MIU-PSU IRS

IS.EL.ENG.CondorMS

Exported in August 2024

[Rev. *-- : 08/2024]*

Interface Requirements Specification (IRS)

for the

PSU – MIU Communication Interface

for the

Condor-MS System

Contract Number *[8L0028104]*

CDRL Sequence No. *[NA]*

Prepared by :

EO-ISTAR Business Unit

ELBIT Systems Electro-Optics - Elop, Ltd.

PO Box 1165, Rehovot 76111, Israel

List of changed from Previous Version

Paragraph	Change Description	Reason of Change

List of TBDs

Reference	Description

List of TBRs

Reference	Description

List of TBCs

Reference	Description

Table of Contents

List of Figures

No table of figures entries found.

List of Tables

No table of figures entries found.

1   SCOPE

This document specifies the format and content of the communication messages between the MIU and the PSU.

1.1   Interface Overview

The PSU shall have a 100MbEth interface with which communication is accomplished with the MIU (performed using MDC - Management and Display Card of the MIU). The same interface shall also be used for downloading PSU logfile via the MIU Ethernet switch directly to external computer.

1.2   Document Overview

The document structure is as follows:

- Chapter 1 – Scope
- Chapter 2 – Applicable documents
- Chapter 3 – General Interface Protocol
- Chapter 4 – MIU to PSU Messages
- Chapter 5 – PSU to MIU Messages
- Chapter 6 - PSU Logfile Structure

1.3   Abbreviations and Acronyms

AC-	Alternating Current
A/C-	Aircraft
ADLS-	Airborne Data Link System
ATP-	Automatic Test Procedure
AUF-	Airborne Uninhibited Fighter
BIT-	Built In Test
BP-	Best Practice
BTOK-	Bench Test OK
CBIT-	Continuous Built-In-Test
CCTCU-	Camera Compartment Temperature Control Unit
CE-	Conducted Emission
C.M.-	Common Mode
CND-	Can Not Duplicate
COG-	Center Of Gravity
COTS-	Commercial Of The Shelf

CS-	Conducted Susceptibility
CSM-	Common Sensor Model
CT-	Corrective Time
CPLD-	Complex Programmable Logic Device
CPU-	central processing unit
DC-	Direct Current
D.M.-	Differential Mode
DRPU-	Dual Receiver Processor Unit
ECS-	Environment Control System
ECTCU-	Electronics Compartment Temperature Control Unit
EDU-	Encryption Decryption System
EI-	Electrical Interface
EMC-	Electro-Magnetic Compatibility
EMI-	Electro-Magnetic Interference
ER-	Established Reliability
ESS-	Environmental Stress Screening
ETI-	Elapsed Time Indication
ETM-	Elapsed Time Meter
EVT-	Environmental Verification Test
FAI-	First Article Inspection
FDU-	Filter & Distribution Unit
FIL-	Filtered
FFI-	For Future Implementation
FPGA-	Field Programmable Gate Array
FPS-	Frames Per Second
F/W-	Firmware
H/W-	Hardware
IBIT-	Initiated Built-In-Test
ICD-	Interface Control Document
ID-	Identification
I/F-	Interface
ILCTE-	Intermediate Level Computerized Test Equipment
ILS-	Integrated Logistic Support
INS-	Inertial Navigation System

LRU-	Line Replaceable Unit
MDC-	Management and Display Card
MIU-	Mission management & Image processing Unit
MS-	Multi-Spectral
MTBCF-	Mean Time Between Critical Failures
MTBF-	Mean Time Between Failures
MTBMA-	Mean Time Between Maintenance Action
MTO-	Military Temperature Only
MTTR-	Mean Time To Replace
NA-	Not Applicable
NATO-	North Atlantic Treaty Organization
OLTE-	Operational Level Test Equipment
O.V.-	Over Voltage
PBIT-	Periodic Built In Test
PCB-	Printed Circuit Board
POD-	Proof Of Design
PSD-	Power Spectral Density
PSU-	Power Supply Unit
PUBIT-	Power-Up Built In Test
PUI-	Project Unique Identifier
RAM-	Random Access Memory
RE-	Radiated Emission
REG-	Regulated
RF-	Radio Frequency
RFI-	Radio Frequency Interference
RH-	Relative Humidity
RMS-	Root Mean Square
RS-	Radiated Susceptibility
SRU-	Shop Replaceable Unit
STANAG-	Standard Agreement
S/W-	Software
SyRS-	System Requirements Specification
TBC-	To Be Confirmed
TBD-	To Be Defined

TBR-	To Be Reviewed
TCU-	Temperature Control Unit
UART-	Universal Asynchronous Receiver Transmitter
U.V.-	Under Voltage
VCRM-	Verification Cross Reference Matrix
WD-	Watch Dog

1.4 Glossary

To Be Confirmed (TBC) – Requires further verification or agreement.

To Be Defined (TBD)   – A requirement that has yet to be developed.

To Be Reviewed (TBR) – A requirement that might over-constrain the design. This requirement shall be investigated during the preliminary design phase and updated if necessary.

For Future Implementation (FFI) – A requirement which is not necessary for product delivery but may require implementation in future versions. Foundations for implementation should be applied, provided that additional effort is reasonable and does not cause unnecessary risk to the program.

2   Referenced Documents

2.1   Elbit Systems Documents

No.	Title	ID	Revision	Date
1.	Condor-MS SyRS	5495-1000-00PS		
2.	Condor-MS Interface Control Document (ICD)	5495-1000-00IC		
3.	PSU Prime Item Development Specification (PIDS)	5495-6000-00PS		
4.	MIU Prime Item Development Specification (PIDS)	5495-2000-00PS		
5.	System Functional & Operational Requirements Specification (SYS_FRS_ORS)	5495-1000-00FF		

2.2   Others

No.	Title	ID	Revision	Date
6.	Serial Communications (Ethernet)	IEEE 802.3		

3   General Interface Protocol

The interface shall be used to:

- Send commands from the MIU to the PSU for controlling TCUs – ON/OFF.
- Receive BIT status and telemetry information from the PSU.
- Download logfile from the PSU.
- Synchronize GMT time.

The proprietary communication protocol definition shall be as follows:

- Interface Type: Ethernet 100Mbit
- Protocol: Asynchronous
- Format: Little Endian

GMT time synchronization:

- Once MIU-PSU communication is established, the actual time will be sent from the MIU to PSU using the Linux NTP (Network Time Protocol) lib

The UDP/IP communication parameters shall be as follows:

- PSU IP address is 192.168.1.60
- MDC (Management and Display Card of the MIU) IP address is 192.168.1.10
- Local Port in MDC (Foreign Port in PSU) is 10601
- Foreign Port in MDC (Local Port in PSU) is 60101

3.1 UDP message structure

The message structure is described in the following table:

Byte	Content	Remark
1 ÷ N	Message Data	<Length> bytes

3.2 Variables Type Definition

Type	Description
U1	Unsigned, 8-bit integer
U2	Unsigned, 16-bit integer
U4	Unsigned, 32-bit integer
U8	Unsigned, 64-bit integer
S1	Signed, 8-bit integer
S2	Signed, 16-bit integer
S4	Signed, 32-bit integer
S8	Signed, 64-bit integer
Bx	String of x bytes, without terminating NULL

4   MIU to PSU Messages (commands)

The following table is a list of the MIU messages that can be sent to the PSU:

Message ID	Name	Description	Message rate	Message size (Bytes)
0x01	Keep_Alive	Keep alive validation message	1 Hz	1
0x02	TCU_Control	Command to switch off or on any TCU.	Message sent upon event. TCU_Control message is sent only on TCU malfunction event.	3
0x03	Logfile_Maintenance	Start/Stop Logfile recording / Log erase command	Message sent upon event. Logfile_Maintenance message is sent every start / end of a sortie situations.	2

4.1   Keep Alive Message

The Keep Alive message shall be sent periodically by the MIU, and shall include the following message element:

#	Type	Name	Units	Range	Resolution (Scale factor)	Sign convention	Description	Comments
1	U1	Message_ID	N/A	0x01	N/A	N/A	Unique message ID	

4.2   TCU Control Command

The following command shall be sent as required by the MIU, and includes the following message elements:

#	Type	Name	Units	Range	Resolution (Scale factor)	Sign convention	Description	Comments
1	U1	Message_ID	N/A	0x02	N/A	N/A	Unique message ID	
2	U1	TCU_ID	N/A	0 – 1	N/A	N/A	TCU identification	0x00 – ECTCU 0x01 - CCTCU
3	U1	ON_OFF	N/A	0 – 1	N/A	N/A	ON/OFF command	0x00 – OFF 0x01 – ON

4.3 Logfile Maintenance Command

The following command shall be sent as required by the MIU, and includes the following message elements:

#	Type	Name	Units	Range	Resolution (Scale factor)	Sign convention	Description	Comments
1	U1	Message_ID	N/A	0x03	N/A	N/A	Unique message ID	
2	U1	Start_Stop_Erase_Logfile	N/A	0 – 2	N/A	N/A	Start/Stop Logfile recording / Log erase command	0x00 – Halt and close Logfile. 0x01 - Commence Logfile recording. 0x02 - Erase Logfile.

5 PSU to MIU Messages (status & telemetry)

The following table is a list of the PSU messages that shall be sent to the MIU periodically:

Message ID	Name	Description	Message rate	Message size (Bytes)
0x81	Telemetry_and_BIT	Telemetry and BIT information.	100Hz	196

5.1 Telemetry and BIT Message

- Since PSU status changes can occur intermittently, in order not to miss the occurrence, the faulty notification shall be latched and recorded on the Logfile until sent to the MIU via communication channel. Only after the faulty notification was sent to MIU, it will be cleared.

The following status message shall be sent periodically by the PSU, and shall include the following message elements:

#	Type	Name	Units	Range	Resolution (Scale factor)	Sign convention	Description	comments
1	U1	Message_ID	N/A	0x81	N/A	N/A	Unique message ID	
2	S2	VDC_IN	VDC	+/- 100VDC	50mV	N/A	28VDC Input voltage	
3	S2	VAC_IN_PH_A	VAC	+/- 200VAC	100mV	N/A	115 VAC phA input voltage	
4	S2	VAC_IN_PH_B	VAC	+/- 200VAC	100mV	N/A	115 VAC phB input voltage	
5	S2	VAC_IN_PH_C	VAC	+/- 200VAC	100mV	N/A	115 VAC phC input voltage	
6	S2	I_DC_IN	A DC	+/- 100A	50mA	N/A	Input DC current	
7	S2	I_AC_IN_PH_A	A AC	+/- 200A	50mA	N/A	AC phA input current	
8	S2	I_AC _IN_PH_B	A AC	+/- 200A	50mA	N/A	AC phB input current	
9	S2	I_AC _IN_PH_C	A AC	+/- 200A	50mA	N/A	AC phC input current	
10	S2	V_OUT_1	VDC	+/- 100VDC	50mV	N/A	Output Voltage to Fan CCA	
11	S2	V_OUT_2	VDC	+/- 100VDC	50mV	N/A	Output Voltage to	

							MWIR Cooler	
12	S2	V_OUT_3_ph1	VAC	+/- 200VAC	100mV	N/A	Output Voltage to ADLS phase 1	
13	S2	V_OUT_3_ph2	VAC	+/- 200VAC	100mV	N/A	Output Voltage to ADLS phase 2	
14	S2	V_OUT_3_ph3	VAC	+/- 200VAC	100mV	N/A	Output Voltage to ADLS phase 3	
15	S2	V_OUT_4	VAC	+/- 200VAC	100mV	N/A	Output Voltage to EDU phase 1	
16	S2	V_OUT_5	VDC	+/- 100VDC	50mV	N/A	Output Voltage to VNIR channel	
17	S2	V_OUT_6	VDC	+/- 100VDC	50mV	N/A	Output Voltage to SWIR/MWIR channel	
18	S2	V_OUT_7	VDC	+/- 100VDC	50mV	N/A	Output Voltage to MCC	
19	S2	V_OUT_8	VDC	+/- 100VDC	50mV	N/A	Output Voltage to MIU	
20	S2	V_OUT_9	VDC	+/- 100VDC	50mV	N/A	Output Voltage to LOS motors	
21	S2	V_OUT_10	VDC	+/- 100VDC	50mV	N/A	Output Voltage to INS / EDU / SPARE	
22	S2	I_OUT_1	A DC	+/- 100A	50mA	N/A	Output Current to Fan CCA	
23	S2	I_OUT_2	A DC	+/- 100A	50mA	N/A	Output Current to MWIR Cooler	
24	S2	I_OUT_3_ph1	A AC	+/- 200A	100mA	N/A	Output Current to ADLS_phase 1	

25	S2	I_OUT_3_ph2	A AC	+/- 200A	100mA	N/A	Output Current to ADLS_phase 2	
26	S2	I_OUT_3_ph3	A AC	+/- 200A	100mA	N/A	Output Current to ADLS_phase 3	
27	S2	I_OUT_4	A AC	+/- 200A	100mA	N/A	Output Current to EDU phase 1	
28	S2	I_OUT_5	A DC	+/- 100A	50mA	N/A	Output Current to VNIR channel	
29	S2	I_OUT_6	A DC	+/- 100A	50mA	N/A	Output Current to SWIR/MWIR channel	
30	S2	I_OUT_7	A DC	+/- 100A	50mA	N/A	Output Current to MCC	
31	S2	I_OUT_8	A DC	+/- 100A	50mA	N/A	Output Current to MIU	
32	S2	I_OUT_9	A DC	+/- 100A	50mA	N/A	Output Current to LOS motors	
33	S2	I_OUT_10	A DC	+/- 100A	50mA	N/A	Output Current to INS / EDU / SPARE	
34	U2	AC_Power	VA	10KW	1VA	N/A	Total AC Power Consumption	
35	U2	Fan1_Speed	RPM	[1 - 30,000]	1RPM	N/A	PSU Fan1 Speed	
36	U2	Fan2_Speed	RPM	[1 - 30,000]	1RPM	N/A	PSU Fan2 Speed	
37	U2	Fan3_Speed	RPM	[1 - 30,000]	1RPM	N/A	PSU Fan3 Speed	
38	U8	Volume_size	Bytes	10Gbyte	1byte	N/A	Total available volume allocated for logfiles.	
39	U8	Logfile_size	Bytes	[0-10Gbyte]	1byte	N/A	Total usage of logfiles.	
40	S1	T1	°C	+/- 127°C	1°C	N/A	Thermistor 1	

41	S1	T2	°C	+/- 127°C	1°C	N/A	Thermistor 2	
42	S1	T3	°C	+/- 127°C	1°C	N/A	Thermistor 3	
43	S1	T4	°C	+/- 127°C	1°C	N/A	Thermistor 4	
44	S1	T5	°C	+/- 127°C	1°C	N/A	Thermistor 5	
45	S1	T6	°C	+/- 127°C	1°C	N/A	Thermistor 6	
46	S1	T7	°C	+/- 127°C	1°C	N/A	Thermistor 7	
47	S1	T8	°C	+/- 127°C	1°C	N/A	Thermistor 8	
48	S1	T9	°C	+/- 127°C	1°C	N/A	Thermistor 9	
49	U4	ETM	minutes	N/A	1min	N/A	Elapsed Time Meter	
50	U1	SW_Major	N/A	00-FF	N/A	N/A	Software Version Major	
51	U1	SW_Minor	N/A	00-FF	N/A	N/A	Software Version Minor	
52	U1	SW_Build	N/A	00-FF	N/A	N/A	Software Version Build	
53	U1	SW_Hotfix	N/A	00-FF	N/A	N/A	Software Version Hotfix	
54	U1	SN	N/A	00-FF	N/A	N/A	Serial Number	
55	U8	PSU_Status **	N/A	N/A	N/A	N/A	PSU Status	PSU Status
56	U1	Control_Panel_Lamp_Indication	N/A	0 – 3	N/A	N/A	Control Panel Lamp Indication	0x00 – Lamp in OFF indication. 0x01 - Lamp in ON indication. 0x02 - Lamp in Flash (fast rate) indication. 0x03 - Lamp in Flash

								(slow rate) indication.
57	U1~~U8~~	FW_Major~~Spare~~	N/A	00-FF	N/A	N/A	Firmware Version Major	
58	U1~~U8~~	FW_Minor~~Spare~~	N/A	00-FF	N/A	N/A	Firmware Version Minor	
59	U1~~U8~~	FW_Build~~Spare~~	N/A	00-FF	N/A	N/A	Firmware Version Build	
60	U1~~U8~~	FW_Hotfix~~Spare~~	N/A	00-FF	N/A	N/A	Firmware Version Hotfix	
61	U4~~U8~~	Spare	N/A	N/A	N/A	N/A	N/A	
62	U8	Spare	N/A	N/A	N/A	N/A	N/A	
63	U8	Spare	N/A	N/A	N/A	N/A	N/A	
64	U8	Spare	N/A	N/A	N/A	N/A	N/A	
65	U8	Spare	N/A	N/A	N/A	N/A	N/A	
66	U8	Spare	N/A	N/A	N/A	N/A	N/A	
67	U8	Spare	N/A	N/A	N/A	N/A	N/A	
68	U8	Spare	N/A	N/A	N/A	N/A	N/A	
69	U8	Spare	N/A	N/A	N/A	N/A	N/A	
70	U8	Spare	N/A	N/A	N/A	N/A	N/A	

** - The PSU_Status field (#55) is persistent.

PSU_Status:

Data bits	Description	Values	Default Value	Remarks
0	DC_IN_Status	0=OK 1=FAIL	0	DC Input Voltage Status - OK (0) or Fail (1)
1	AC_IN_Status	0=OK 1=FAIL	0	AC Input Voltage Status - OK (0) or Fail (1)

2	Power_Out_Status	0=OK 1=FAIL	0	Output power Status - OK (0) or Fail (1)
3	MIU_COM_Status	0=OK 1=FAIL	0	MIU Communication Status - OK (0) or Fail (1)
4	OUT1_OC	0=OK 1=Overcurrent	0	Overcurrent Indication for Output1
5	OUT2_OC	0=OK 1=Overcurrent	0	Overcurrent Indication for Output2
6	OUT3_OC	0=OK 1=Overcurrent	0	Overcurrent Indication for Output3
7	OUT4_OC	0=OK 1=Overcurrent	0	Overcurrent Indication for Output4
8	OUT5_OC	0=OK 1=Overcurrent	0	Overcurrent Indication for Output5
9	OUT6_OC	0=OK 1=Overcurrent	0	Overcurrent Indication for Output6
10	OUT7_OC	0=OK 1=Overcurrent	0	Overcurrent Indication for Output7
11	OUT8_OC	0=OK 1=Overcurrent	0	Overcurrent Indication for Output8
12	OUT9_OC	0=OK 1=Overcurrent	0	Overcurrent Indication for Output9
13	OUT10_OC	0=OK 1=Overcurrent	0	Overcurrent Indication for Output10
14	DC_IN_OV	0=OK 1=Overvoltage	0	Overvoltage indication for DC Input

15	AC_IN_ PH1_OV	0=OK 1=Overvoltage	0	Overvoltage indication for Phase 1 Input
16	AC_IN_ PH2_OV	0=OK 1=Overvoltage	0	Overvoltage indication for Phase 2 Input
17	AC_IN_ PH3_OV	0=OK 1=Overvoltage	0	Overvoltage indication for Phase 3 Input
18	OUT1_OV	0=OK 1=Overvoltage	0	Overvoltage Indication for Output1
19	OUT2_OV	0=OK 1=Overvoltage	0	Overvoltage Indication for Output2
20	OUT3_OV	0=OK 1=Overvoltage	0	Overvoltage Indication for Output3
21	OUT4_OV	0=OK 1=Overvoltage	0	Overvoltage Indication for Output4
22	OUT5_OV	0=OK 1=Overvoltage	0	Overvoltage Indication for Output5
23	OUT6_OV	0=OK 1=Overvoltage	0	Overvoltage Indication for Output6
24	OUT7_OV	0=OK 1=Overvoltage	0	Overvoltage Indication for Output7
25	OUT8_OV	0=OK 1=Overvoltage	0	Overvoltage Indication for Output8
26	OUT9_OV	0=OK 1=Overvoltage	0	Overvoltage Indication for Output9
27	OUT10_OV	0=OK 1=Overvoltage	0	Overvoltage Indication for Output10

28	DC_IN_UV	0=OK 1=Undervoltage	0	Undervoltage indication for DC Input
29	AC_IN_ PH1_UV	0=OK 1=Undervoltage	0	Undervoltage indication for Phase 1 Input
30	AC_IN_ PH2_UV	0=OK 1=Undervoltage	0	Undervoltage indication for Phase 2 Input
31	AC_IN_ PH3_UV	0=OK 1=Undervoltage	0	Undervoltage indication for Phase 3 Input
32	AC_IN_PH1_Status	0=OK 1=MISSING	0	Phase 1 OK (0) or missing indication (1)
33	AC_IN_PH2_Status	0=OK 1=MISSING	0	Phase 2 OK (0) or missing indication (1)
34	AC_IN_PH3_Status	0=OK 1=MISSING	0	Phase 3 OK (0) or missing indication (1)
35	AC_IN_Neutral_Status	0=OK 1=MISSING	0	Neutral OK (0) or missing indication (1)
36	Is_Logfile_Running	0= Logfile not Running 1= Logfile Running	0	Is Logfile running?
37	Is_Logfile_Erase_In _Process	0 = Logfile not in erase process 1 = Logfile in erase process	0	Is Logfile Erase In process?
38	Fan1_Speed_Status	0 = OK 1 = Fan speed fail	0	Fan1 speed Status - OK (0) or Fail (1)
39	Fan2_Speed_Status	0 = OK 1 = Fan speed fail	0	Fan2 speed Status - OK (0) or Fail (1)

40	Fan3_Speed_Status	0 = OK 1 = Fan speed fail	0	Fan3 speed Status - OK (0) or Fail (1)
41	T1_OVER_TEMP_Status	0 = OK 1 = Over Temperature	0	PSU T1 Temperature OK (0) Or Over Temperature indication (1)
42	T2_OVER_TEMP_Status	0 = OK 1 = Over Temperature	0	PSU T2 Temperature OK (0) Or Over Temperature indication (1)
43	T3_OVER_TEMP_Status	0 = OK 1 = Over Temperature	0	PSU T3 Temperature OK (0) Or Over Temperature indication (1)
44	T4_OVER_TEMP_Status	0 = OK 1 = Over Temperature	0	PSU T4 Temperature OK (0) Or Over Temperature indication (1)
45	T5_OVER_TEMP_Status	0 = OK 1 = Over Temperature	0	PSU T5 Temperature OK (0) Or Over Temperature indication (1)
46	T6_OVER_TEMP_Status	0 = OK 1 = Over Temperature	0	PSU T6 Temperature OK (0) Or Over Temperature indication (1)
47	T7_OVER_TEMP_Status	0 = OK 1 = Over Temperature	0	PSU T7 Temperature OK (0)

				Or Over Temperature indication (1)
48	T8_OVER_TEMP_Status	0 = OK 1 = Over Temperature	0	PSU T8 Temperature OK (0) Or Over Temperature indication (1)
49	T9_OVER_TEMP_Status	0 = OK 1 = Over Temperature	0	PSU T9 Temperature OK (0) Or Over Temperature indication (1)
50	CC_TCU_Inhibit	0 = OFF 1 = ON	0	CCTCU OFF (0) or ON (1) indication
51	EC_TCU_Inhibit	0 = OFF 1 = ON	0	ECTCU OFF (0) or ON (1) indication
52	Reset	0 = Reset to MIU Not Initiated 1 = Reset to MIU Initiated	0	Reset to MIU Initiated indication. Intermittent indication to Logfile.
53	Shutdown	0 = Shutdown to MIU Not Initiated 1 = Shutdown to MIU Initiated	0	Shutdown to MIU Initiated indication. Intermittent indication to Logfile.
54	Emergency_Shutdown	0 = Emergency Shutdown to MIU Not Initiated 1 = Emergency Shutdown to MIU Initiated	0	Emergency Shutdown to MIU Initiated indication. Intermittent indication to Logfile.

55	System_Off	0 = Power Down Process Not Initiated 1 = Power Down Process Initiated	0	Power Down Process Initiated indication. Intermittent indication to Logfile.
56	ON_OFF_Switch_State	0 = ON/OFF Switch in OFF State 1 = ON/OFF Switch in ON State	0	ON/OFF Switch State indication
57	Capacitor1_end_of_life	0 = Capacitor OK 1 = Capacitor end of life	0	Capacitor-1 end of life indication - Optional TBD
58	Capacitor2_end_of_life	0 = Capacitor OK 1 = Capacitor end of life	0	Capacitor-2 end of life indication - Optional TBD
59	Capacitor3_end_of_life	0 = Capacitor OK 1 = Capacitor end of life	0	Capacitor-3 end of life indication - Optional TBD
60	Capacitor4_end_of_life	0 = Capacitor OK 1 = Capacitor end of life	0	Capacitor-4 end of life indication - Optional TBD
61	Capacitor5_end_of_life	0 = Capacitor OK 1 = Capacitor end of life	0	Capacitor-5 end of life indication - Optional TBD
62	Capacitor6_end_of_life	0 = Capacitor OK 1 = Capacitor end of life	0	Capacitor-6 end of life indication - Optional TBD
63	Capacitor7_end_of_life	0 = Capacitor OK 1 = Capacitor end of life	0	Capacitor-7 end of life indication - Optional TBD

6 PSU Logfile Structure

6.1 PSU Logfile handling - general rules

- Logfile shall be recorded in the PSU at 1KHz rate.

- A Logfile is defined as a sequence of recorded entries (entry format detailed in par 6.2 below).

- Every time input minimum voltage is supplied to the PSU (see PSU PIDS paragraph 3.1.10 for minimum voltage conditions for log operation), a new log file will be started with the following name:

  - o At first the name of the file will be based on a sequential cyclic counter and then the starting date of 01/01/1970.

    E.g. **0000_1970_01_01_00_00_00_PSU.log**

  - o Once receiving the actual time from the MIU, the file name will be updated according to the actual date and time, using the following format: XXXX_YYYY_MM_DD_HH_MM_SS_PSU.log   (XXXX – stays as before with the sequential counter, YYYY-Year, MM-Month, DD-Day, HH-Hour, MM-Minutes, SS-Seconds).

  - o In case no communication with the MIU is established, then the file name shall remain with the sequential counter and the date of 1970.

- The logfile continues operating as long as at least one of the voltages are within the required limits (see PSU PIDS paragraph 3.1.10 for minimum voltage conditions for log operation). Once ALL the voltages are adequately below this minimum limit to disable auxiliary power to the PSU control, the logfile is no longer recording, and the file is closed.

- Log files recording will be based on a cyclic mechanism.

- Logfile shall be downloaded using SFTP client.

6.2 PSU Logfile record entry structure

6.2.1 Initial entry for every new file (once only at start of file):

char m_recordId[5] = "LFCFG";

unsigned short m_recordSize = 15; /* Size of block */

unsigned int   m_gmtTime; /* It is almost universally expected to be an integral value representing the number of seconds elapsed since 00:00 hours, Jan 1, 1970 UTC. */

unsigned short m_microSec; /* Micro second, fixed point. The LSB is 10^6 / (0xFFFF) */

unsigned int m_endian = 0xCAFE2BED;

BIT_CONFIG_DT m_bitConfig; // see defnition below

unsigned int m_version1; // updated each GDE generate (defined in LogRecords\LogRecordsCrc32.h)

unsigned int m_version2; // same as m_version1

unsigned char m_lenSize = 2; // 1 or 2 byte - length of payload

unsigned char m_cs;

where:

typedef struct

   {

       unsigned short flag : 1; /* Flag */

       unsigned short reserved : 15; /* Reserved */

   } BIT_CONFIG_DT;

example for log file (little endian):


```
        0  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F   0123456789ABCDEF
0000h:  4C 46 43 46 47 00 0F 65 ED A2 80 3B 41 CA FE 2B  LFCFG.. eí¢€;AÊþ+
0010h:  ED 00 01 35 D5 C7 86 9A 34 D3 66 02 A2 4C 46 30  í..5ÕÇ†š4Óf.¢LF0
```

another example (hex view)

4c 46 43 46 47 00 0f 65 f3 05 81 53 46 ca fe 2b ed 00 01 c3 aa 8b d8 8a 60 3b 00 02 c0

char m_recordId[5] = "LFCFG"

unsigned short m_recordSize = 15

unsigned int   m_gmtTime

unsigned short m_microSec

unsigned int m_endian   = 0xCAFE2BED

BIT_CONFIG_DT m_bitConfig = 1

unsigned int m_version1 // updated each GDE generate (defined in LogRecords\LogRecordsCrc32.h)

unsigned int m_version2 // same as m_version1

unsigned char m_lenSize = 2 // 1 or 2 byte - length of payload

unsigned char m_cs

6.2.2 Structure for all entries after initial entry (at rate of 1KHz):

#	Name	Description	comments
1	Log_Header	Log Header	Log Header
2	Log Payload	The fields structure of the Log Payload is defined in the PSU Telemetry and BIT Message (not including the message ID Byte)	
3	Log_Trailer	Log Trailer	Log Trailer

Log_Header:

#	Name	Description	Variables Type	Range	Remarks
1	Log_ID	Log ID	B10	LX12345678	Constant value
2	Log_Payload_Size	Payload Size [Bytes]	U2	195	Not including Log Header/Trailer. Constant value.
3	GMT_Time	number of seconds elapsed since 00:00 hours, Jan 1, 1970 UTC	U4	0-FFFFFFFF	At first start from 0, when time from MIU received, continue from there.
4	Micro_Sec	micro seconds in GMT Time	U2	0-FFFF	Micro second, fixed point. The LSB is 10^6 / (0XFFFF). At first start from 0, when time from MIU received, continue from there.

[Log_Trailer:](#)

#	Name	Description	Variables Type	Range	Remarks
1	Checksum	Sum of all log header bytes and log payload bytes.	U1	0-FF	The checksum is calculated for each record entry separately.