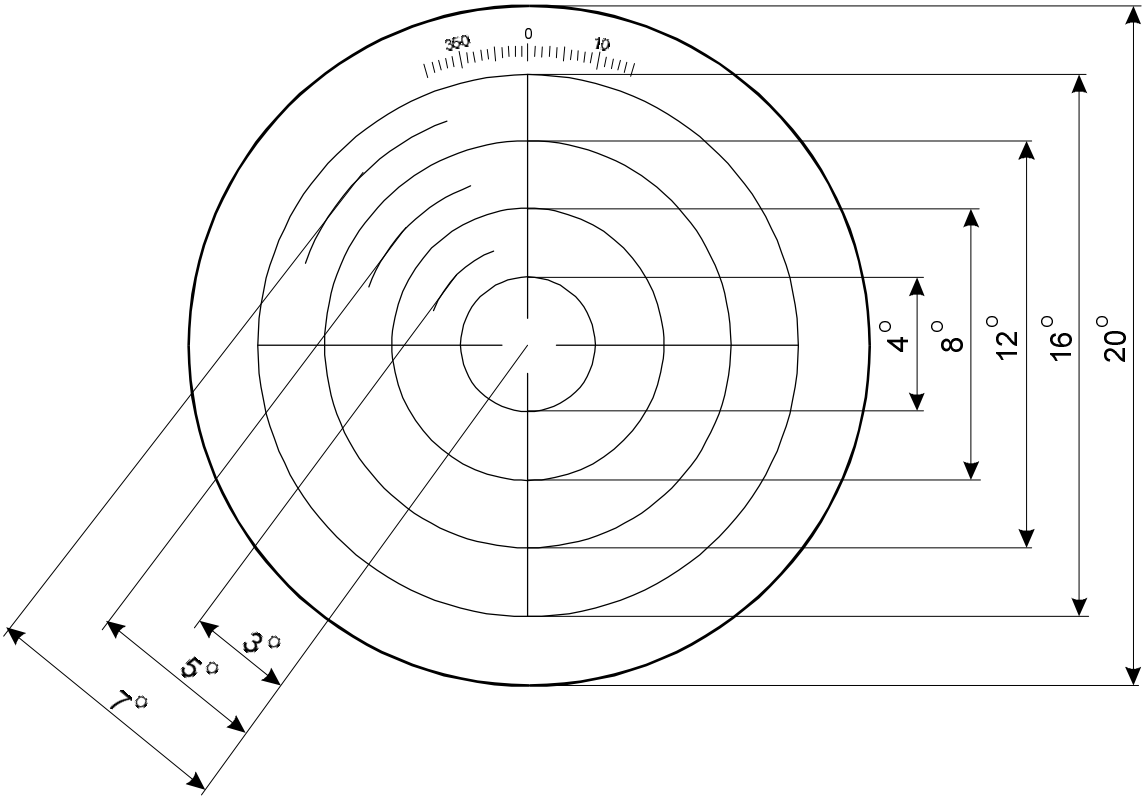
Components:
optical unit;
backlight lamp holder;
housing.

The sight is rotated 30 degrees by hand around OC (pitch) and OB (roll) axes.
OB restraint (OC restraint) is used to lock the instrument into position if rotated about OB (OC) axis.
To rotate grid, turn ↶ grid adjustment ring
Readings are taken according to grid scale
Attenuator filters are used to observe bright objects.
Install filters into guide grooves, holding them by knurled surface.

5.2.2. EXTERNAL VIEW



5.2.3. VIEWING FIELDS



5.2.4. SETUP

1. Install sight on window #8
   Secure with fastening screws

2. Connector X840Ю10 of cable 17КС.10Ю 8210А-4780 →|← connector X840Ю30 ВП-2
   Connector X846Ю10 of cable 17КС.10Ю 8210А-4780 →|← connector X846Ю10 of cable 17КС.10Ю 8210А-3510 (to ППС-21)
   Connector X261Ю30 of cable 17КС.30Ю 8230А-930 →|← connector X261Ю41 ВП-2
   Connector X260Ю30 of cable 17КС.30Ю 8230А-930 →|← connector X260Ю30 УС22-1

3. Install light filters (if required)

5.2.5. INSTRUMENT OPERATION (БИНС CORRECTION FROM PILOT SIGHT)

1. Select 2 stars **on MCC GO**

2. Input star coordinates in RS Laptop (TBD)

3. Initiate БИНС correction mode from Pilot Sight (TBD)

ППС-21 4. sw ВИЗИР ПИЛОТА → On

ВП-2 5. sw → On
□ grid backlight
Choose optimal grid brightness by rotating ↶↷ brightness control knob
OC restraint — pull and ⟳
OB restraint — pull and ⟳

6. Locate set reference point (1st star) by rotating ↶↷ the sight
Align reference point with the sight axis of the instrument
БВК-1 pb Pilot Sight measurement → Press

7. Locate set reference point (2nd star) by rotating ↶↷ the sight
Align reference point with the sight axis of the instrument
БВК-1 pb Pilot Sight measurement→ Press

8. Monitor БИНС correction from Pilot Sight via RS Laptop (TBD)

5.2.6. CLOSEOUT OPERATIONS

1. Secure OC restraint
Secure OB restraint
ВП-2 sw → Off
■ grid backlight

ППС-21 2. sw ВИЗИР ПИЛОТА → Off

3. Remove light filters (if installed)

On MCC GO 4. Connector X840Ю10 of cable 17КС.10Ю 8210А-4780 ←|→ from connector X840Ю30 ВП-2
Connector X846Ю10 of cable 17КС.10Ю 8210А-4780 ←|→ from connector X846Ю10 of cable 17КС.10Ю 8210А-3510 (from ППС-21)
Connector X261Ю30 of cable 17КС.30Ю 8230А-930 ←|→ from connector X261Ю41 ВП-2
Connector X260Ю30 of cable 17КС.30Ю 8230А-930 →|← from connector X260Ю30 УС22-1

5. Remove sight from window # 8
   Stow into nominal location

5.2.7. OFF-NOMINAL SITUATIONS

1. No grid backlight

ППС-21	1. √ sw ВИЗИР ПИЛОТА	→ On
ВП-2	√ sw	→ On
	■ grid backlight lamp	
ВП-2	2. sw	→ Off
	Unscrew lamp holder by holding and pressing the restraint control	
	Screw in the new lamp holder ↻ by holding and pressing the restraint control (from Spares kit)	
ВП-2	3. sw	→ On
	√ □ grid backlight	

5.3. PUMA PORTABLE ZOOM VIEWFINDER

The Puma Portable Zoom Viewfinder is used to view remote objects and determine their angular position in the SM coordinate system in order to:
- provide geographical reference of observed terrestrial objects;
- determine target vector in a specified coordinate system.

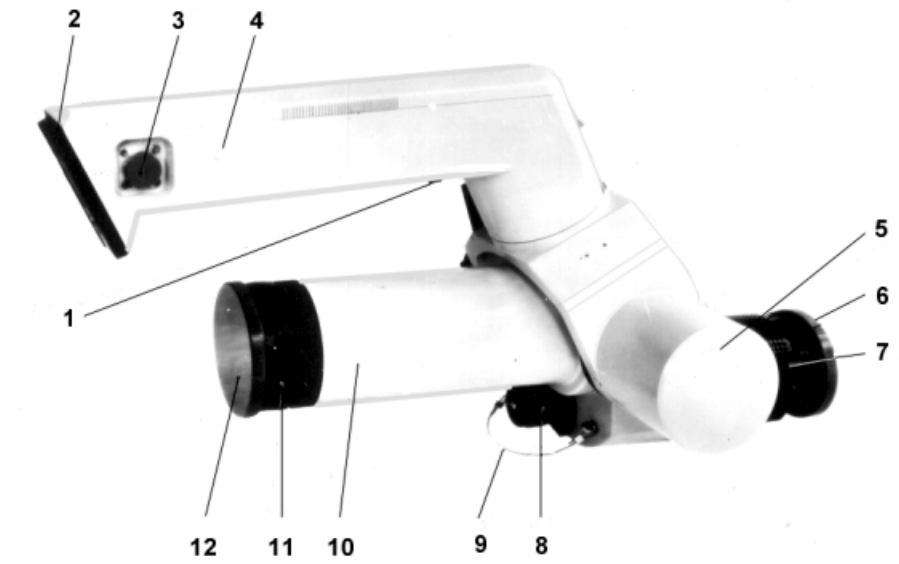
5.3.1. TECHNICAL PARAMETERS

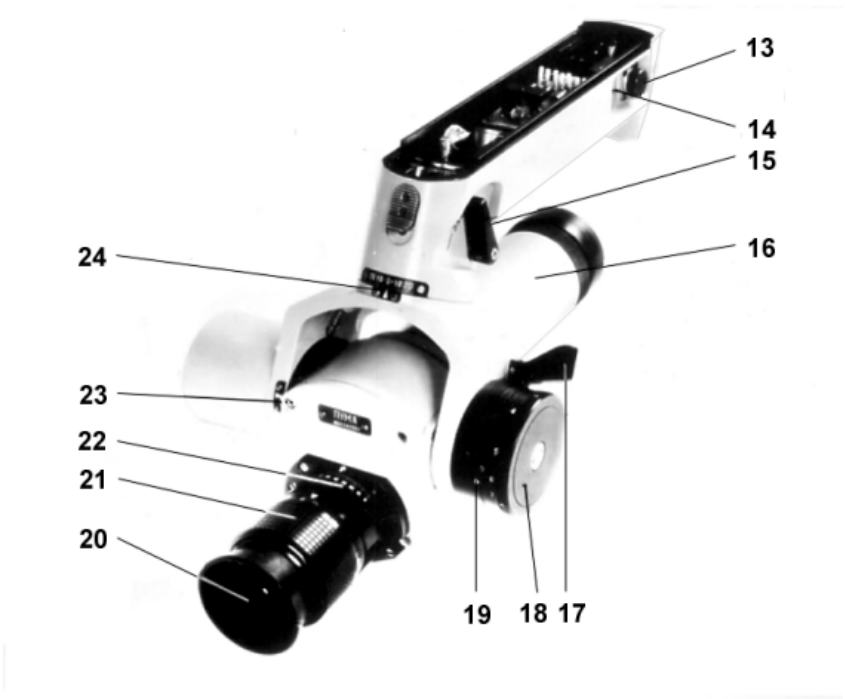
Magnification range, times	1.5---15
Viewing field size at 1.5 times magnification, degs	40
Viewing field size at 15 times magnification, degs	4
Dioptric adjustment range, diopters	± 4
Optical transmission factor	0.35
Resolution in viewing field center at x1.5 times magnification, sec	30
Goniometrical grid rotation angles (yaw), degs	0---90
Grid rotation (yaw) scale graduation, degs	2
Instrument roll and pitch rotation angle range, degs	± 22
Roll and pitch scales graduation, degs	2
Sight length, mm	320

Puma Portable Zoom Viewfinder is a monocular spyglass which includes:
- lens;
- eyepiece;
- quick removal fixture.

A soft damper protects the window from damage.
Goniometrical grid adjustment ring is used to rotate ↶ goniometrical grid.
Roll and pitch rotation locking screws are used to lock the device in required roll (pitch) angular position.
Readings are taken using roll and pitch rotation scales.
Magnification control is used for smooth magnification adjustment (↶).
Eyepiece dioptric adjustment ring (↶) is used to improve the image sharpness for a specific operator.

5.3.2. EXTERNAL VIEW

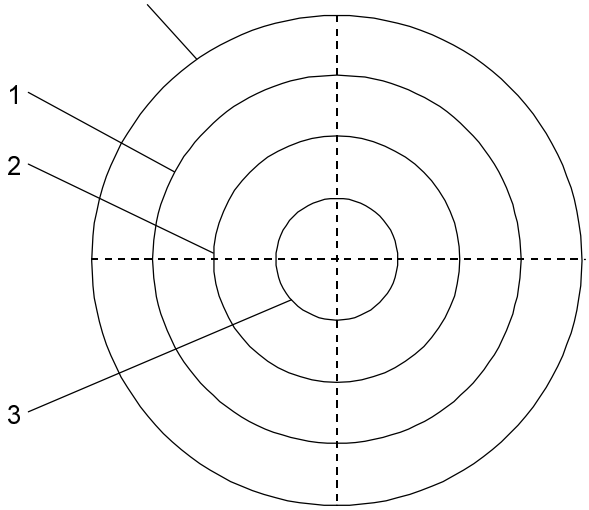




1. Goniometrical grid backlight brightness control knob
2. Window mounting guide
3. TM-connector (Ш2)
4. Quick removal fixture
5. Angular coordinates TM-sensors housing
6. Eye-shade
7, 16. Eyepiece
8. Backlight lamp protective cap
9. Polyamide thread
10, 20. Lens
11. Removable soft damper
12. Lens cover

13. Grid backlight activation switch
14. Power connector (Ш1)
15. Roll rotation locking screw
17. Pitch rotation locking screw
18. Magnification adjustment knob
19. Magnification scale
21. Eyepiece dioptric adjustment ring
22. Goniometrical grid rotation ring with scale (yaw)
23. Pitch rotation scale
24. Roll rotation scale

5.3.3. VIEWING FIELD



Magnification, times	Viewing field (degs)			
	View-finder	For each ring zone		
		1	2	3
1.5	40	30	20	10
3	20	15	10	5
6	10	7.5	5	2.5
12	5	4	2.5	~1.3
15	4	3	2	1

5.3.4. SETUP

1. Install Puma onto window #6
   Secure device with fastening screws

2. Connector X840Ю10 of cable17КС.10Ю 8210А-4780 →|← connector Ш1 ПВП Puma
   Connector X846Ю10 of cable 17КС.10Ю 8210А-4780 →|← connector X846Ю10 of cable 17КС.10Ю 8210А-3510 (to ППС-21)
   Connector X261Ю30 of cable 17КС.30Ю 8230А-930 →|← connector Ш2 ПВП Puma
   Connector X260Ю30 of cable 17КС.30Ю 8230А-930 →|← connector X260Ю30 of УС22-1

5.3.5. INSTRUMENT OPERATION (БИНС CORRECTION FROM PUMA)

1. Select two stars per **MCC** instructions

2. Input star coordinates in RS Laptop (TBD)

3. Initiate БИНС correction from Puma mode (TBD)

Puma 4. sw → On
□ ПОДСВЕТ СЕТКИ (grid backlight)
Select optimal grid backlight brightness by rotating ↶ control knob
Rotation locking screws ↺ (released)
Adjust grid sharpness by rotating ↶ eyepiece dioptric adjustment ring
Set optimal magnification

5. Locate required reference point (1st star) by rotating viewfinder ↶
Align reference point with instrument line of sight
БВК-1 pb ИЗМЕРЕНИЕ ПУМА (Puma measurement) → Press

6. Locate required reference point (2nd star) by rotating viewfinder ↶
Align reference point with instrument line of sight
БВК-1 pb ИЗМЕРЕНИЕ ПУМА(Puma measurement) → Press

RS Laptop 7. Monitor execution of БИНС correction from Puma via RS Laptop (TBD)

5.3.6. CLOSEOUT OPERATIONS

1. Pitch and roll locking screws ↷ (tight)
Puma sw → Off
√ ■ grid backlight

On MCC GO 2. connector X840Ю10 of cable 17КС.10Ю 8210А-4780 ←┼→ connector Ш1 ПВП Puma
connector X846Ю10 of cable 17КС.10Ю 8210А-4780 ←┼→ connector X846Ю10 of cable 17КС.10Ю 8210А-3510 (from ППС-21)
connector X261Ю30 of cable 17КС.30Ю 8230А-930 ←┼→ connector Ш2 ПВП Puma
connector X260Ю30 of cable 17КС.30Ю 8230А-930 →┼← connector X260Ю30 of УС22-1

3. Remove viewfinder from window #6
Stow in nominal location

5.3.7. OFF-NOMINAL SITUATIONS

1. NO GRID BACKLIGHT

PUMA 1. √ sw → On
■ grid backlight lamp

PUMA 2. sw → Off
Replace lamp with spare from Spares kit

PUMA 3. sw → On
√ □ grid backlight

6. INTEGRATED PROPULSION SYSTEM (ОДУ)

Propulsion system valves abbreviations

Low pressure electropneumatic valves

Hardware name	Hardware ID
Low-pressure oxidizer tank pressurization electropneumatic valve	ЭКННО1
Low-pressure oxidizer tank pressurization electropneumatic valve	ЭКННО2
Low-pressure fuel tank pressurization electropneumatic valve	ЭКННГ1
Low-pressure fuel tank pressurization electropneumatic valve	ЭКННГ2
High-pressure oxidizer tank pressurization electropneumatic valve	ЭКНБВО1
High-pressure oxidizer tank pressurization electropneumatic valve	ЭКНБВО2
High-pressure fuel tank pressurization electropneumatic valve	ЭКНБВГ1
High-pressure fuel tank pressurization electropneumatic valve	ЭКНБВГ2
Fuel pressurization and evacuation system electropneumatic valve (backup)	ЭКНВГ2
Oxidizer pressurization and evacuation system electropneumatic valve (backup)	ЭКНВО2
Backup compressor fuel pressurization and evacuation system electropneumatic valve	ЭКРНВГ
Backup compressor oxidizer pressurization and evacuation system electropneumatic valve	ЭКРНВО
FGB fuel tanks pressurization and evacuation system electropneumatic valve	ЭКНТГ1
FGB fuel tanks pressurization and evacuation system electropneumatic valve	ЭКНТГ2
FGB oxidizer tanks pressurization and evacuation system electropneumatic valve	ЭКНТО1
FGB oxidizer tanks pressurization and evacuation system electropneumatic valve	ЭКНТО2

High pressure electropneumatic valves

Hardware name	Hardware ID
Fuel spherical tank ramp separation electropneumatic valve	ЭКРШГ
Oxidizer spherical tank ramp separation electropneumatic valve	ЭКРШО
High pressure fuel pressurization and evacuation system electropneumatic valve	ЭКНВГ1
High pressure oxidizer pressurization and evacuation system electropneumatic valve	ЭКНВО1

Electrohydraulic valves

Hardware name	Hardware ID
Low-pressure fuel tank 1 electrohydraulic valve	ЭКГ1
Low-pressure fuel tank 2 electrohydraulic valve	ЭКГ2
Low-pressure fuel tank 3 electrohydraulic valve	ЭКГ3
Low-pressure oxidizer tank 1 electrohydraulic valve	ЭКО1
Low-pressure oxidizer tank 2 electrohydraulic valve	ЭКО2
Low-pressure oxidizer tank 3 electrohydraulic valve	ЭКО3
High-pressure fuel tank electrohydraulic valve	ЭКГВ
High-pressure oxidizer tank electrohydraulic valve	ЭКОВ
Oxidizer refilling system electrohydraulic valve	ЭКДО1
Oxidizer refilling system electrohydraulic valve	ЭКДО2
Oxidizer refilling system electrohydraulic valve	ЭКДО3
Oxidizer refilling system electrohydraulic valve	ЭКДО4
Oxidizer refilling system electrohydraulic valve	ЭКДО5
Oxidizer refilling system electrohydraulic valve	ЭКДО6
Oxidizer refilling system electrohydraulic valve	ЭКДО7
Oxidizer refilling system electrohydraulic valve	ЭКДО8
Fuel refilling system electrohydraulic valve	ЭКДГ1
Fuel refilling system electrohydraulic valve	ЭКДГ2
Fuel refilling system electrohydraulic valve	ЭКДГ3
Fuel refilling system electrohydraulic valve	ЭКДГ4
Fuel refilling system electrohydraulic valve	ЭКДГ5
Fuel refilling system electrohydraulic valve	ЭКДГ6
Fuel refilling system electrohydraulic valve	ЭКДГ7
Fuel refilling system electrohydraulic valve	ЭКДГ8
FGB fuel tanks 2, 3 refilling system electrohydraulic valve	ЭКДТГ1
FGB oxidizer tanks 2, 3 refilling system electrohydraulic valve	ЭКДТО1
FGB fuel tanks 1, 4 refilling system electrohydraulic valve	ЭКДТГ2
FGB oxidizer tanks 1, 4 refilling system electrohydraulic valve	ЭКДТО2

7. SM AND FGB PROPULSION SYSTEM

7.1. PURPOSE

ОДУ is part of the Russian Segment motion control engines system and is used for the Russian Segment and ISS reboost, to create control moments relative to the Russian Segment and ISS centers of mass and to create moments using High-pressure oxidizer tanks and UDM roll thrusters.

7.2. TECHNICAL PARAMETERS

7.2.1. SM ОДУ technical parameters

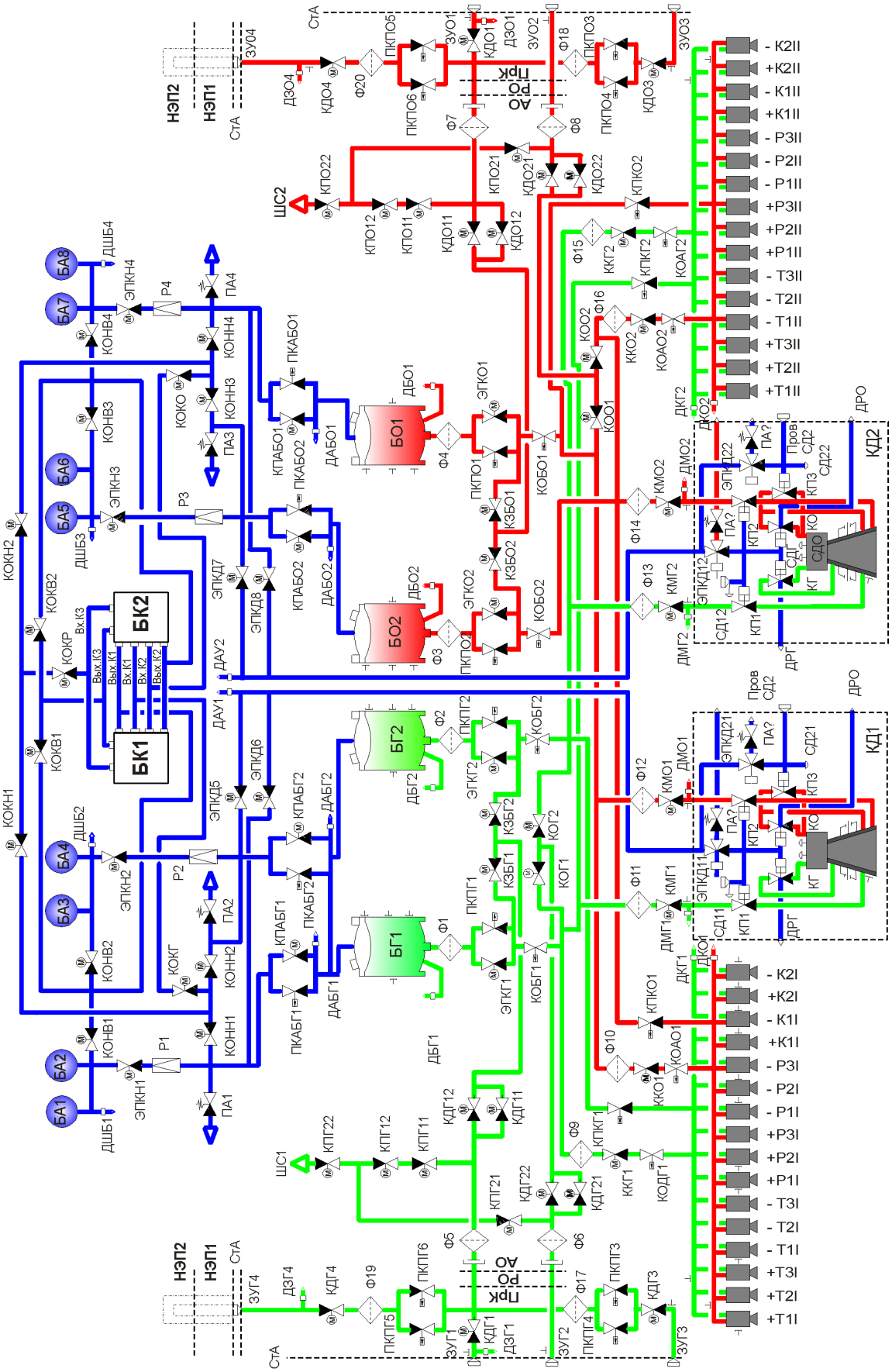
nominal internal tank volume, L	260
fluid cavity volume, L	218
volume of filled component in the tank, L	190 --- 194
volume of filled component when Tank bellows position indicator triggers, L	189 --- 191
total volume of filled fuel, kg:	
fuel	304
oxidizer	556
refill amount, max, kg:	
fuel	280
oxidizer	520
Nitrogen tank internal volume (nominal), L	20
quantity of Nitrogen tanks	8
Nitrogen working pressure, = (at t = 30° c), kgf/cm^2	≤ 230
pressurization system Nitrogen margin (at t = 15° C and P_{refill} = 205 - 210 kgf/cm^2), kg	37
fuel supply system working pressure (nominal), kgf/cm^2	19 --- 23
refilling pressure in the lines, kgf/cm^2,	2 --- 22
oxidizer and fuel input pressure, kgf/cm^2:	
In КД (Reboost engine),	13.5 --- 24.5
In ДО (Attitue control thrusters),	12 --- 23
components input pressure differential, kgf/cm^2:	
In КД,	≤ 2
In ДО,	≤ 3
specific impulse, kgf/kg:	
КД	290.7 --- 296.7
ДО (continuous mode)	230
ДО (pulse mode)	180
continuous operation time, max, sec:	
КД	400
ДО	300
total operation time, sec:	
КД	2700
ДО	5000
interval between КД activations, min, sec	10

propellant components ratio in initial operation conditions:
for КД (if P_{input} = 17.5 atm and t = 15° C)..... 1.77 --- 1.93
for ДО (if P_{input} = 18 atm and t = 15° C)
in continuous mode..... 1.5 --- 2.3
in pulse mode..... 1.4 --- 2.3
absolute pressure in gas cavities
Oxidizer tanks and Fuel tanks during Nitrogen evacuation..... > 2
КД electropneumatic valve driving gas pressure..... 19 --- 23
pressure differential, max, kgf/cm^2:
between gas and fluid cavities of Oxidizer tanks and Fuel tanks..... ≤ 5
between fluid and gas cavities of Oxidizer tanks and Fuel tanks..... ≤ 0.8

7.2.2. FGB ДУ technical parameters

Mass of filled propellant, max, kg: 6120
fuel (including propellant lines)..... 3952
oxidizer (including propellant lines)..... 2168
mass of pressurization system Nitrogen
(at t = 15° C and P_{refill} = 235 kgf/cm^2), kg..... 145
one time refill propellant volume, L
from SM ..... 100 --- 1500
to SM..... 5 --- 400
quantity of intake-output cycles 30
mass of guaranteed usable propellant margin, kg..... 5760
working pressure in Low-pressure tank, kgf/cm^2 23
propellant components pressure during intake and output kgs/cm^2..... 5---20
max propellant intake volume, L
for High-pressure tanks and Low-pressure tanks..... 370
for Auxiliary propellant tanks..... 303

7.3. SM ОДУ PNEUMOHYDRAULIC SCHEMATIC



8. ОДУ MONITORING AND CONTROL FROM RS LAPTOP

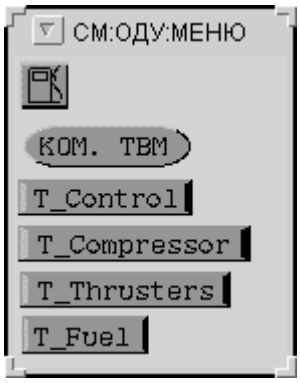
8.1. CALLING UP ОДУ MENU

ОДУ summary menu can be brought up from any display that has systems button panel

RS Laptop Home page SM

sel 

ОДУ menu appears



Display access button

Oval-shaped icon to bring up system control window (commands)

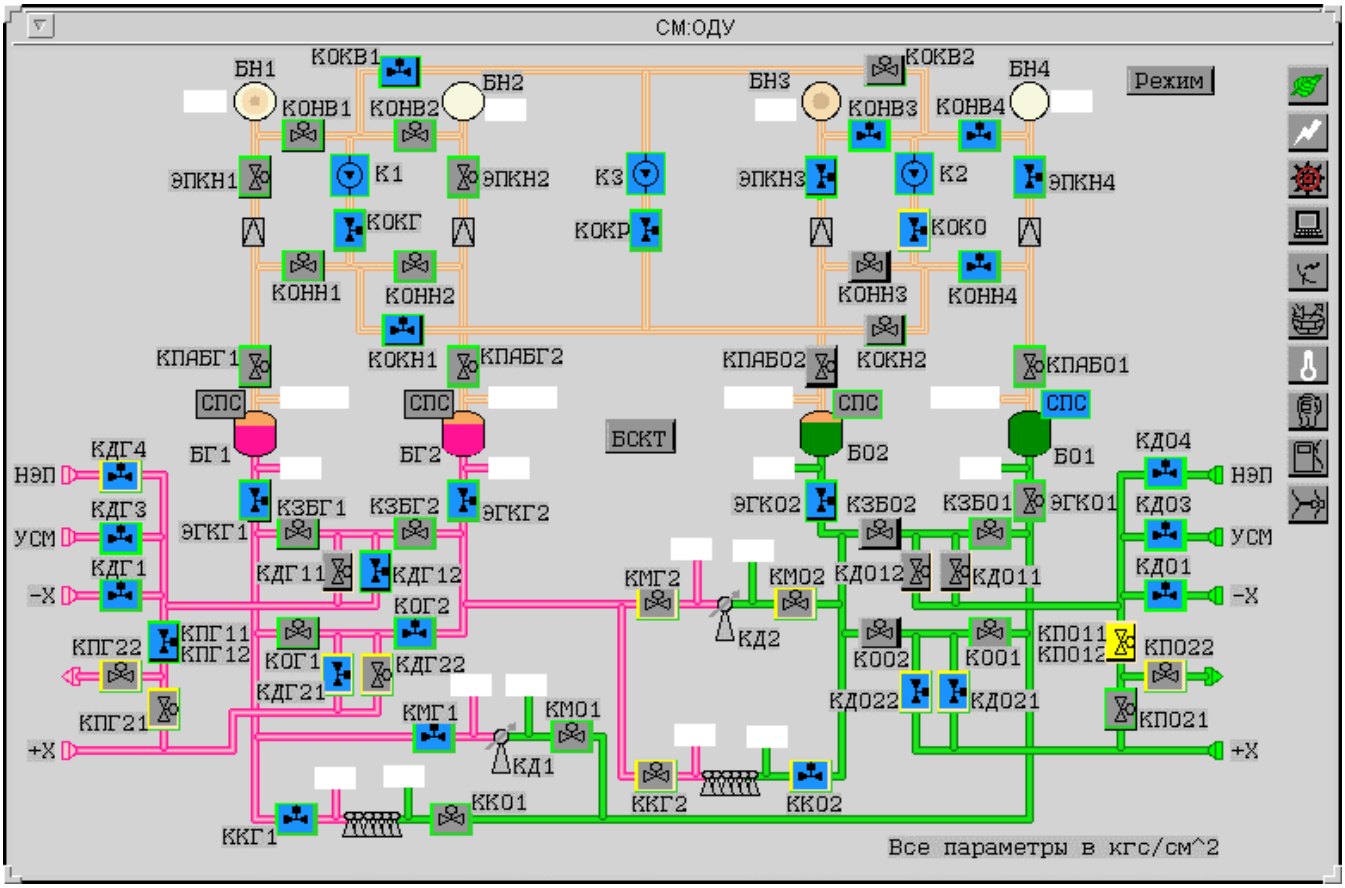
Icons to bring up technical support displays for the system (used only per **MCC** instructions)

8.2. ОДУ DISPLAY

RS Laptop СМ:ОДУ

sel 

ОДУ display appears



Display elements

brings up БСКТ (Propellant monitoring unit) display (СМ:ОДУ:БСКТ)

brings up ОДУ mode display (СМ:ОДУ:Режимы)


Nitrogen line


fuel line


oxidizer line


compressor

tank bellows position indicator


valve (when selected, valve command window appears)

Display elements status change


compressor is not powered up, Off


compressor is powered up, On

indicator is powered up, Off

indicator is powered up, On


valve is not powered up


valve is powered up, closed


valve is powered up, open


valve failed (Caution)


power problem


static data


invalid data

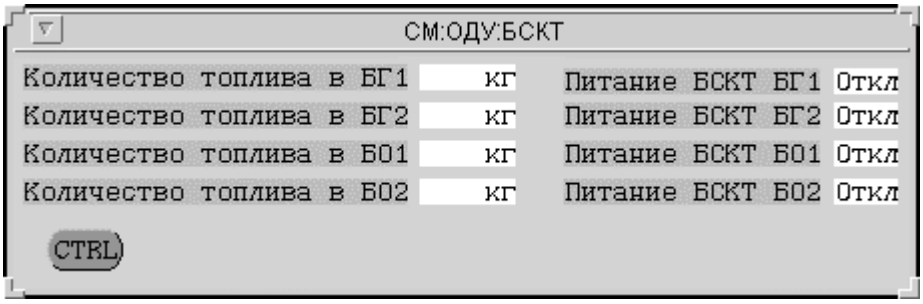

valve failed (Warning)

8.2.1. Propellant monitoring unit display

RS Laptop СМ:ОДУ

sel БСКТ

СМ:ОДУ:БСКТ display appears
(Propellant monitoring unit power and propellant amount in tanks checkout)

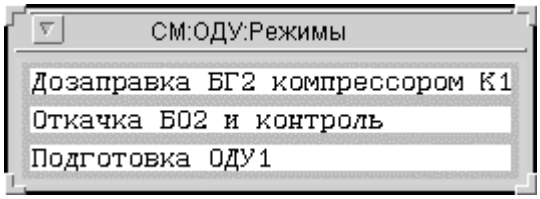


RS Laptop СМ:ОДУ:БСКТ CTRL
sel
БСКТ (Propellant monitoring unit) (commands) control window appears

8.2.2. Modes display

RS Laptop СМ:ОДУ

sel Режим
ОДУ modes monitoring window appears



9. DYNAMIC MODES

9.1. CONFIGURING ОДУ FOR DYNAMIC MODES

CAUTION

Oxidizer line compressors opening valve, Fuel line compressors opening valve, Backup compressor opening valve, Fuel refilling valve 1, КДГ3 (Fuel refilling valve 3), КДГ4 (Fuel refilling valve 4), КДО1 (Oxidizer reflIling valve 1),КДО3 (Oxidizer reflIling valve 3), КДО4 (Oxidizer reflIling valve 4) valves initial position — открыты (open)

9.1.1. Configuring ОДУ of Manifold 1

CAUTION

This mode is incompatible with Fuel tank 1 and Oxidizer tank 1 refill mode

On MCC GO verify the following valves are open and Propellant monitoring unit is powered up:

without Fuel tank 1 and Oxidizer tank 1 pressurization	with Fuel tank 1 and Oxidizer tank 1 pressurization
RS Laptop SM:MCS vlv ЭГКГ1 vlv ЭГКО1) vlv ККГ1 vlv ККО1 RS Laptop SM:MCS:BCKT Питание БСКТ БГ1 (Fuel tank 1 Propellant monitoring unit power) — Вкл (On) Питание БСКТ БО1 (Oxidizer tank 1 Propellant monitoring unit power) — Вкл (On)	RS Laptop SM:MCS vlv ЭПКН1 vlv ЭПКН4 vlv КПАБГ1 vlv КПАБО1 vlv ЭГКГ1 vlv ЭГКО1 vlv ККГ1 vlv ККО1 RS Laptop SM:MCS:BCKT Питание БСКТ БГ1 (Fuel tank 1 Propellant monitoring unit power) — Вкл (On) Питание БСКТ БО1 (Oxidizer tank 1 Prop. monitoring unit power) — Вкл (On)

On MCC GO when combining Manifolds 1 and 2, verify the following valves are open:

RS Laptop SM:MCS
vlv КОГ1
vlv КОГ2
vlv КОО1
vlv КОО2

9.1.2. Configuring ОДУ of Manifold 2

C A U T I O N

This mode is incompatible with Fuel tank 2 and Oxidizer tank 2 refill mode

On MCC GO verify the following valves are open and Propellant monitoring unit is powered up:

without Fuel tank 2 and Oxidizer tank 2 pressurization	with Fuel tank 2 and Oxidizer tank 2 pressurization
RS Laptop SM:MCS vlv ЭГКГ2 vlv ЭГКО2 vlv ККГ2 vlv ККО2	RS Laptop SM:MCS vlv ЭПКН2 vlv ЭПКН3 vlv КПАБГ2 vlv КПАБО2 vlv ЭГКГ2 vlv ЭГКО2 vlv ККГ2 vlv ККО2
RS Laptop SM:MCS:ВСКТ	RS Laptop SM:MCS:ВСКТ
Питание БСКТ БГ2 (Fuel tank 2 Propellant monitoring unit power) Вкл (On) Питание БСКТ БО2 (Oxidizer tank 2 Propellant monitoring unit power) Вкл (On)	Питание БСКТ БГ2 (Fuel tank 2 Propellant monitoring unit power) Вкл (On) Питание БСКТ БО2 (Oxidizer tank 2 Prop. monitoring unit power) Вкл (On)

On MCC GO when combining manifolds 1 and 2 verify the following valves are open:

RS Laptop SM:MCS
vlv КОГ1
vlv КОГ2
vlv КОО1
vlv КОО2

9.1.3. Cancelling ОДУ configuration

On MCC GO verify the following valves are closed and Propellant monitoring unit is powered down:

Manifold 1	Manifold 2
RS Laptop SM:MCS vlv ЭПКН1 vlv ЭПКН4 vlv КПАБГ1 vlv КПАБО1 vlv ЭГКГ1 vlv ЭГКО1 vlv ККГ1 vlv ККО1	RS Laptop SM:MCS vlv ЭПКН2 vlv ЭПКН3 vlv КПАБГ2 vlv КПАБО2 vlv ЭГКГ2 vlv ЭГКО2 vlv ККГ2 vlv ККО2
RS Laptop SM:MCS:ВСКТ	RS Laptop SM:MCS:ВСКТ
Питание БСКТ БГ1 (Fuel tank 1 Propellant monitoring unit power) Откл (Off) Питание БСКТ БО1 (Oxidizer tank 1 Propellant monitoring Откл (Off)	Питание БСКТ БГ2 (Fuel tank 2 Propellant Откл (Off) Питание БСКТ БО2 (Oxidizer tank 2 Prop. Откл (Off)

On MCC GO with combined Manifolds 1 and 2, verify the following valves are closed:

RS Laptop SM:MCS
vlv КОГ1
vlv КОГ2
vlv КОО1
vlv КОО2

9.1.4. Preparation for КД1 (SM Reboost engine 1) activation

C A U T I O N

This mode is incompatible with refill modes of appropriate tanks

On MCC GO verify the following valves and КД1 cover are open:	
Selected Fuel tank 1 and Oxidizer tank 1	Selected Fuel tank 2 and Oxidizer tank 2
RS Laptop SM:MCS vlv КМО1 vlv КМГ1 RS Laptop SM:GNCP:Reboost Открытие крышки КД1 (КД1 cover open)	RS Laptop SM:MCS vlv КМО1 vlv КМГ1 RS Laptop SM:GNCP:Reboost Открытие крышки КД1 (КД1 cover open)

9.1.5. Preparation for КД2 activation

C A U T I O N

This mode is incompatible with refill modes of appropriate tanks

On MCC GO verify the following valves and КД2 cover are open:	
Selected Fuel tank 1 and Oxidizer tank 1	Selected Fuel tank 2 and Oxidizer tank 2
RS Laptop SM:MCS vlv КМО2 vlv КМГ2 RS Laptop SM:GNCP:Reboost Открытие крышки КД2 (КД2 cover open)	RS Laptop SM:MCS vlv КМО2 vlv КМГ2 RS Laptop SM:GNCP:Reboost Открытие крышки КД2 (КД2 cover open)

9.1.6. Configuring КД1 to initial position

On MCC GO verify the following valves and КД1 cover are closed:	
Selected Fuel tank 1 and Oxidizer tank 1	Selected Fuel tank 2 and Oxidizer tank 2
RS Laptop SM:MCS 00:00 vlv КМО1 vlv КМГ1 RS Laptop 00:11 SM:GNCP:Reboost Закрытие крышки КД1 (КД1 cover closed)	RS Laptop SM:MCS 00:00 vlv КМО1 vlv КМГ1 RS Laptop 00:11: SM:GNCP:Reboost Закрытие крышки КД1 (КД1 cover closed)

9.1.7. Configuring КД2 to initial position

On MCC GO verify the following valves and КД2 cover are closed:	
Selected Fuel tank 1 and Oxidizer tank 1	Selected Fuel tank 2 and Oxidizer tank 2
RS Laptop SM:MCS 00:00 vlv КМО2 vlv КМГ2 RS Laptop 00:11 SM:GNCP:Reboost Закрытие крышки КД2 (КД2 cover closed)	RS Laptop SM:MCS 00:00 vlv КМО2 vlv КМГ2 RS Laptop 00:11 SM:GNCP:Reboost Закрытие крышки КД2 (КД2 cover closed)

10. REFILLING

CAUTION
Oxidizer tank 1, Oxidizer tank 2, Fuel tank 1, Fuel tank 2 refill modes are mutually incompatible

10.1. REFILLING БГ 1 (FUEL TANK 1) USING COMPRESSOR 1, 3

CAUTION
This mode is incompatible with modes «Configuring ОДУ on Manifold 1», «Preparation for КД1 Activation», «Purging Fuel Lines»

10.1.1. Nitrogen evacuation from БГ 1 using Compressor 1

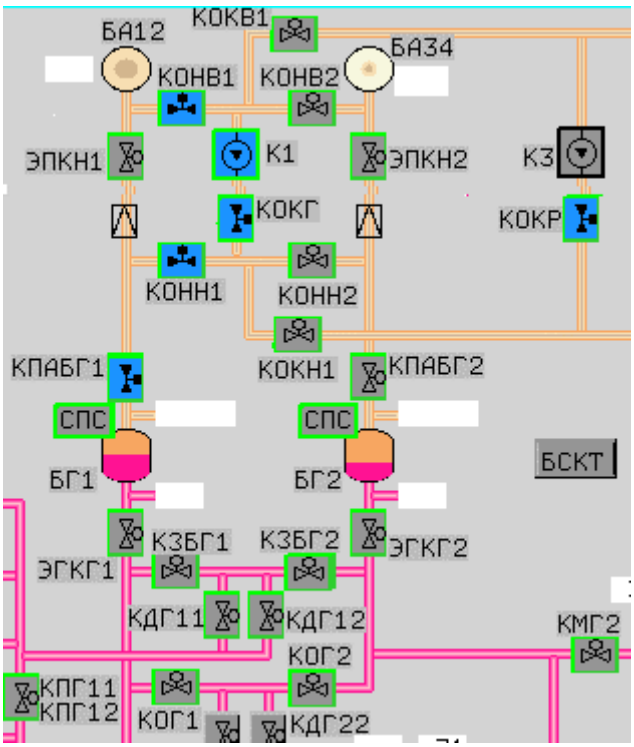
On MCC GO verify:

RS Laptop SM:MCS:BCKT

Питание БСКТ БГ1 (Fuel tank 1 Propellant monitoring unit power)	Вкл (On)

RS Laptop SM:MCS

vlv ЭПКН1	— Closed
vlv КЗБГ1	— Closed
vlv КЗБГ2	— Closed
vlv КОГ1	— Closed
vlv КОГ2	— Closed
vlv КОНН2	— Closed
vlv КОНВ2	— Closed
vlv КОКГ	— Open
vlv КОНН1	— Open
vlv КПАБГ1	— Open
vlv КОНВ1	— Open
СПС БГ1	— СПС
К1	—



Report to MCC Р.БГ1 = _____ kgf/cm^2

10.1.2. Nitrogen evacuation from БГ1 using Compressor 3

NOTE
This mode is used if Compressor 1 fails

On MCC GO verify:

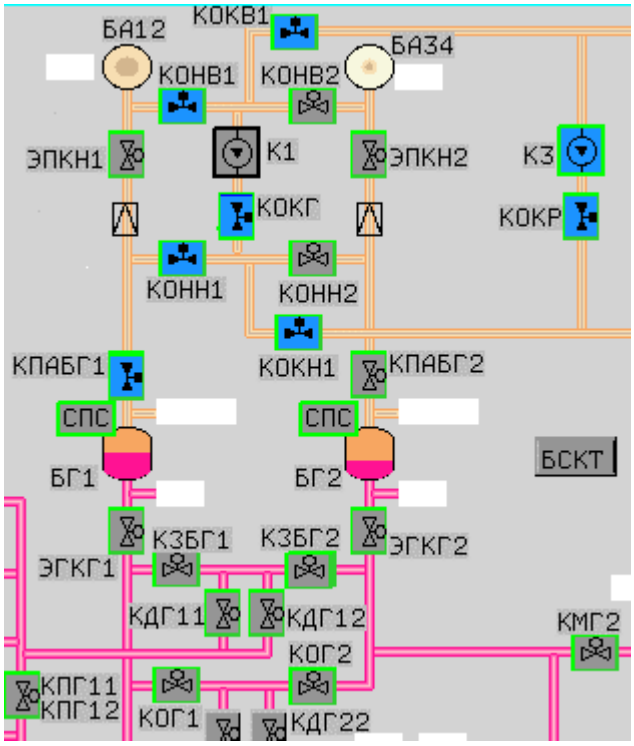
RS Laptop SM:MCS:ВСКТ

Питание БСКТ БГ1 (Fuel tank 1 Propellant monitoring unit power)	Вкл (On)

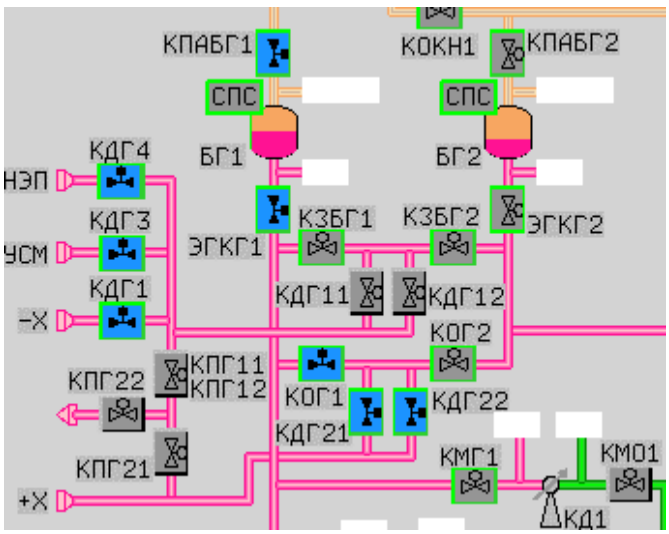
RS Laptop SM:MCS

кл ЭПКН1	—Closed
кл КЗБГ1	—Closed
кл КЗБГ2	—Closed
кл КОНН2	—Closed
кл КОГ1	—Closed
кл КОГ2	—Closed
кл КОНВ2	—Closed
кл КОКВ2	—Closed
кл КПАБГ1	—Open
кл КОНН1	—Open
кл КОКН1	—Open
кл КОКГ	—Open
кл КОКВ1	—Open
кл КОНВ1	—Open
СПС БГ1	— СПС
КЗ	—

Report to MCC Р.БГ1 = _____ kgf/cm^2



10.1.3. Propellant transfer to БГ1 from Progress (via AO)



RS Laptop SM:MCS

Report to MCC Р.БГ1 = _____ kgf/cm^2

On MCC GO verify the following valves are open:

RS Laptop SM:MCS

vlv ЭГКГ1
vlv КОГ1
vlv КДГ21
vlv КДГ22

RS Laptop SM:MCS:ВСКТ

Report to MCC	Количество топлива в БГ1 (propellant amount in Fuel tank 1)	кг (kg)

After propellant transfer to Fuel tank 1 **on MCC GO** verify:

RS Laptop SM:MCS

vlv ЭГКГ1	— Closed
vlv КОГ1	— Closed
vlv КДГ21	— Closed
vlv КДГ22	— Closed
vlv КОНН1	— Closed
vlv КОНВ1	— Closed
vlv КОКН1	— Closed
vlv КПАБГ1	— Closed
vlv КОКВ1	— Closed
СПС БГ1	— СПС (СПС — if tank is full)

RS Laptop SM:MCS:ВСКТ

Питание БСКТ БГ1 (Fuel tank 1 Propellant monitoring unit power)	Откл (Off)

RS Laptop SM:MCS

К1 —-

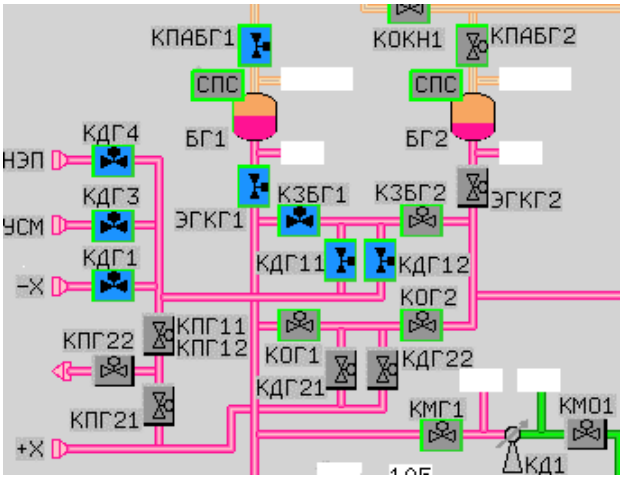
К3 —-

Report to MCC Р.БГ1 =_____ kgf/cm^2

10.1.4. Propellant transfer to БГ1 from FGB (via ПхО)

RS Laptop SM:MCS

Report to MCC Р.БГ1 = _____ kgf/cm^2



On MCC GO verify the following valves are open:

RS Laptop SM:MCS

vlv ЭГКГ1
vlv КЗБГ1
vlv КДГ11
vlv КДГ12

RS Laptop SM:MCS:ВСКТ

Report to MCC	Количество топлива в БГ1 (propellant amount in Fuel tank 1) кг (kg)

After propellant transfer to БГ1 (Fuel tank 1) **on MCC GO** verify:

RS Laptop SM:MCS

vlv ЭГКГ1	—Closed
vlv КДГ1	—Closed
vlv КДГ11	—Closed
vlv КДГ12	—Closed
vlv КЗБГ1	—Closed
vlv КОНН1	—Closed
vlv КОНВ1	—Closed
vlv КОКН1	—Closed
vlv КОКВ1	—Closed

vlv КПАБГ1 —Closed
СПС БГ1 — СПС (СПС — if tank is full)

RS Laptop SM:MCS:BCKT

Питание БСКТ БГ1 (Fuel tank 1 Propellant monitoring unit power)	Откл (Off)

RS Laptop SM:MCS

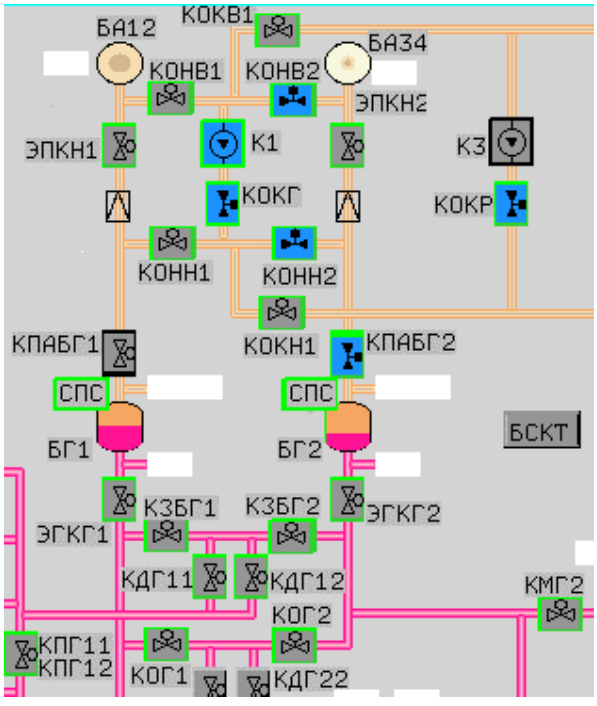
К1 —-
К3 —-
Report to MCC Р.БГ1 =_____ kgf/cm^2

10.2. REFILLING БГ2 (FUEL TANK 2) USING COMPRESSOR 1, 3

C A U T I O N

This mode is incompatible with modes «Configuring ОДУ on Manifold 2» , «Preparation for КД2 Activation», «Purging Fuel Lines»

10.2.1. Nitrogen evacuation from БГ2 using Compressor 1



On MCC GO verify:
RS Laptop SM:MCS:BCKT

Питание БСКТ БГ2 (Fuel tank 2 Propellant monitoring unit power)	Вкл (On)

RS Laptop SM:MCS

vlv ЭПКН2	—Closed
vlv КЗБГ1	—Closed
vlv КЗБГ2	—Closed
vlv КОНН1	—Closed
vlv КОГ1	—Closed
vlv КОГ2	—Closed
vlv КОНВ1	—Closed
vlv КОКГ	—Open
vlv КОНН2	—Open
vlv КПАБГ2	—Open
vlv КОНВ2	—Open
СПС БГ1	— СПС
К1	—

Report to MCC Р.БГ2 = _____ kgf/cm^2

10.2.2. Nitrogen evacuation from БГ2 using Compressor 3

NOTE

The mode is used if Compressor 1 fails

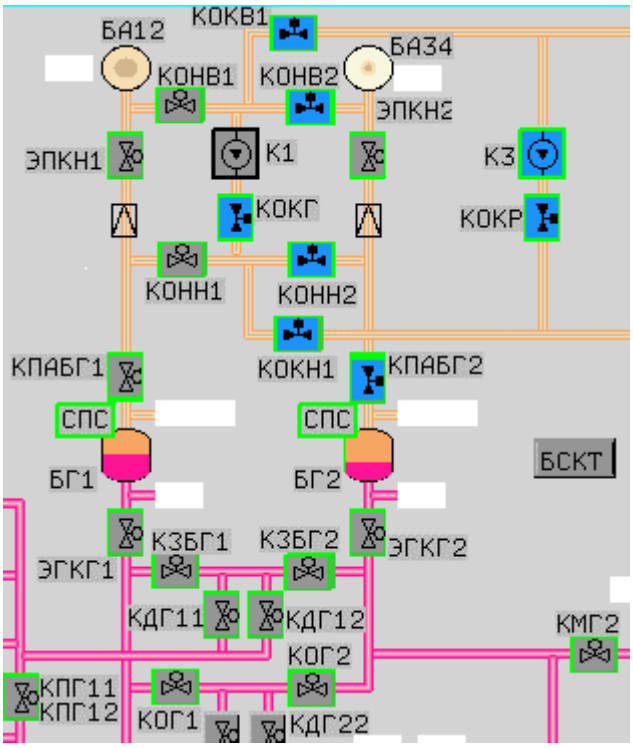
On MCC GO verify:

RS Laptop SM:MCS:ВСКТ

Питание БСКТ БГ2 (Fuel tank 2 Propellant monitoring unit power)	Вкл (On)

RS Laptop SM:MCS

vlv ЭПКН2	—Closed
vlv КЗБГ1	—Closed
vlv КЗБГ2	—Closed
vlv КОНН1	—Closed
vlv КОГ1	—Closed
vlv КОГ2	—Closed
vlv КОКН2	—Closed
vlv КОКВ2	—Closed
vlv КОНВ1	—Closed
vlv КПАБГ2	—Open
vlv КОКН1	—Open
vlv КОНН2	—Open
vlv КОКР	—Open
vlv КОКВ1	—Open
vlv КОНВ2	—Open
СПС БГ2	— СПС
К3	—



Report to MCC Р.БГ2 = _____ kgf/cm^2

10.2.3. Propellant transfer to БГ2 from Progress (via АО)

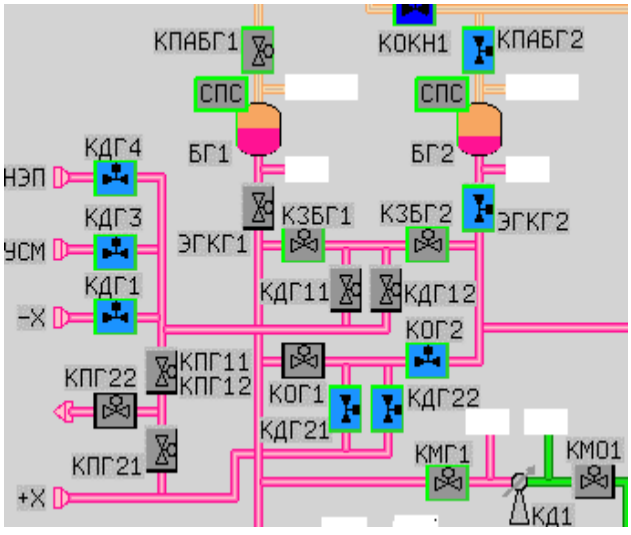
RS Laptop SM:MCS

Report to MCC Р.БГ2 = _____ kgf/cm^2

On MCC GO verify the following valves are open:

RS Laptop SM:MCS

vlv ЭГКГ2
vlv КОГ2
vlv КДГ21
vlv КДГ22



RS Laptop SM:MCS:ВСКТ

Report to MCC

Количество топлива в БГ2 (propellant amount in Fuel tank 2)	кг (kg)

After propellant transfer to Fuel tank 2 **on MCC GO** verify:

RS Laptop SM:MCS

vlv ЭГКГ2	—Closed
vlv КОГ2	—Closed
vlv КДГ21	—Closed
vlv КДГ22	—Closed
vlv КОНН2	—Closed
vlv КОНВ2	—Closed
vlv КОКН1	—Closed
vlv КОКВ1	—Closed
vlv КПАБГ2	—Closed
СПС БГ2	—- СПС (СПС — if tank is full)

RS Laptop SM:MCS:ВСКТ

Питание БСКТ БГ2 (Fuel tank 2 Propellant monitoring unit power)	Откл (Off)

RS Laptop SM:MCS

К1 —-

К3 —-

Report to MCC Р.БГ2 =_____ kgf/cm^2

10.2.4. Propellant transfer to БГ2 from FGB (via ПхО)

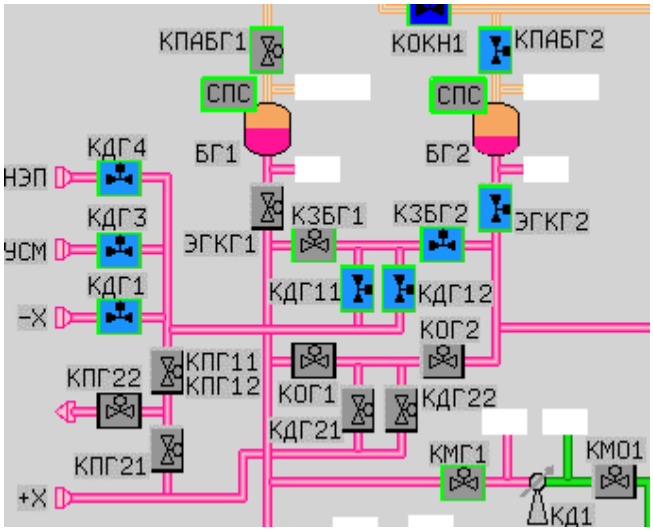
RS Laptop SM:MCS

Report to MCC Р.БГ2 = _____ kgf/cm^2

On MCC GO verify the following valves are open:

RS Laptop SM:MCS

vlv ЭГКГ2
vlv КЗБГ2
vlv КДГ11
vlv КДГ12



RS Laptop SM:MCS:ВСКТ

Report to MCC	Количество топлива в БГ2 (propellant amount in Fuel tank 2) кг (kg)

After propellant transfer to Fuel tank 2 **on MCC GO** verify:

RS Laptop SM:MCS

vlv ЭГКГ2	—Closed
vlv КДГ11	—Closed
vlv КДГ12	—Closed
vlv КЗБГ2	—Closed
vlv КОНН2	—Closed

vlv КОНВ2 —Closed
vlv КОКН1 —Closed
vlv КОКВ1 —Closed
vlv КПАБГ2 —Closed
СПС БГ2 —- СПС (СПС — if tank is full)

RS Laptop SM:MCS:ВСКТ

Питание БСКТ БГ2 (Fuel tank 2 Propellant monitoring unit power)	Откл (Off)

RS Laptop SM:MCS

К1 —-
К3 —-
Report to MCC Р.БГ2 =_____ kgf/cm^2

10.3. REFILLING БО1 (OXIDIZER TANK 1) USING COMPRESSOR 2, 3

C A U T I O N

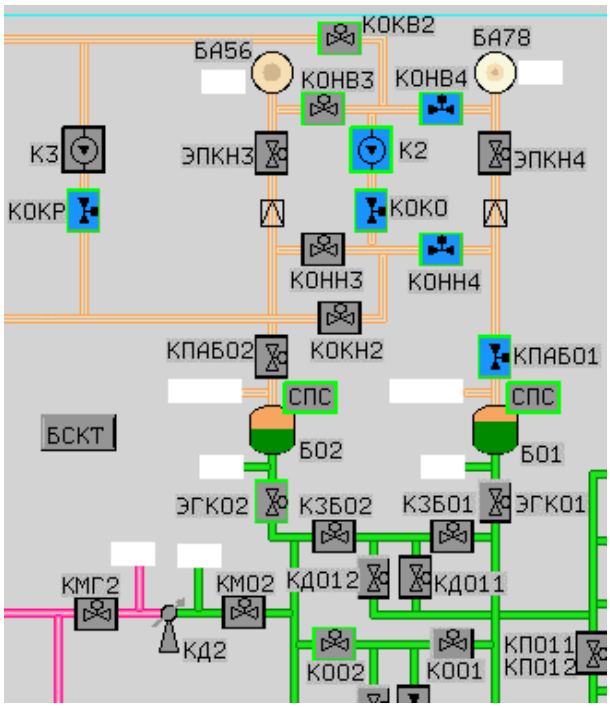
This mode is incompatible with modes «Configuring ОДУ on Manifold 1», «Preparation for КД1 Activation», «Purging Oxidizer Lines»

10.3.1. Nitrogen evacuation from БО1 using Compressor 2

On MCC GO verify:
RS Laptop SM:MCS:ВСКТ

Питание БСКТ БО1 (Oxidizer tank 1 Propellant monitoring unit power)	Вкл (On)

RS Laptop SM:MCS
vlv ЭПКН4 —Closed
vlv КЗБО1 —Closed
vlv КЗБО2 —Closed
vlv КОНН3 —Closed
vlv КОО1 —Closed
vlv КОО2 —Closed
vlv КОНВ3 —Closed
vlv КПАБО1 — Open
vlv КОНН4 —Open
vlv КОКО —Open
vlv КОНВ4 —Open
СПС БО1 — СПС
К1 —



Report to MCC Р.БО1 = _____ kgf/cm^2

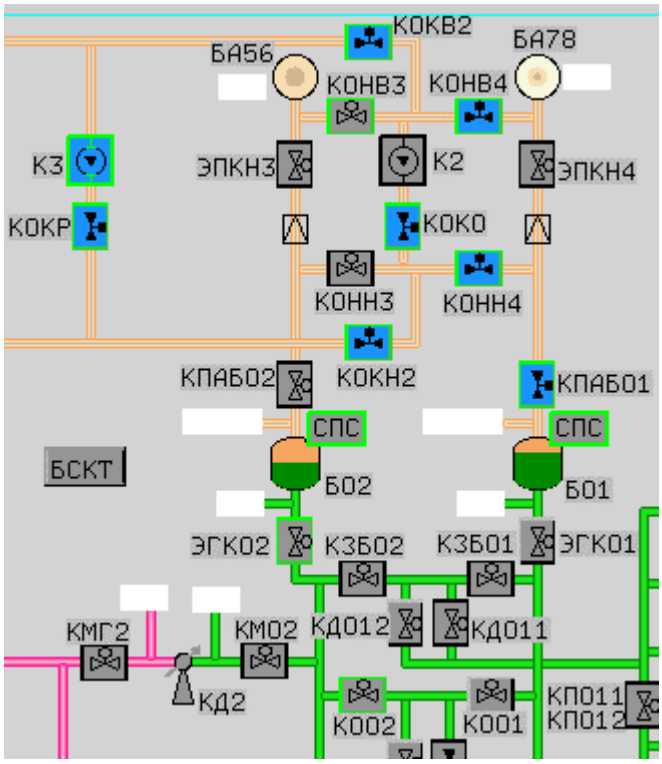
10.3.2. Nitrogen evacuation from БО1 using Compressor 3

NOTE
This mode is used if Compressor 2 fails

On MCC GO verify:

RS Laptop SM:MCS:ВСКТ

Питание БСКТ БО1 (Oxidizer tank 1 Propellant monitoring unit power)	Вкл (On)



RS Laptop SM:MCS

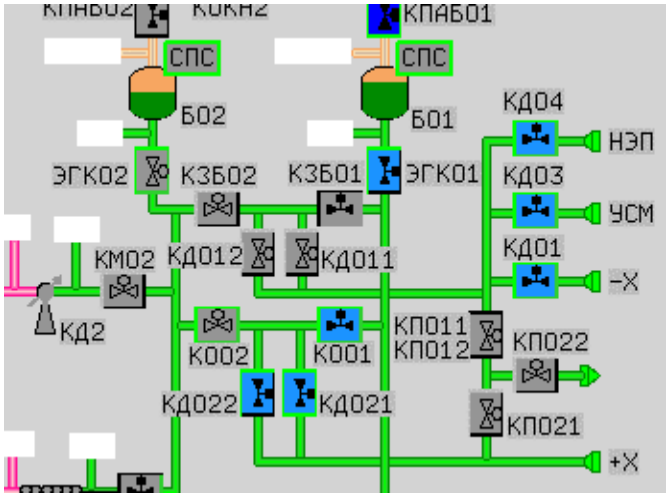
vlv ЭПКН4)	—Closed
vlv К3БО1	—Closed
vlv К3БО2	—Closed
vlv КОНН3	—Closed
vlv КОО1	—Closed
vlv КОО2	—Closed
vlv КОКН1	—Closed
vlv КОКВ1	—Closed
vlv КОНВ3	—Closed
vlv КПАБО1	—Open
vlv КОНН4	—Open
vlv КОКН2	—Open
vlv КОКР	—Open
vlv КОКВ2	—Open
vlv КОНВ4	—Open
СПС БО1	— СПС
К3	—

Report to MCC Р.БО1 = _____ kgf/cm^2

10.3.3. Propellant transfer to БО1 from Progress (via АО)

RS Laptop SM:MCS

Report to MCC Р.БО1 = ___ kgf/cm^2



On MCC GO verify the following valves are open:

RS Laptop SM:MCS

vlv ЭГКО1
vlv КОО1
vlv КДО21
vlv КДО22

RS Laptop SM:MCS:ВСКТ

Report to MCC	Количество топлива в БО2 (propellant amount in Oxidizer tank 2)	кг (kg)

After propellant transfer to Oxidizer tank 2 **on MCC GO** verify:

RS Laptop SM:MCS

vlv ЭГКО1 —Closed
vlv КОО1 —Closed
vlv КДО21 —Closed
vlv КДО22 —Closed
vlv КОНН4 —Closed
vlv КОНВ4 —Closed
vlv КОКН2 —Closed
vlv КОКВ2 —Closed
√vlv КПАБО1 —Closed
СПС БО1 — СПС (СПС — if tank is full)

RS Laptop SM:MCS:ВСКТ

Питание БСКТ БО1 (Oxidizer tank 1 Propellant monitoring unit power)	Откл (Off)

RS Laptop SM:MCS

К2 —
К3 —

Report to MCC Р.БО1 = _____ kgf/cm^2

10.3.4. Propellant transfer to БО1 from FGB (via ПхО)

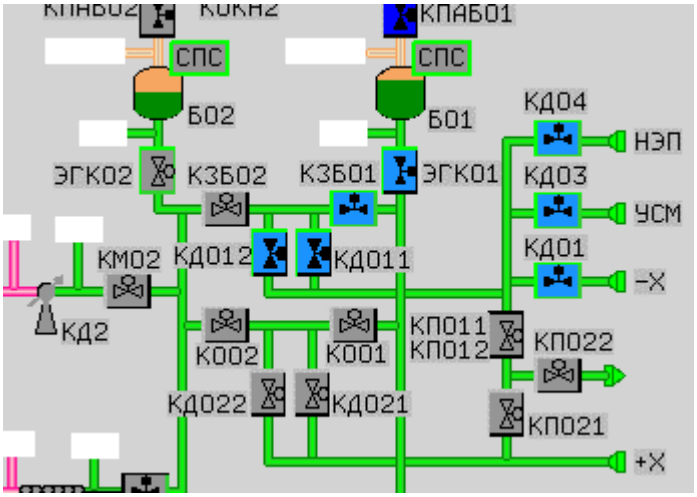
RS Laptop SM:MCS

Report to MCC Р.БО1 = _____ kgf/cm^2

On MCC GO verify the following valves are open:

RS Laptop SM:MCS

vlv ЭГКО1
vlv КЗБО1
vlv КДО11
vlv КДО12



RS Laptop SM:MCS:ВСКТ

Report to MCC	Количество топлива в БО1 (propellant amount in Oxidizer tank 1)	кг (kg)

After propellant transfer to Oxidizer tank 1 **on MCC GO** verify:

RS Laptop SM:MCS

vlvЭГКО1 —Closed
vlv КДО11 —Closed
vlv КДО12 —Closed
vlv КЗБО1 —Closed
vlv КОНН4 —Closed
vlv КОНВ4 —Closed

vlv КОКН2 —Closed
vlv КОКВ2 —Closed
vlv КПАБО1 —Closed
СПС БО1 — СПС (СПС — if tank is full)

RS Laptop SM:MCS:ВСКТ

Питание БСКТ БО1 (Oxidizer tank 1 Propellant monitoring unit power)	Откл (Off)

RS Laptop SM:MCS

К2 —
К3 —
Report to MCC Р.БО1 = _____ kgf/cm^2

10.4. REFILLING БО2 (OXIDIZER TANK 2) USING COMPRESSOR 2, 3

C A U T I O N

This mode is incompatible with modes «Configuring ОДУ on Manifold 2», «Preparation for КД1 Activation», «Purging Oxidizer Lines»

10.4.1. Nitrogen evacuation from БО2 using Compressor 2

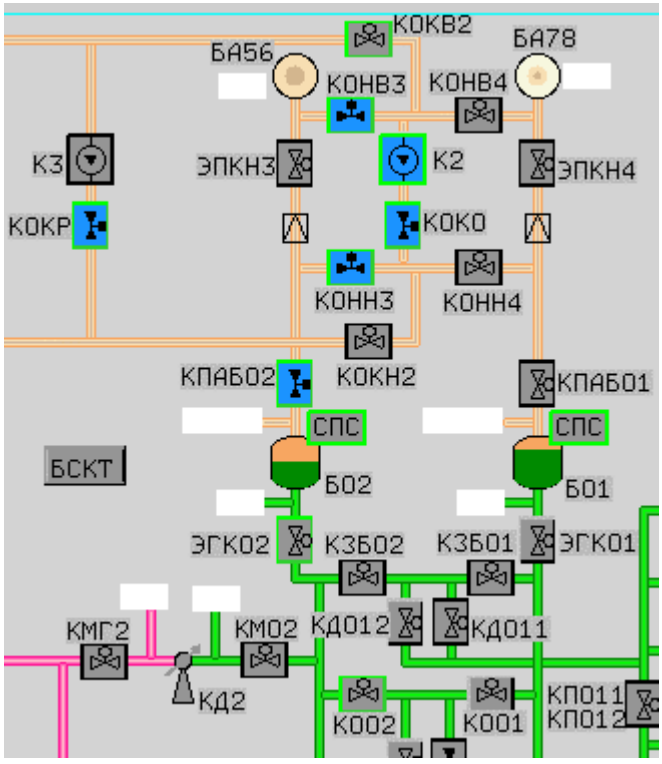
On MCC GO verify:
RS Laptop SM:MCS:ВСКТ

Питание БСКТ БО2 (Oxidizer tank 2 Propellant monitoring unit power)	Вкл (On)

RS Laptop SM:MCS

vlv ЭПКН3 — Closed
vlv КЗБО1 — Closed
vlv КЗБО2 —Closed
vlv КОНН4 —Closed
vlv КОО1 —Closed
vlv КОО2 —Closed
vlv КОНВ4 —Closed
vlv КПАБО2 —Open
vlv КОНН3 —Open
vlv КОКО —Open
vlv КОНВ3 —Open
СПС БО2 — СПС
К1 —

Report to MCC Р.БО2 = _____kgf/cm^2



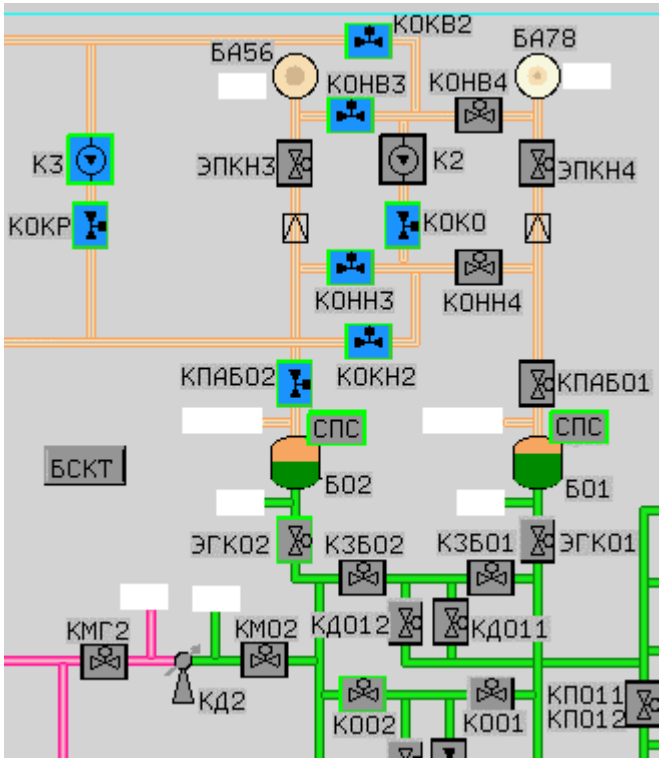
10.4.2. Nitrogen evacuation from БО2 using Compressor 3

NOTE
This mode is used if Compressor 2 fails

On MCC GO verify:

RS Laptop SM:MCS:ВСКТ

Питание БСКТ БО2 (Oxidizer tank 2 Propellant monitoring unit power)	Вкл (On)



RS Laptop SM:MCS

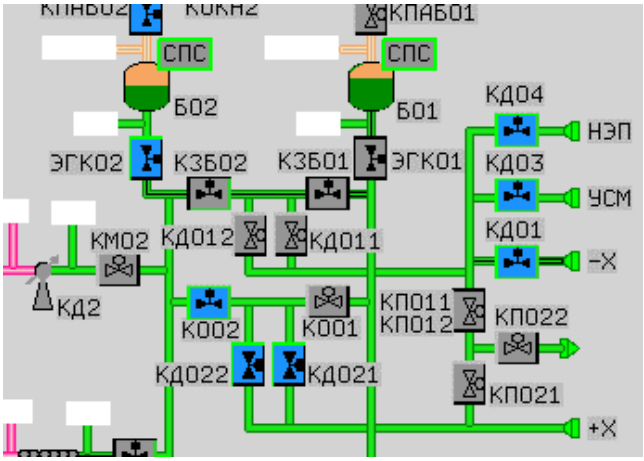
vlv ЭПКН3	—Closed
vlv К3БО1	—Closed
vlv К3БО2	—Closed
vlv КОНН4	—Closed
vlv КОО1	—Closed
vlv КОО2	—Closed
vlv КОКН1	—Closed
vlv КОКВ1	—Closed
vlv КОНВ4	—Closed
vlv КПАБО2	—Open
vlv КОКН2	—Open
vlv КОНН3	—Open
vlv КОКР	—Open
vlv КОКВ2	—Open
vlv КОНВ3	—Open
СПС БО2	— СПС
К3	—

Report to MCC Р.БО2 = _____ kgf/cm^2

10.4.3. Propellant transfer to БО2 from Progress (via АО)

RS Laptop SM:MCS

Report to MCC Р.БО2 = _____ kgf/cm^2



On MCC GO verify the following valves are open:

RS Laptop SM:MCS

vlv ЭГКО2
vlv КОО2
vlv КДО21
vlv КДО22

RS Laptop SM:MCS:ВСКТ

Report to MCC	Количество топлива в БО2 (propellant amount in Oxidizer tank 2)	кг (kg)

After propellant transfer to Oxidizer tank 2 **On MCC GO** verify:

RS Laptop SM:MCS

vlv ЭГКО2 —Closed
vlv КОО2 —Closed
vlv КДО21 —Closed
vlv КДО22 —Closed
vlv КОНН3 —Closed
vlv КОНВ3 —Closed
vlv КОКН2 —Closed
vlv КОКВ2 —Closed
vlv КПАБО2 —Closed
СПС БО2 — СПС (СПС — if tank is full)

RS Laptop SM:MCS:ВСКТ

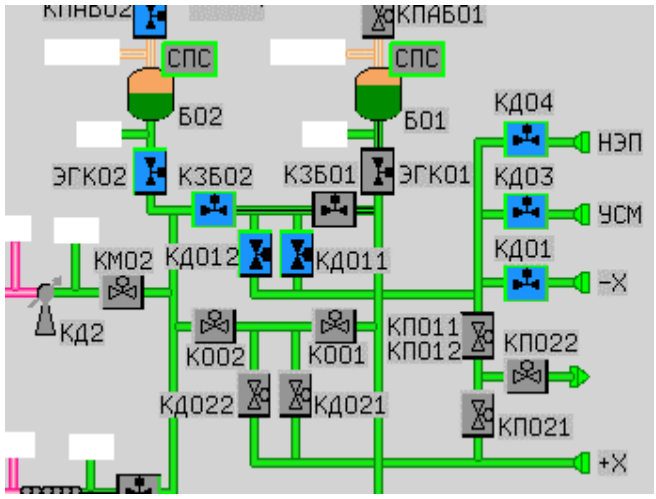
Питание БСКТ БО2 (Oxidizer tank 2 Propellant monitoring unit power)	Откл (Off)

RS Laptop SM:MCS

К2 —
К3 —
Report to MCC Р.БО2 = _____ kgf/cm^2

10.4.4. Propellant transfer to БО2 from FGB (via ПхО)

RS Laptop SM:MCS
Report to MCC Р.БО2 = ____ kgf/cm^2



On MCC GO verify the following valves are open:

RS Laptop SM:MCS
vlv ЭГКО2
vlv КЗБО2
vlv КДО11
vlv КДО12

RS Laptop SM:MCS:ВСКТ

Report to MCC	Количество топлива в БО2 (propellant amount in Oxidizer tank 2)	кг (kg)

After propellant transfer to Oxidizer tank 2 **on MCC GO** verify:

RS Laptop SM:MCS

vlvЭГКО2 — Closed
vlv КДО11 — Closed
vlv КДО12 — Closed
vlv КЗБО2 — Closed
vlv КОНН3 — Closed
vlv КОНВ3 — Closed
vlv КОКН2 — Closed
vlv КОКВ2 — Closed
vlv КПАБО2 — Closed
СПС БО2 — СПС (СПС — if tank is full)

RS Laptop SM:MCS:ВСКТ

Питание БСКТ БО2 (Oxidizer tank 2 Propellant monitoring unit power)	Откл (Off)

RS Laptop SM:MCS

К2 — 

К3 — 

Report to MCC Р.БО2 = _____ kgf/cm^2