SM Power Supply System

SERVICE MODULE

POWER SUPPLY SYSTEM

SM.1

2000

Approved per signature page
### Revision Log

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INTRODUCTION

The SM Power Supply System crew procedures contain information for the crew about procedures and commands for СЭП, СОСБ operation, and procedures and rules for Internal Lighting System operations.

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

These crew procedures may be updated pending ISS assembly, systems modification and procedure validation at simulators and training facilities, and as a result of ground tests.

These crew procedures were developed based on БВС Software release 4.30.14 and RS Laptop Software dated 07.03.00.

ACRONYMS AND ABBREVIATIONS

АБ — storage battery
АЗС — circuit breaker
б/и — crew procedure
БВ — switch panel
БВК — command output unit
БВП — switch panel w/ circuit breaker
БПП — fuse box panel
Дна3-М — report to MCC-M
ЗРУ — charge/discharge unit
ИнПУ — integrated control panel
кбл — cable
Л — lamp
н/с — off-nominal situation
СБ — solar array
СОСБ — solar array orientation system
СМ — Service Module
СНТ — voltage and current stabilizer
СЭП — SM power supply system
ПоУЗ-М — on MCC-M GO
ППС — system power panel
ПС — 28/120 converter
РБС — power outlet
рзм — connector
РЩП — power distribution panel
ТВ — TV
тмб — switch, sw
ЩО — night lighting panel
ЩСР — crew quarters lighting panel
№ — АБ or ЗРУ indicated by MCC-M
CONVENTIONAL SYMBOLS

□ illuminated
■ not illuminated
⊙ sw → On (i.e. up relative to label on panel)
⊙ sw → Off (i.e. down relative to label on panel)
→ mouse left click
← place physical device in designated state
↔ disconnect
← connect
↓ press pushbutton
✓ check (in case of discrepancy, attempt a corrective action one time only)
▲ verify
↓↓ continuously monitor
12:45:30 12 h 45 min 30 sec

advisory information
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-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

To ensure nominal systems operation and crew safety, the crew needs to perform the following actions:

1. When working with the system, use only hardware, tools and protective devices, designated by these crew procedures or by MCC-M
2. Upon detection of an off-nominal situation not documented in these crew procedures, the crew must:
   - 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-M during earliest available comm pass.
3. Fuse replacement must be conducted after having powered off the appropriate system or device. Ensure fuse amperage matches the label on the hardware. Repeated fuse replacement — on MCC-M GO.
### 2. POWER SUPPLY SYSTEM (СЭП)

#### 2.1. 3PY OPERATING MODES (ON MCC-M GO)

<table>
<thead>
<tr>
<th>#</th>
<th>Command (Procedure)/Mode Name</th>
<th>Command (Procedure)</th>
<th>Screen Display Status</th>
<th>Note</th>
</tr>
</thead>
</table>
| 1. | АБ Incomplete Charge Mode ON           | cmd P_ONRNZAB       |           | Charge mode
|    |                                         |                     | AБ partial Charge
|    |                                         |                     | АБ1 – 8 (all)                    | Full Charge Mode or Incomplete Charge Mode can be activated for all storage batteries, activation of one mode deactivates the other (if currently active) |
| 2. | АБ Full Charge Mode ON                 | cmd P_ONRPZAB       |           | Charge mode
|    |                                         |                     | АБ full Charge
|    |                                         |                     | АБ1 – 8 (all)                    |                                                                                                                                 |
|    |                                         |                     |          |                                                                           |                                                                                                                                 |
| 3.1| Storage Battery (АБ) #__ Cycling Mode, Start | proc F40_SEP_1, param1 № |           |                                                                           | Storage Battery #__ Cycling Mode Activation Requirements:
|    |                                         |                     |          |                                                                           | 1. Corresponding 3PY #__ is active
|    |                                         |                     |          |                                                                           | 2. Storage Battery #__ is not running
|    |                                         |                     |          |                                                                           | 'Discharge Disconnected Storage Battery' procedure                                                             |
| 3.2| АБ #__ Cycling Mode ON                | cmd P_ONRCAB №_     |           |                                                                           |                                                                                                                                 |
| 4.1| Storage Battery (АБ) #__ Cycling Mode, Halt | proc F40_SEP_0      |           |                                                                           | This procedure (command) deactivates Cycling Mode on all storage batteries                                    |
| 4.2| АБ #__ Cycling Mode OFF                | cmd P_OFRCAB        |           |                                                                           |                                                                                                                                 |
| 5.1| Discharge Deactivated Storage Battery (АБ) | proc F40_SEP_2, param1 №_ |           |                                                                           | Storage Battery #__ Mode Activation Requirements:
|    |                                         |                     |          |                                                                           | 1. Corresponding 3PY #__ is active
|    |                                         |                     |          |                                                                           | 2. Storage Battery #__ is not running
|    |                                         |                     |          |                                                                           | 'Discharge Disconnected Storage Battery' procedure                                                             |
| 5.2| Disconnected АБ #__ Discharge Enable   | cmd P_ONROAB        |           |                                                                           | 'Disconnected АБ #__ Discharge Enable' command is effective for all currently disconnected storage batteries
|    |                                         |                     |          |                                                                           | * 2.1.1.1.2 (command output pattern)                                                                            |
| 6. | АБ #__ 3PY ON                          | cmd P_ONZRUAB№_     |           |                                                                           |                                                                                                                                 |
| 7. | АБ #__ 3PY Disconnect                  | cmd P_OFZRUAB№_     |           |                                                                           |                                                                                                                                 |
2.1.1. DISCONNECTED STORAGE BATTERY DISCHARGE MODE

2.1.1.1. DISCONNECTED STORAGE BATTERY DISCHARGE ACTIVATION USING PROCEDURE (ON MCC-M GO)

NOTE

Requirements to run a procedure:
1. Corresponding ЗРУ №___ is active
2. Storage battery №___ is not running cycling mode procedure

RS Laptop

СМ:СЭП
none of АБ 1 – 8 is in Cycling Mode

proc F40_SEP_2 (Discharge disconnected storage batteries АБ1(2 - 8))

param №___

00:00:00

Execute

АБ №___ — cycling in discharge mode

02---03:00:00

ЗРУ №___ — ЗРУ deactivation

АБ №___ — disconnected АБ discharge

NOTE

‘Disconnected АБ discharge Enable’ command contained in the procedure is effective for all currently disconnected storage batteries

If

ЗРУ (except those currently in discharge mode)

cmd P_ONZRUAB (АБ ЗРУ ON)

Execute

ЗРУ

cmd P_OFZRUAB (АБ ЗРУ Disconnect)

Execute

ЗРУ (the same ЗРУ)
2.1.1.2. DISCONNECTED АБ DISCHARGE MODE ACTIVATION USING COMMAND (ON MCC-M GO)

RS Laptop

СМ:СЭП

<none> of АБ 1 – 8 is in Cycling Mode

1. 3РУ №___

cmd P_ONRCAB №___ (АВ1№___ cycling mode ON)

Execute

00:00:00

АБ №___

02---03:00:00

Voltage АБ №___ – 24 V

АБ charge indicator ↑ → ↓

2. 3РУ №___

cmd P_OFRCAB (АВ cycling mode OFF)

Execute

3. cmd P_OFZRUAB №___ (АВ1(2 - 8) 3РУ Disconnect)

Execute

3РУ №___

5. cmd P_ONROAB (Disconnected АВ discharge Enable)

Execute

(АВ icon does not change)

NOTE

‘Disconnected АВ discharge Enable’ command contained in the procedure is effective for all currently disconnected АВ
If 3РУ (except those currently in discharge mode)

↓ 3РУ (except those currently in discharge mode)

\texttt{cmd P\_ONZRUAB (АБ 3РУ ON)}
\texttt{Execute}

\texttt{3РУ}

\texttt{cmd P\_OFZRUAB (АБ 3РУ Disconnect)}
\texttt{Execute}

\texttt{3РУ (the same 3РУ)}

6. \textbf{On MCC-M GO} – override current mode by 3РУ activation command

7. \textbf{On MCC-M GO} – enable Cycling Mode for АБ
2.2. CURRENT AND VOLTAGE STABILIZER [CHT] ACTIVATION/DEACTIVATION

2.2.1. [CHT] ACTIVATION (ON MCC-M GO)

Initial configuration:
CHT1,2 – connected to feeder PMA-1C
CHT3,4 – connected to feeder PMA-1D

NOTE
When [CHT] is deactivated, parameters are invalid

RS Laptop

\[
\begin{array}{c}
\begin{array}{c}
\text{CMD: СЭП} \\
\text{▌ from USOS (PMA-1C)) (from USOS (PMA-1D))}
\end{array} \\
\text{▌ [CHT] connectors are mated}
\end{array}
\]

\[
\begin{array}{c}
\text{▌} \\
\text{cmd P_ONSNT1(2,3,4) (CHT1(2,3,4) ON)}
\end{array}
\]

Execute

\[
\begin{array}{c}
\text{▌} \\
\text{CHT}
\end{array}
\]

\[
\begin{array}{c}
\text{▌ Input Voltage} \\
\text{▌ Output Voltage} \\
\text{▌ Output Current} \\
\text{▌ CHT Temperature}
\end{array}
\]

\[
\begin{array}{c}
100 --- 170 V \\
27 --- 31 V \\
0 --- 60 A \\
30 --- 40 C
\end{array}
\]

2.2.2. [CHT] DEACTIVATION (ON MCC-M GO)

RS Laptop

\[
\begin{array}{c}
\begin{array}{c}
\text{CMD: СЭП} \\
\text{▌ [CHT]}
\end{array} \\
\text{▌ cmd P_OFSNT1(2,3,4) (CHT1(2,3,4) OFF)}
\end{array}
\]

Execute

\[
\begin{array}{c}
\text{▌} \\
\text{CHT}
\end{array}
\]

\[
\begin{array}{c}
\text{▌ Input Voltage} \\
\text{▌ Output Voltage} \\
\text{▌ Output Current} \\
\text{▌ CHT Temperature}
\end{array}
\]

\[
\begin{array}{c}
\text{▌} \\
\text{▌} \\
\text{▌} \\
\text{▌}
\end{array}
\]
2.3. 28/120 CONVERTER (ПС) ACTIVATION/DEACTIVATION

2.3.1. 28/120 CONVERTER (ПС) ACTIVATION (ON MCC-M GO)

Underneath 134
РЩП-С1  √ Е1, Е2 (for ПС1)
(√ Н1, Н2 (for ПС2))

NOTE
When ПС is deactivated, parameters are invalid

RS Laptop

![SM:СП8](icon)

Выбирайте

СМ:СП8:Continue

√ ПС connectors are mated

![ПС1](icon) ![ПС2](icon)

cmd P_ONPS1(2) (ПС1(2) ON)

Execute

![ПС1](icon) ![ПС2](icon)

√ Input Current 0 --- 90 A
√ Output Current 0 --- 17 A
√ Output Voltage 120 + 2 V
√ Temperature 30 --- 40 С

*******************************************************************
When overcurrent and/or overvoltage protection is triggered, 28/120 converter (ПС) automatically switches off
Then √ Output Current = 0 A
and √ Output Voltage = 95 V

![ПС1](icon) ![ПС2](icon) – icon does not change.

On MCC-M GO — output command for ПС deactivation
*******************************************************************

2.3.2. 28/120 CONVERTER (ПС) DEACTIVATION (ON MCC-M GO)

RS Laptop

![SM:СП8](icon)

Выбирайте

СМ:СП8:Continue

![ПС1](icon) ![ПС2](icon)

cmd P_OFPS1(2) (ПС1(2) OFF)

Execute

![ПС1](icon) ![ПС2](icon)
3. SOLAR ARRAY ORIENTATION SYSTEM (СОСБ)

3.1. DISPLAY INDICATION SPECIFICS

1. When Б14 unit is off, SM: СЭП: СОСБ display does not show any СБ zones.
2. If proc «Initial Position 1(2)>> is currently running, Mod — init. pos. 1(2) remains on RS Laptop display SM: СЭП: СОСБ until any other СОСБ proc is output. In such a case, it is possible to monitor modes using ИНПУ display SM: STATUS СОЖ, СОСБ, СОТР.
3. On ИНПУ screen display SM: STATUS СОЖ, СОСБ, СОТР one of the selected primary operating modes (i.e. СОСБ standalone, СОСБ combined mode, СОСБ СУД-driven) is highlighted.

3.2. СОСБ ACTIVATION (ON MCC-M GO)

RS Laptop

1. Б03
   cmd P_ONPB03_M (P_ONPB03_R) ('Primary (backup) Б03 power ON')
   Execute B03

2. Б14
   cmd P_ONPSOSB_M (P_ONPSOSB_R) (СОСБ primary (backup) Ch power ON)
   Execute B14

   for СБ2 and СБ4 (RS Laptop display pictograms for previously active sets will be highlighted)

   Mode — Composite (Autonomous, from СУД) (previously selected mode indicator is lit)

3.3. СОСБ OPERATING MODE SELECTION

RS Laptop

1. Б03
   cmd P_PRAVTSB (СОСБ Autonomous mode) (P_PRSOVSB (СОСБ composite mode) (P_PRSUDSB (СУД Cntl mode))
   Execute

   Mode — Autonomous — Composite — from СУД
3.4. СОСБ EQUIPMENT SETS SELECTION

3.4.1. Б15 SETS SELECTION FOR СБ2, СБ4 (ON МСС-М GO)

NOTE
During selection of different Б15 sets, Б14 unit must be powered.

RS Laptop

СМ:СЭП:СОСБ

√ Б14 (Б14)

cmd P_ONPSOSB_M (P_ONPSOSB_R) (СОСБ primary (backup) Ch power ON))

For simultaneous selection of primary sets Б15 for СБ2, СБ4

RS Laptop

СМ:СЭП:СОСБ

(Б15 for СБ2(СБ4))

cmd P_SSB2SB4_M (Primary СБ2,4 Б15 Select)

Execute

Б15 for СБ2 and СБ4

**********

To select primary, backup Б15 sets, output the commands according to the Table below:

RS Laptop

СМ:СЭП:СОСБ

<table>
<thead>
<tr>
<th>#</th>
<th>Sets</th>
<th>Cmd pb</th>
<th>cmd</th>
<th>Name</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Б15 СБ2 pri</td>
<td></td>
<td>P_SSB2_M</td>
<td>(Primary СБ2 Б15 Select)</td>
<td>515 for СБ2****</td>
</tr>
<tr>
<td>2</td>
<td>Б15 СБ2 bkup</td>
<td>(Б15 for СБ2)</td>
<td>P_SSB2_R</td>
<td>(Backup СБ2 Б15 Select)</td>
<td>515 for СБ2****</td>
</tr>
<tr>
<td>3</td>
<td>Б15 СБ4 pri</td>
<td></td>
<td>P_SSB4_M</td>
<td>(Primary СБ4 Б15 Select)</td>
<td>515 for СБ4****</td>
</tr>
<tr>
<td>4</td>
<td>Б15 СБ4 bkup</td>
<td>(Б15 for СБ4)</td>
<td>P_SSB4_R</td>
<td>(Backup СБ4 Б15 Select)</td>
<td>515 for СБ4****</td>
</tr>
</tbody>
</table>

******************************************************************************

If

cmd P_ONPSB2(4) (СБ2(4) Б15 power ON)

Execute

******************************************************************************
3.4.2. Б14M SETS SELECTION (ON MCC-M GO)

**NOTE**
During selection of different Б14 sets, the unit must be **unpowered**.

RS Laptop

```
if (Б14) cmd P_OFPSOSB (COCБ power OFF)
```

Execute

```
(514) for СБ2 and СБ4
```

```
cmd P_ONPSOSB_R (P_ONPSOSB_M) ('COCБ backup (primary) Ch power ON')
```

Execute

```
(514) for СБ2 and СБ4 (RS Laptop display pictograms for previously active sets will be highlighted)
```

3.4.3. Б03 SETS SELECTION

**NOTE**
During selection of different Б03 sets, the unit must be **unpowered**.

1. Deactivate system per 3.5, p.3 – 4
2. Activate system with the required sets per 3.2, p.3 – 1.
3.5. COCE DEACTIVATION (ON MCC-M GO)

RS Laptop

1. ↓ (Б14)
   cmd P_OFPSOSB (COCE Power OFF)
   Execute

   for СБ2 and СБ4

   ***************

2. ↓ (Б15)
   cmd P_OFPSB2 (P_OFPSB4) (СБ2 (СБ4) Б15 power OFF)
   Execute

   for СБ2 and СБ4

2. ↓ (Б03)
   cmd P_OFPB03 (Б03 power OFF)
   Execute
3.6. SOLAR ARRAY CONFIGURATION TO INITIAL POSITION 1(2)

NOTE
Init.pos. 1 – 112.5 degs (docking mode)
Init.pos. 2 – 0 degs (sun tracking mode)

3.6.1. SOLAR ARRAY CONFIGURATION TO INITIAL POSITION 1(2)
USING PROCEDURE (ON MCC-M GO)

NOTE
1. This mode may be enabled both with activated and deactivated Б14 unit
2. If Б14 was previously powered, re-configuration to select a different set will not occur

If Б14 was deactivated:

RS Laptop
1. СМ:СЭП:СОСБ
   Б03 (Б03)
   Б01
2. proc Ф22_SOSB_4 (СБ in Initial Position 1, Setup)
   Ф22_SOSB_5 (СБ in Initial Position 2, Setup)
   param1 0x4002 (for Б14 primary)
   (param1 0x4000 (for Б14 backup))
   Execute
   00:00:00
   Б14 (Б14)
   Б15 (Б15) for СБ2 and СБ4

≤ 00:12:00
   Mode — Init.pos. 1
   (↔ Mode — Init.pos. 2)
   Б03 (Б03)
   Б14
   Б15 for СБ2 and СБ4
   Б01
If Б14 was activated:

1. СМ:СЭП:СОСБ

   Б03
   Б14
   Б15 for СБ2 and СБ4
   Б01

2. proc F22_SOSB_4 (СБ in Initial Position 1, Setup)
   (F22_SOSB_5 (СБ in Initial Position 2, Setup))

   param1 0

   Execute

   00:00:00

   ≤ 00:12:00

   Mode — Init.pos. 1

   (Mode — Init.pos. 2)
3.6.2. SOLAR ARRAY CONFIGURATION TO INITIAL POSITION 1(2)
USING COMMAND (ON MCC-M GO)

RS Laptop

СМ:СЭП:СОСБ

00:00:00

If СОСБ main program is on:

≤ 00:12:00

If СОСБ main program is off:

≤ 00:12:00

cmd P_OFPSOSB (СОСБ power OFF)

Execute

for СБ2 and СБ4

for СБ2 and СБ4
3.7. INITIAL POSITION 1(2) CONFIGURATION MODE CANCEL (ON MCC-M GO)

RS Laptop

\[
\text{СМ:СЭП:СОСБ}
\]

↓ (Б14)
\[
\text{cmd P_ONPSOSB_M (P_ONPSOSB_R) (СОСБ primary (backup) Ch power ON)}
\]

Execute

\[
\text{603 (503)}
\]

\[
\text{514 (514)}
\]

\[
\text{515 (515)}
\]

for СБ2 and СБ4

\[
\text{601}
\]

NOTE

This reactivates the mode set prior to configuring solar panels to «Исходное» (Initial) position

Current mode can be monitored on ИнПУ СМ: STATUS СОЖ, СОСБ, СОТР

3.7.1. RECOVERY ACTIONS IN CASE OF ERRONEOUS COMMANDING TO INITIAL POSITION

1. Wait until «Исходное» (Initial) position is achieved

RS Laptop

\[
\text{СМ:СЭП:СОСБ}
\]

\[
\text{Mode — Init.pos. 1 (2)}
\]

\[
\text{603 (503)}
\]

\[
\text{514}
\]

\[
\text{515}
\]

for СБ2 and СБ4

\[
\text{601}
\]
2. To cancel Initial position

RS Laptop

\[ \text{CM:CЭП:СОСБ} \]

\[ \text{cmd P_ONPSOSB_M (P_ONPSOSB_R) (СОСБ primary (backup) Ch power ON)} \]

\[ \text{Execute} \]

\[ \text{603} \]

\[ \text{514} \]

\[ \text{515} \]

for СБ2 and СБ4

\[ \text{604} \]

If it is required to set a different Initial position (by running procedure):

RS Laptop

\[ \text{CM:CЭП:СОСБ} \]

\[ \text{\downarrow (B14)} \]

\[ \text{proc F22_SOSB_5 (F22_SOSB_4) (СБ in Initial Position 2(1), Setup)} \]

\[ \text{param1 0x4002 (for B14 primary)} \]

\[ \text{(param1 0x4000 (for B14 backup))} \]

\[ \text{Execute} \]
3.8. SOLAR ARRAY MANUAL CONTROL MODE

**NOTE**

1. Simultaneous control of two drives is impossible. Only one drive can be controlled at a time.
2. Each zone is 22.5 degrees wide.
3. Solar array rotation rate ranges 0.5 --- 1 degree per second (average rate is 0.73).

3.8.1. SOLAR ARRAY INCOMPLETE ROTATION (WITHOUT REACHING STOP) (ON MCC-M GO)

RS Laptop

- **CM:CЭП:COCEB**
  - Determine rotation angle zone (\(\sqrt{\text{MCC-M}}\))
  - **cmd** P_OFPSOSB (COCEB power OFF)
    - Execute
  - **514**

- **515** (for СБ2 and СБ4)

3. **cmd** P_ONPRUCSB (BO1 manual control power ON)
   - Execute
   - Mode — Manual
   - **501**

<table>
<thead>
<tr>
<th>Step</th>
<th>To rotate СБ2</th>
<th>To rotate СБ4</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.</td>
<td><strong>cmd</strong> P_ONPSB2 (СБ2 Б15 power ON) Execute</td>
<td><strong>cmd</strong> P_ONPSB4 (СБ4 Б15 power ON) Execute</td>
</tr>
<tr>
<td></td>
<td><strong>515</strong> (for СБ2)</td>
<td><strong>515</strong> (for СБ4)</td>
</tr>
</tbody>
</table>

**NOTE**

1. P_POVSMB – rotates solar array counterclockwise
2. P_POVSMB – rotates solar array clockwise
3. Т.K – Т.0 = calculated rotation angle/0.73 degrees per second (time to pass one zone is approximately 30 seconds)

5. **cmd** P_POVSBP(P_POVSBM) (СБ + Rotation (СБ – Rotation))
   - Execute

Т.0______
3.8.2. SOLAR ARRAY COMPLETE ROTATION (WITH REACHING STOP)  
(ON MCC-M GO)

1. Activate ИпПУ (see RODF:SM Manual Controls)

RS Laptop

СМ:СЭП:СОСБ

2.  ↓ (B14)  
cmd P_OFPSOSB (COCB power OFF)  
Execute  
514  
515 for СB2 and СB4

3.  ↓ (B01)  
cmd P_ONPRUCSB (БО1 manual control power ON)  
Execute  
Mode — Manual  
B01

<table>
<thead>
<tr>
<th>Step</th>
<th>For СB2</th>
<th>For СB4</th>
</tr>
</thead>
</table>
| 7.   | ↓ (B15 for СB2)  
cmd P_OFPSB2 (СB2 B15 power OFF)  
Execute  
515 | ↓ (B15 for СB4)  
cmd P_OFPSB4 (СB4 B15 power OFF)  
Execute  
515 | for СB2 | for СB4 |

NOTE

1. P_POVSBP – rotates solar array counterclockwise
2. P_POVSBM – rotates solar array clockwise

5.  ↓ (B01)  
cmd P_POVSBR(P_POVSBR) (СB + Rotation (СB – Rotation))  
Execute

ИпПУ  
SM STATUS СОЖ, СОСБ, СОТР ≤ 00:12:00  
1 ARRAY 2 (ARRAY 4) STOP DISABLE
RS Laptop

6. ↓ (B01)
   `cmd P_POVSBM(P_POVSBP)`  
   \( (CE - Rotation ((CE + Rotation)) \)
   
   **Execute**

   **NOTE**

   \( T.K - T.0 = \) calculated rotation angle from stop/0.73 degrees per second
   (time to pass one zone is approximately 30 seconds)

ИнПУ

T.0____

7. ↓ ARRAY RETRACT FROM STOP (press several times)
   ■ ARRAY 2 (ARRAY 4) STOP DISABLE

RS Laptop

8. ↓ (B01)
   `cmd P_STOPSB (CB Halt)`
   
   **Execute**

<table>
<thead>
<tr>
<th>Step</th>
<th>For СБ2</th>
<th>For СБ4</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.</td>
<td>↓ (B15 for СБ2) <code>cmd P_OFPSB2 (СБ2 В15 power OFF)</code></td>
<td>↓ (B15 for СБ4) <code>cmd P_OFPSB4 (СБ4 В15 power OFF)</code></td>
</tr>
<tr>
<td></td>
<td><strong>Execute</strong></td>
<td><strong>Execute</strong></td>
</tr>
<tr>
<td></td>
<td><strong>515</strong> for СБ2</td>
<td><strong>515</strong> for СБ4</td>
</tr>
</tbody>
</table>

3.8.3. MANUAL CONTROL MODE DISABLE (ON MCC-M GO)

RS Laptop

1. ↓ (B01)
   `cmd P_OFPRUCSB (B01 manual control power OFF)`
   **Execute**

   **601**

2. ↓ (B14)
   `cmd P_ONPSOSB_M (P_ONPSOSB_R) (COCE primary (backup))
   Ch power ON)`
   
   **Execute**

   **603**
   **514**
Mode — Autonomous (Composite, from СУД)

NOTE
This reactivates the mode set prior to configuring the system to manual control mode
4. INTERNAL LIGHTING SYSTEM [CBO]

**NOTE**

1. When fuse is blown:
   - ■ lamp (Л) of corresponding light
   - On corresponding lighting panel: □ LED
2. LED number corresponds to fuse number

4.1. CD1-7 STATIONARY LAMP CONTROL

4.1.1. CD1-7 STATIONARY LAMP CONTROL FROM ЩО-ЛО AND ЩО-ШО

**NOTE**

1. sw 5 on ЩО-ЛО is not wired
2. If Л1 has blown out, Л2 will operate when Л1
3. If Л2 has blown out, then Л2 and use Л1
4. If Л1 fuse has blown out, both Л1 and Л2 will not light

**CAUTION**

Do not flip the switch for blown-out lamp — it may cause the power supply unit to burnout

1. GENERAL MAIN

   ЩО-ЛО (ЩО-ШО) when Л1(2,3,4)-Л1 □ 1(2,3,4)-Л1 (lamp of corresponding unit)
   when Л1(2,3,4)-Л1 ■ 1(2,3,4)-Л1 ■ 1(2,3,4)-Л2

2. AUX

   when □ 1(2,3,4) - Л1

   ЩО-ЛО (ЩО-ШО) when Л1(2,3,4)-Л2 □ 1(2,3,4)-Л2
   when Л1(2,3,4)-Л2 ■ 1(2,3,4)-Л2
4.1.2. СД1-7 STATIONARY LAMP CONTROL FROM ЩО

NOTE
1. Night lighting can be activated from any of the ЩО panels
2. Night lighting activates automatically after docking with Soyuz or Progress vehicles
3. If lamp Л1(Л2) is blown, ↓ OFF and continue working with Л2(Л1)

ADDITIONAL (only for ПхО and ПрК)

ПхО, ПрК
ЩО
 когда ↓ Л1 □ Л1
 когда ↓ Л2 □ Л2
 когда ↓ OFF ■ Л1
 ■ Л2

NIGHT

ЩО
 когда ↓ Л1 □ Л1 ALL (there are four onboard)
 когда ↓ Л2 □ Л2 ALL
 когда ↓ OFF ■ Л1 ALL
 ■ Л2 ALL

4.2. СД1-5М STATIONARY LAMP CONTROL

БВ-1
 когда φ □ Л
 когда φ ■ Л

4.3. СД1-6 PORTABLE LAMP CONTROL

NOTE
1. ЩСР lighting panel is provided with lamp brightness control knob
2. When fuse ПР1-А is blown — ■ Л

ЩСР
 когда φ LIGHT ON □ Л
 когда φ ■ Л
4.4. СД1-7, СД1-5М, СД1-6 LAMP UNIT REPLACEMENT

**NOTE**

1. Lamps Л1 and Л2 of СД1-7 are combined into one permanently sealed lamp unit (БД)
2. БД lamp unit is replaced if Л1 and Л2 are blown
3. БЦ lamp unit of СД1-5М and СД1-6 is replaced if Л lamp is blown

To replace БД and БЦ lamp units:

1. √ lighting fixture is unpowered
2. Release lamp unit locking latches
3. Remove lamp unit from power supply unit
4. Install new lamp unit onto guide pins
5. Engage lamp unit locking latches

Report to MCC-M

4.5. CP-2 STATIONARY LAMP CONTROL

**NOTE**

There are six lamps in one CP-2 lighting fixture

417, 434
ЩО-ШО1
when Φ1(2) - Л1  □ 3 Л (three lamps of lighting fixture)
when Φ1(2) - Л2  □ 3 Л (other three lamps of lighting fixture)

when Φ1(2) - Л1  ■ 3 Л
when Φ1(2) - Л2  ■ 3 Л

4.6. СГ2-8 PORTABLE LAMP CONTROL

1. Activation:
СГ2-8 —— connector Х2 «3А» of РБС-10/3 power outlet
РБС-10/3  ◐
СГ2-8  ◐

2. Deactivation:
СГ2-8  ◐
РБС-10/3  ◐
СГ2-8 —— РБС-10/3 power outlet
4.7. СПР-1 PORTABLE TV LAMP SETUP AND OPERATION

1. Unstow cable 17КС.10Ю 8210А-2150 (-5340) (originally stowed in bag on panel 430)
2. connector 10А of cable 17КС.10Ю 8210А-2150 (-5340) → ОС-10А (СПР-1)
3. connector X250А(Б) of cable 17КС.10Ю 8210А-2150 (-5340) → X250-1 (. . .-14) on panels

4.7.1. СПР-1 CONNECT TO OUTLETS [TB-CBET] ON CONNECTOR #10Ю-X250-11 (. . .-14)

<table>
<thead>
<tr>
<th>panel</th>
<th>437</th>
<th>338</th>
<th>228</th>
<th>234</th>
</tr>
</thead>
<tbody>
<tr>
<td>[TB-CBET]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>connector</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ППС</td>
<td>ППС-23 (panel 338)</td>
<td>ППС-24 (panel 338)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

338 ППС-23 (-24) ✔ PORTABLE LIGHT ☐ СПР-1

NOTE
Outlets [TB-CBET] on connector #10Ю-X250-11 (. . .-14) are protected by ППС-23 (-24) circuit breaker

4.7.2. СПР-1 DISCONNECT FROM OUTLETS [TB-CBET] ON CONNECTOR #10Ю-X250-11 (. . .-14)

338 ППС-23(-24) ✔ PORTABLE LIGHT ☐ СПР-1

if necessary, disassemble the circuit
4.7.3. [СПР-1] CONNECT TO OUTLETS [ТВ-СВЕТ]

<table>
<thead>
<tr>
<th>panel</th>
<th>206</th>
<th>211</th>
<th>218</th>
<th>324</th>
<th>225</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ТВ-СВЕТ] connector</td>
<td>X250-1</td>
<td>X250-3</td>
<td>X250-5</td>
<td>X250-7</td>
<td>X250-9</td>
</tr>
<tr>
<td>БПП</td>
<td>panel 421 БПП-31 (port СПР outlets) Д9 – Д12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel</th>
<th>408</th>
<th>417</th>
<th>419</th>
<th>428</th>
<th>431</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ТВ-СВЕТ] connector</td>
<td>X250-2</td>
<td>X250-4</td>
<td>X250-6</td>
<td>X250-8</td>
<td>X250-10</td>
</tr>
<tr>
<td>БПП</td>
<td>panel 421 БПП-32 (starboard СПР outlets) Д9 – Д12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RS Laptop

<table>
<thead>
<tr>
<th>СМ:БРТК:TV SYSTEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>cmd I_ONPSVETT (TV Lighting power ON)</td>
</tr>
<tr>
<td>Execute</td>
</tr>
</tbody>
</table>

☐ СПР-1

NOTE
Outlets X250-1 (. . .-10) are protected by fuses on БПП-31 (-32)

4.7.4. СПР-1 DISCONNECT FROM OUTLETS [ТВ-СВЕТ]

RS Laptop

<table>
<thead>
<tr>
<th>СМ:БРТК:TV SYSTEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>cmd I_OFPSVETT (TV lighting power OFF)</td>
</tr>
<tr>
<td>Execute</td>
</tr>
</tbody>
</table>

☐ СПР-1

if necessary, disassemble the circuit
5. LIGHTS, OUTLETS, ЩО, РШП, БВ, БВП LOCATIONS
Plane 1 (Deck)
Diagram showing toilet back wall and toilet front wall with labels 139, 451, 452, 453, 454, and 455. Legend includes:
- Δ Power Outlet РБС 50
- ББ-1
- ББ-3
- БВК-2
- Stationary Lamp СД 1-5М