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Template No.

CEMILAC\_SYSGP\_TS\_14

**TECHNICAL SPECIFICATION**

**for <LRU/SYSTEM Name>**

**for**

**<Platform Name>**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
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| **Title:** | | | | | **Project/System :** | |
| **TECHNICAL SPECIFICATION**  **For**  **<LRU/SYSTEM Name>for <Platform name>** | | | | | < Project/System Name> | |
| **LRU/System Part No.** | |
| <No.> | |
| **Critical Level** | |
| <A/B/C/D/E> | |
|  | **Name & Designation** | | | | **Signature** | |
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| **<Design Firm Name & Address>** | | | | | | |

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This document is a guidance document. Applicable section / table rows may be considered. Any additional details may be added. Any not applicable section/ table rows may be deleted. The template is very general and vary with process to process followed by Development Agency. The document may be fine-tuned with the TAA for finalization.

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**Amendment History**

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| **Issue**  **No.** | **Issue Date** | **Brief Description of Amendment** | **Change Request Ref.** | **Affected Pages** | **Affected Section** | **Change Effective From** |
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| 002 |  |  |  |  |  | Unit sl.no. <aaa> |

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**List of Tables:**

*Give the list of all the tables used in the specification*

**List of figures :**

*Give the list of all the figures used in the specification*

* Note :

In case any of the sub sections of Section 2.0 are not applicable for a system/ LRU, those sections may be removed and other relevant information may be added.

# Introduction

*<Give a brief about the background and need for new system design, any predecessor system used earlier for the same purpose, what were the shortcomings of the earlier system etc.*>

## Scope

*<Mention the Purpose and scope of the specification document with identification of the system. Ex: This specification establishes the broad functional and technical characteristics and design requirements for the <System Name> <Part No.> for use on the Military and Civil variants of the <Platform Name>.*

## Applicable/Reference Documents

*<All the applicable documents of the system and the standards to which the system should conform to, should be given here along with the document number, issue number & date of issue. Also, Feasibility study report and QR references are to be included here.>*

## Definitions and Acronyms

*<Give all the list of Acronyms used in the specification Alphabetically. Any special/non-generic definitions if applicable can be given here>*

# System Specifications

# Description of the system

*<Describe the LRU functionality in brief. Overall responsibilities of the LRU in the context of the next level system. >*

## System Operational Capability

*<Describe LRU functional or operational capabilities in detail including states and modes of operation.>*

# Interface Specifications

*<Interface block diagram depicting other systems /sensors on the aircraft interfacing with the system can be given here>*

### Power Supply Interface

*<Describe the Power supply requirement and Power consumption budget for the system. If power consumption varies for various modes of operation (like Tx mode, emergency mode etc) the power budget for each mode to be mentioned. >*

# Bus Interface

*<Give ARINC 429, RS 422/232, MIL 1553B, Ethernet details. If a separate Bus ICD exists, reference to Bus ICD may be given here>*

# Human Machine Interface (HMI)

*<If the LRU is required to be operated by pilot/co-pilot, mention the top level requirements and details of various switches, knobs, controls and display along with their required functionality Include a diagram of HMI display, positions of controls, markings etc. >*

# Analog Input Specifications

*<Tabulate All Analog voltage/current/frequency signals coming to the system from external environment>*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Signal name** | **Source** | **Range** | **Resolution** | **Tolerance** | **Signal Characteristics** | **Remarks** |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

### 

# Analog Output Specifications

*<Tabulate all expected Analog voltage/current/frequency signals from the system to the external environment.>*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Signal name** | **Destination** | **Range** | **Resolution** | **Tolerance** | **Signal Characteristics** | **Remarks** |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

# Discrete/Digital Input Specifications

*<Tabulate all the Discrete/Digital Inputs received by the system from external environment >*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Signal name** | **Source** | **Range** | **Tolerance** | **Signal Characteristics** | **Remarks** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

# Discrete/Digital Output Specifications

*< Tabulate all the Discrete/Digital outputs sent from the system to external environment >*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.No** | **Signal name** | **Destination** | **Range** | **Tolerance** | **Signal Characteristics** | **Remarks** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

# RF Input (Receiver) Parameters Specifications

*<Give details of RF Input parameters including the conditions under which the measurements are to be made.* *Ex: Signal level, bandwidth, Input impedance, VSWR etc*.*>*

# RF Output (Transmitter) Parameters Specifications

*<Give details of RF Output parameters* *Ex: Power output, antenna feed, plumbing losses on the platform etc >*

# Other Interfaces

*<Describe in brief if any other types of interfaces exist with external environment like; pressure ports, tubes, removable cartridges etc. Also include details of In-Situ loading of the software using JTAG/Ethernet/USB port>*

## System Health check Specifications

*<Indicate the requirement of on line and offline health checks for the unit. Mention whether off-line diagnostic facility is required or on line data storing is required for later analysis. Give details of the type duration of data/events to be recorded>*

### PBIT/POST

*<Give Resources to be checked, Time constraint of the PBIT. Mention actions to be taken in case of failures >*

### CBIT

*<Give the periodicity, Resources checked, Time constraint of the CBIT. Mention actions to be taken in case of failures >*

### IBIT

*<Mention Extent of Resources to be checked, Time constraint of the IBIT. Mention actions to be taken in case of failures>*

## Memory specification

*<Mention the types of memory, their sizes and the expected spare memory capacity for future enhancements>*

## Timing requirements

*<Mention Timing requirements with reference to system performance/ system response to inputs. i.e maximum iteration time to complete one execution cycle of Input-Process-Output. Mention also the time margins available for future enhancements>*

## Criticality of the system

*<Mention the criticality level of the system i.e. whether the failure of the system results in catastrophic, hazardous, major or minor damages to the aircraft and crew.>*

## Compliance to standards

*<Mention applicable development, testing and documentation standards for Software, firmware and system like RTCA-DO or SAE or ICAO etc.>*

# Physical characteristics

## Dimensions

*<Overall dimension of the LRU should be given with tolerances along with figure>*

## Weight

< *Mention the weight of the unit with tolerances>*

## Mounting

*<If mounting tray is used, provide the dimensions and weight of the Mounting tray along with tolerances . Otherwise provide details of mounting provision in the aircraft. This is for determining adequacy of mechanical structure, handles etc.>*

## Type of the Connectors

*<Mention all the connectors, their type and pin designations.>*

## Insulation and Bonding

*<Ex : Insulation resistance measured between connector pins & chassis: >10MΩ*

*Bonding resistance measured between any two contacts on the Chassis < 100mΩ>*

## Marking

<*Nameplate or product marking shall specify*

* *Name of the equipment with part number*
* *Name of the manufacturer*
* *Serial number*
* *Year of manufacture*
* *Provision to indicate Hardware and Software Configuration status*
* *Any other relevant details.>*

## Finishing

*<Mention Product finish requirements Ex: Black painted matt finish on all external surfaces and conductive chromate conversion coating on all inside surfaces>*

# Growth Potential

*<Specify how many additional Inputs, outputs the system can cater for, including spare connector pins available. Also mention whether any other interfaces are available in the hardware which are currently unused but may be used in future>*

# Reliability, Maintainability and Life

MTBF of the unit shall be \_\_\_\_\_\_\_ Hrs at \_\_\_\_\_\_\_oC.

MTTR of the unit shall be \_\_\_\_\_\_\_ Hrs.

**Total Technical Life of the unit : Hours.**

Storage Life of the unit : Years from the date of manufacture.

Total Calendar Life of the unit : Years from the date of manufacture, including

storage and operation.

Time Between Overhaul (TBO) : (If applicable)

# Thermal Specification

*<Mention whether any cooling/ heating is required for the system on the platform>*

# Environmental and EMI/EMC Requirements

The system shall be used for operation in *<name of the aircraft>* with the flight profile given in Appendix 1. The complete set of mission profiles for the platform are given in Appendix 2.

Equipment shall comply Environmental tests as specified in Appendix 3.

*< The customization of test severities will be done in QTP/ SOFT document based on Appendix 1&2>*

# Packing and Storage

*<Mention how the product is required to be packed for transportation and storage.>*

# Maintenance Specification

*<Mention whether any periodical maintenance is required during storage or operation of the system like, calibration, change of gasket, alignment, lubrication, tuning, pressurization etc. Also mention whether the modules will be interchangeable or any adaptation is required before using them in another system of the same part number on the same platform.>*

# Product Deliverables

## Delivery Set list :

*<Provide the Delivery Set list including the LRU, mating connectors, cables, antennas and any other accessories. Exact part number and make* ***need not*** *be mentioned>*

## Deliverable Documentation

*<Mention the documentation including User hand book, maintenance manual, D-level/ I-level repair manual etc>*

## Test and Support Equipment

*<If any ground equipment is required to be delivered, ex: rugged laptop for field loading of data/ downloading of flight data, in-situ programming tools, ATEs etc, give details about the tools.>*

**APPENDIX 1**

# PLATFORM CHARACTERISTICS

<Mention all the applicable parameters in the table as per applicable platform. This information will be used for deciding severities and applicability of environmental, EMI/EMC and Power supply tests. The table given below is to be filled if the system is for use in Jet aircraft. Use respective tables for other platforms like propeller aircraft, helicopter or aircraft external store.>

|  |  |  |
| --- | --- | --- |
| **Sl.no** | **Parameter** | **Value/ Response** |
| 1 | Maximum Operational Altitude  Maximum and minimum operating temperature  Maximum and minimum Storage temperature |  |
| 2 | Max flight speed, rate of ascent and rate of descent |  |
| 3 | d = Whether afterburner present? (y/n)  R = Vector distance from center of engine exhaust plane to materiel center of gravity (in mts)  θ = Angle between R vector and engine exhaust vector (aft along engine exhaust centerline), degrees (For 70 °< θ ≤ 180 ° use 70 °)  Dc = Engine core exhaust diameter (mts)  Df= Engine fan exhaust diameter (mts)  Vc = Engine Core exhaust velocity (without afterburner) in m/sec  Vf = Engine Fan exhaust velocity (without afterburner) in m/sec  q = Flight dynamic pressure in kN / m2 |  |
| 4 | Vector distance of the unit from the gun muzzle (D)  Gun standoff distance (h)  Depth parameter (Rs) i.e. normal distance from unit to aircraft skin.  Gun calibre (C)  Firing rate (F1) in Rounds/ sec  Blast energy of the gun (E)  No. of guns closely spaced, firing together (N) |  |
| 5 | Endurance of the aircraft (Maximum Continuous flight duration) |  |
| 6 | Is arrestor landing expected in the platform? |  |
| 7 | Are there fuel/ hydraulic fluid/ engine oil lines near unit installation/storage/ handling location? Are Cleaning fluids, solvents, de-icers, coolants etc likely to come in contact with unit? |  |
| 8 | Unit Mounting orientation on the platform? (Attach a diagram) |  |
| 9 | Is Arrestor landing expected for the aircraft ? If yes, what are the shock levels? |  |
| 10 | Is unit water tightness required? |  |
| 11 | Is the unit exposed to direct sunlight? |  |
| 12 | Does the platform have ASW capability? |  |
| 13 | Is the unit Aircraft external or safety critical or used for Army/ Navy platforms? |  |
| 14 | Unit Functionality required during Change from Ground (External Power supply) to Aircraft internal Power supply (50 ms)? |  |
| 15 | Unit Functionality at 16V required? |  |
| 16 | Unit Functionality at 12V required? |  |
| 17 | Is lightning Protection required for the equipment?  If yes,  Is the aircraft body metallic or composite?  Is the unit well-protected/ partially protected/ moderately exposed/ in severe EM environment?  Is the unit shielded or unshielded?  Is the unit aperture/ aperture-resistive coupled with the aircraft? |  |

**Appendix 2**

*<Provide various mission profiles of the platform* ***relevant to the system****. These may include take off, landing and taxiing characteristics, cruising, maneuvers like banking angles, vertical flight, inverted flight, sidewise or backward flight (for helicopters), parking on ship, maximum durations for each of these maneuvers etc>*

**Appendix 3**

# QUALIFICATION TEST PROFILE

< The table below lists all the tests as per MIL standards. Depending on the type of the equipment, mounting details and user requirements, some of the tests in the following table may be removed or some others may be added>.

|  |  |  |
| --- | --- | --- |
| **Sl.**  **No.** | **Name of the**  **Test** | **Standard, Method/ Clause and Procedure** |
| **1** | Low pressure (altitude) | MIL-STD-810G Method 500.5 Procedure-ІІ |
| **2** | High temperature | MIL-STD-810G Method 501.5 Procedure І & ІІ |
| **3** | Low temperature | MIL-STD-810G Method 502.5 |
| **4** | Thermal Shock | MIL-STD-810G Method 503.5 Procedure I-C |
| **5** | Contamination by Fluids | MIL-STD-810G Method 504.1 Procedure I |
| **6** | Solar radiation | MIL-STD-810G Method 505.5 Procedure II |
| **7** | Blowing Rain/ Rain Drip Test | MIL-STD-810G Method 506.5 Procedure I and III |
| **8** | Humidity | MIL-STD-810G Method 507.5 Procedure II |
| **9** | Fungus | MIL-STD-810G Method 508.6 |
| **10** | Salt fog | MIL-STD-810G Method 509.5 |
| **11** | Blowing dust and sand | MIL-STD-801G Method 510.5 Procedure I and II |
| **12** | Explosive Atmosphere | MIL-STD-801G Method 511.5 Procedure I |
| **13** | Immersion | MIL-STD-810G Method 512.5 Procedure I |
| **14** | Acceleration (Functional, Structural, Crash safety) | MIL-STD-810G Method 513.6 Procedure I, II and III |
| **15** | Vibration | MIL-STD-810G Method 514.6 |
| **16** | Shock (Functional, Transit drop, Crash hazard, Bench Handling, Arrestor landing) | MIL-STD-810G Method 516.6 Procedure I, IV, V, VI, VIII |
| **17** | Gun fire shock | MIL-STD-810G Method 519.5 |
| **18** | Combined Humidity Altitude and Temperature (CATH) | MIL-STD-810G Method 520.3 |
| **15** | Icing/ Freezing rain | MIL-STD-810G Method 521.3 |
| **16** | Aircraft Power supply variation tests | MIL-STD-704F Section 4.2 |
| **17** | Lightning protection test (Indirect effects) | DO-160F Waveform set A3G33 |
| **18** | CE101 | MIL-STD-461E Section 5.4 |
| **19** | CE 102 | MIL-STD-461E Section 5.5 |
| **20** | CS101 | MIL-STD-461E Section 5.7 |
| **21** | CS 109 | MIL-STD-461E Section 5.11 |
| **22** | CS 114 | MIL-STD-461E Section 5.12 |
| **23** | CS 115 | MIL-STD-461E Section 5.13 |
| **24** | CS116 | MIL-STD-461E Section 5.14 |
| **25** | RE 101 | MIL-STD-461E Section 5.15 |
| **26** | RE 102 | MIL-STD-461E Section 5.16 |
| **27** | RS 101 | MIL-STD-461E Section 5.18 |
| **28** | RS 103 | MIL-STD-461E Section 5.19 |
| **29** | RS 105 | MIL-STD-461E Section 5.20 |