



Request for Proposal (RFP) for Development, Fabrication, Testing and Supply of TM-TC INTERFACE UNIT

Technical Details




 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024 <hr/> Issue: A Rev: 00 Page 2 of 48
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 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024 Issue: A Rev: 00 Page 3 of 48
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SPACECRAFT CHECKOUT GROUP
U.R.RAO SATELLITE CENTRE,
BANGALORE

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 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 4 of 48

CONTENTS

1. SCOPE.....	6
2. INTRODUCTION.....	6
3. SYSTEM SPECIFICATIONS	7
4. STATEMENT OF WORK.....	9
4.1. DEFINITION OF WORK- DEVELOPMENT.....	12
4.1.1. PCB DESIGN FOR ‘FUNCTION CARD’.....	12
4.1.2. EQUIPMENT ENCLOSURE DESIGN	12
4.2. DEFINITION OF WORK- FABRICATION	13
4.2.1. PROCUREMENT OF COMPONENTS.....	13
4.2.2. PROCUREMENT OF AC-DC & DC-DC MODULES	13
4.2.3. FABRICATION OF PCB	13
4.2.4. FABRICATION OF EQUIPMENT	14
4.3. DEFINITION OF WORK- TESTING.....	15
4.3.1. TESTING OF MODULES	15
4.3.2. TESTING OF EQUIPMENTS	16
4.3.3. FUNCTIONAL TEST	16
4.3.4. BURN-IN TEST	16
4.3.5. ACCEPTANCE TEST.....	17
4.4. DEFINITION OF WORK- SUPPLY	17
5. APPROVAL TO BE OBTAINED BY VENDOR.....	17
6. BILL OF MATERIAL	19
6.1. Definition of ONE quantity of TM-TC interface unit	19
7. LIST OF DELIVERABLES BY VENDOR	20
7.1. List of deliverables by Vendor.....	20
8. LIST OF INPUTS TO VENDOR BY URSC	21
8.1. List of deliverables by URSC	21
9. DELIVERY TERMS.....	22
9.1. Vendor Compliance for delivery terms.....	22
10. WARRANTY.....	23
11. TERMS OF PAYMENT	23
12. COMPLIANCE BY VENDOR	24
12.1. TECHNICAL COMPLIANCE OF TM-TC INTERFACE UNIT	24
12.2. VENDOR COMPLIANCE AGAINST RFP	27
12.3. VENDOR COMPLIANCE - GENERAL	28
12.4. COVER LETTER/ UNDERTAKING/ DECLARATION.....	32

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 5 of 48

13.	CONFIDENTIALITY.....	34
14.	INSTRUCTIONS TO VENDOR.....	34
15.	ANNEXURES	36
15.1.	ANNEXURE-A: BILL OF MATERIALS - POWER SUPPLY CARD	36
15.1.1.	PCB Details.....	36
15.1.2.	Component Placement	37
15.1.3.	Component List.....	38
15.2.	ANNEXURE-B: BILL OF MATERIALS - FUNCTION CARD	39
15.2.1.	PCB Details.....	39
15.2.2.	Component Placement	39
15.2.3.	Component List.....	39
15.3.	ANNEXURE-C: BILL OF MATERIALS - PIGGYBACK CARD	44
15.3.1.	PCB Details.....	44
15.3.2.	Component Placement	45
15.3.3.	Component List.....	45
15.4.	ANNEXURE-D: BILL OF MATERIALS - FRONT PANEL CARD	47
15.4.1.	PCB Details.....	47
15.4.2.	Component Placement	48
15.4.3.	Component List.....	48
15.5.	ANNEXURE-E: BILL OF MATERIALS - CONNECTORS & WIRING	49
15.5.1.	MECHANICAL CONFIGURATION OF THE INSTRUMENT	49
15.5.2.	UNIT WIRING	50
15.6.	ANNEXURE-F: EQUIPMENT ENCLOSURE.....	50
15.6.1.	Mechanical Description - Subrack.....	50
15.6.2.	Mechanical Description - Front Panel	51
15.6.3.	Front Panel controls	52
15.6.4.	Front Panel Screen Print	53
15.6.5.	Back Panel connectors	53
15.6.6.	Back Panel Screen Print.....	54
15.6.7.	Telescopic Slide	54
15.7.	ANNEXURE-G: PCB DESIGN GUIDELINES.....	55
15.8.	ANNEXURE-H: GUIDELINE FOR MARKINGS ON EQUIPMENT	56
15.9.	ANNEXURE-J : FABRICATION GUIDELINES	57
15.10.	ANNEXURE-K : ESD CONTROL GUIDELINES.....	57
15.11.	ANNEXURE-L: WIRE SPECIFICATIONS	59
15.12.	ANNEXURE-M: PCB SPECIFICATIONS.....	60

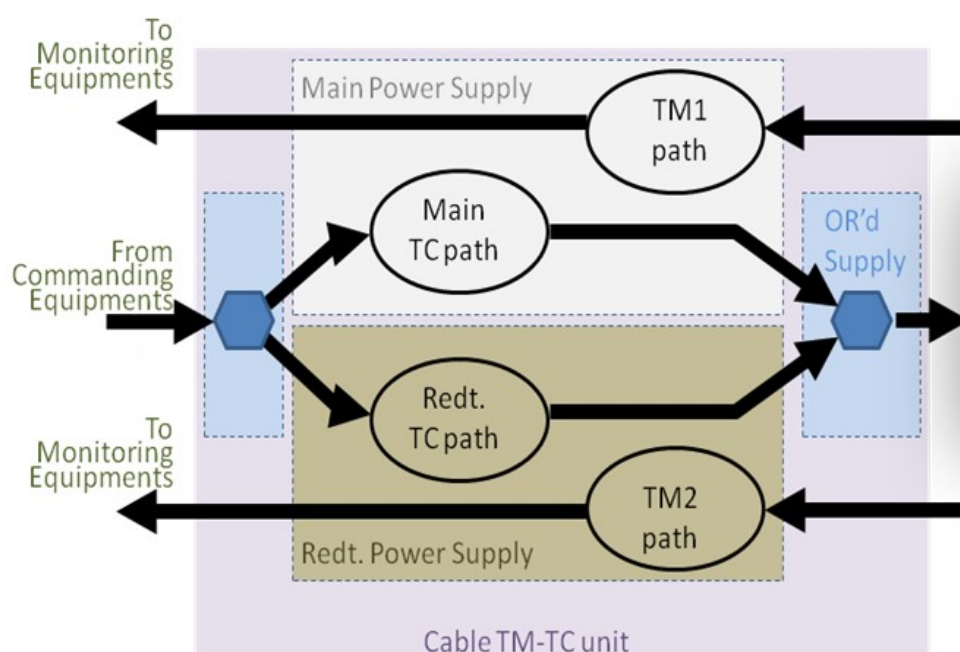
 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 6 of 48

1. SCOPE

This document provides detailed information on the work involved in ‘Development, Fabrication, Testing and Supply of TM-TC INTERFACE UNIT’.

2. INTRODUCTION

The spacecraft is commanded and monitored via cable interface during various phases of Integrated Spacecraft Testing (IST). The ‘TM-TC Interface unit’ meets the interface requirements of the spacecraft for cable telecommand and telemetry. The unit provides for remote monitoring and control from Spacecraft Checkout Computer (SCC) via Ethernet interface. This 1U sized TM-TC Interface unit houses 2 independent TM and TC modules to provide functional redundancy.





 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 7 of 48

Figure 1 : Functional Block diagram of TM-TC Interface Unit

3. SYSTEM SPECIFICATIONS

Table 1 : System Specification of TM-TC Interface unit

TELEMETRY					
1.	No of TM channel	:	2		
2.	Data rate	:	100 bps to 6Mbps		
3.	Input Signal types	:	TTL, CMOS, Differential TTL, RS232		
4.	Output Signal level	:	+5 V into 1 M Ω , 3.2/2.5V into 50 Ω , RS232		
5.	Functional blocks	:	a. Differential TTL to CMOS converter b. Optical-isolator c. Signal conditioner d. 50 Ω Line driver e. RS-232 level converter f. Signal Activity Indicator		
TELECOMMAND					
6.	No of channels	:	2 Analog (1 out of 2 Selectable for output) 6 PCM (3 out of 6 selectable for output)		
7.	Input Signal types Frequency / data rate Impedance	: : : :	<u>Analog</u> 5V pp bi-polar 1 KHz to 100KHz >1k ohm	<u>Base band</u> TTL / CMOS / RS422 100bps to 64Kbps >1k ohm	
8.	Output Output Type Output Level	: :	<u>Analog</u> bi-polar 5Vpp into 1M Ω , 2.5V into 50 Ω , \pm 2.4V voltage limiter	<u>Sinle ended</u> CMOS 5V into 1M Ω , 270 Ω series termination	<u>Differential</u> RS422 Differential driver with 100 Ω series termination
9.	Functional blocks	:	a. TTL Optical-Isolator b. Analog Optical-Isolator c. Single ended driver d. Differential driver e. Voltage limiter f. Remote Control & Monitoring g. Selection Logic		
POWER					
10.	AC Mains	:	230V, 50Hz		

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 8 of 48

			2 inlets with Fuse & Line filter
11.	DC Supply	:	12V, 2.5A

12.	Power Supply Requirement	:	a. Main & Redundant supplies b. Many DC/DC follow single AC/DC c. Two AC-MAINS inputs d. isolated supplies for S/C signals e. ORed supply for selection logic
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INTERFACE

13.	Front Panel Disply/Controls	:	a. MAINS Indication - LED b. Spacecraft / SIM Sel - Push Button c. TC-MAIN / TC-REDT-Push Button d. TC –ENA/DIS Sel - Push Button e. D1, D2 Sel - Push Button f. TM1, TM2 Sel - LED g. TC-M, TC-R Sel - LED h. TC Activity Indicator - LED i. LOCAL / REMOTE Sel - LED
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14.	Back Panel Connectors	:	a. J1 - 50 pin Plug b. J2 -50 pin Socket c. J3- RJ45 Ethernet connector d. AC IN-1- AC mains inlet with SW e. AC IN-2 - AC mains inlet with SW f. Reset switch g. DC supply Connector
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OTHER

15.	EquipmentEnclosure	:	19", 1U, full depth standard instrument, with rack mountable slides, material MS, powder coated
16.	Weight	:	< 10Kg
17.	Operating Temperature	:	+10°C to +40°C
18.	Burn-in test to be completed	:	168 Hrs
19.	Warranty	:	a. One Year standard free warranty from date of Unit Acceptance by URSC b. All components warranty from OEM shall be passed on to the realized product warranty.

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024 Issue: A Rev: 00 Page 9 of 48
--	---	---

4. STATEMENT OF WORK

This section provides nature of work and the responsibilities of the vendor involved in “Development, Fabrication, Testing and Supply of TM TC interface unit”.

The proposal is for Development, Fabrication, Testing and Supply of TM TC interface Units.

The major activities involved in this work are:

1. Development of PCB and Equipment Enclosure
2. Procurement of specified components as per the Bill of Materials provided.
3. Study and understanding of the fabrication details of TM-TC interface unit
4. Fabrication of PCBs as per the supplied Gerber files and specifications.
5. Testing of individual PCBs after populating the components.
6. Fabrication of mechanical enclosure (sub-rack) as per the details provided.
7. Component mounting in PCBs, mounting of modules and Cards in sub-rack and electrical wiring as per supplied drawing
8. Micro-controller programming with the firmware provided
9. Card/ Module level and System level testing as per the test plan provided.
10. Compilation of Test Results and anomalies if any. Details of the components which have failed during fabrication/testing has to be documented in the report.
11. Preparation of Module and System level test result document
12. Submission of reports/records to URSC for review and obtain approvals as indicated in work-flow.
13. Burn-in test for 168Hrs continuous in loaded condition at NTP
14. Supply of all deliverables as mentioned in the Deliverables section.
15. Part delivery of the units as per delivery schedule is acceptable.
16. Participation in acceptance tests at URSC.
17. First realized unit will be called proto Unit. Only after the clearance of Proto Unit wrt its



Development, Fabrication and Testing of TM-TC INTERFACE UNIT

Doc. No: SCG-OCOS-TMTC-2024-01
Issue Date: 30-09-2024

Issue: A Rev: 00
Page 10 of 48

workmanship and satisfactory test results by URSC, the vendor can go ahead with realization of the remaining units.

18. Vendor shall get approval from URSC at the stages prescribed in work flow.

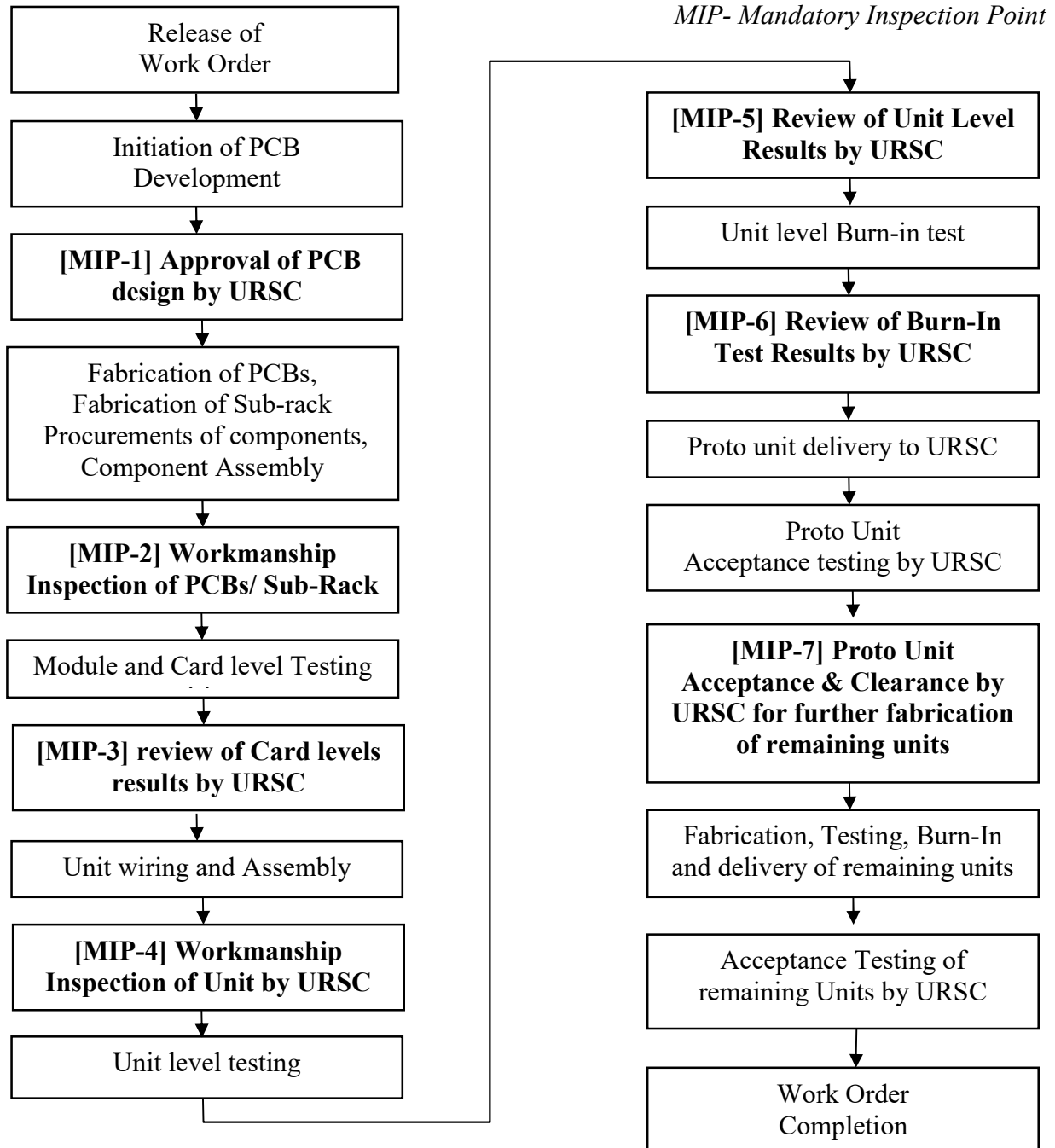



Figure 2: Work Flow of “Development, Fabrication, Testing and Supply of TM TC INTERFACE UNIT”

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 12 of 48

4.1. DEFINITION OF WORK- DEVELOPMENT


Vendor shall design PCB namely “Function Card” as per the schematic supplied by URSC. All the necessary inputs for the same is provided by URSC. The work prescribed shall be carried out at vendor facility.

4.1.1. PCB DESIGN FOR ‘FUNCTION CARD’

- 4.1.1.1. Vendor shall take all the necessary inputs provided by URSC for the PCB design of ‘Function Card’.
- 4.1.1.2. Vendor shall get approval from URSC for Circuit schematic, before proceeding with PCB design
- 4.1.1.3. All the final design files of Schematic, Board, Gerber & Drill outputs shall be delivered to URSC
- 4.1.1.4. Vendor shall get approval from URSC before proceeding to manufacture the PCB
- 4.1.1.5. Number of Layers, Size and approximate component placement of this PCB shall be as per details given in Annexure-B
- 4.1.1.6. Vendor shall strictly follow the PCB design guidelines provided in Annexure-G (PCB design Guidelines).
- 4.1.1.7. The work prescribed shall be carried out at vendor facility.
- 4.1.1.8. Vendor shall fabricate the required no of PCBs as per Section-5 (Bill of Materials)

4.1.2. EQUIPMENT ENCLOSURE DESIGN

- 4.1.2.1. Vendor shall design Front panel & Back panel for Equipments as per the representative drawing provided in Annexure-F
- 4.1.2.2. Vendor should obtain approval from URSC before proceeding for fabrication of Equipment Enclosure.
- 4.1.2.3. Vendor shall follow the guidelines provided Annexure-H, for Logos and markings in

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 13 of 48

equipment panels.

4.1.2.4. Vendor shall fabricate the required no of Equipment enclosures as per BOM

4.2. DEFINITION OF WORK- FABRICATION

Vendor shall procure the components and modules required to fabricate the TM-TC interface unit. All the components and modules, wherever applicable, shall undergo standalone test, before proceeding for equipment fabrication. The following sections explain the responsibilities of vendor in detail. The work prescribed shall be carried out at vendor facility.

4.2.1. PROCUREMENT OF COMPONENTS


- 4.2.1.1. Shall procure the components as per Bill of material (BOM) provided in Annexure-A,B,C,D and E.
- 4.2.1.2. In case any of the component is obsolete, the vendor shall obtain approval from URSC for procuring the equivalent component.
- 4.2.1.3. Shall procure components from OEM or their authorized dealers only.
- 4.2.1.4. All component warranty certificates from OEM shall be submitted to URSC.
- 4.2.1.5. Shall procure the interconnection wire as listed in the Annexure-E. Wire spool Test report from manufacturer shall be provided to URSC

4.2.2. PROCUREMENT OF AC-DC & DC-DC MODULES

- 4.2.2.1. Shall procure the AC-DC & DC-DC modules as per Bill of material(BOM) given in Annexure-A.
- 4.2.2.2. Shall procure Modules from OEM or their authorized dealers only.
- 4.2.2.3. Licenses and warranty provided by OEM/authorized dealers shall be submitted to URSC.

4.2.3. FABRICATION OF PCB


Vendor shall fabricate the following PCBs. The Gerber files will be given by URSC after the release of the Purchase Order, except for 'Function Card'.

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 14 of 48

- 4.2.3.1. Vendor shall fabricate ‘Power Supply Card’ as per Annexure-A . The Gerber files will be given by URSC after the release of the Purchase Order.
- 4.2.3.2. Vendor shall fabricate ‘Function Card’ as per Annexure-B . The Gerber files shall be generated by Vendor.
- 4.2.3.3. Vendor shall fabricate ‘Piggyback Card’ as per Annexure-C. The Gerber files will be given by URSC after the release of the Purchase Order.
- 4.2.3.4. Vendor shall fabricate ‘Front Panel Card’ as per Annexure-D. The Gerber files will be given by URSC after the release of the Purchase Order.
- 4.2.3.5. Vendor shall follow Fabrication guidelines provided in Annexure-J
- 4.2.3.6. Vendor shall follow ESD handling guidelines provided in Annexure-K
- 4.2.3.7. Vendor shall maintain a folder for each card being fabricated and any deviations, anomalies observed shall be logged and shall be submitted for review to URSC
- 4.2.3.8. Vendor shall fabricate the required number of PCBs as per RFP
- 4.2.3.9. PCB Standards are provided on Annexure-M

4.2.4. FABRICATION OF EQUIPMENT

- 4.2.4.1. Vendor shall mechanically fix modules and PCBCs on the chassis and interconnect as per section ‘Unit Wiring’ in Annexure-E .
- 4.2.4.2. Vendor shall prepare equipment layout and obtain approval from URSC before implementation
- 4.2.4.3. Vendor shall follow ESD handling guidelines provided in Annexure-K . Compliance to ESD guidelines is mandatory.
- 4.2.4.4. Vendor facility will be audited against ESD requirements if required, before placing

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 15 of 48

the purchase order.

- 4.2.4.5. Vendor shall prepare Front & Rear panels as per Annexure-F (Equipment Enclosure)
- 4.2.4.6. Vendor shall carry out the harness fabrication as per wiring details given in Annexure E.
- 4.2.4.7. Vendor shall follow the guidelines provided in annexure-H (Guideline for Markings on Equipment), for affixing Logos and markings in equipment panels


4.3. DEFINITION OF WORK- TESTING

Vendor shall carryout testing of Module/Card and Equipment wrt system Specifications given in section-3. The detailed test procedures along with acceptance and rejection criteria are provided by URSC, after placement of Purchase order.

4.3.1. TESTING OF MODULES

The power supply modules and fully fabricated Cards shall be tested in standalone mode as per Test procedure provided by URSC, before using it for equipment fabrication. Vendor shall carryout these tests and record the test results in the specified format. Vendor shall log the test conditions, test results and report deviations if any to the URSC focal point and proceed only after necessary clearance. After completion of the test on each module, the results are to be reviewed and approved by URSC.

- 4.3.1.1. shall carryout AC-DC power supply module testing
- 4.3.1.2. Shall carryout testing of fully fabricated ‘Power supply card’
- 4.3.1.3. Shall carryout testing of fully fabricated ‘Piggyback card’
- 4.3.1.4. Shall carryout testing of fully fabricated ‘Function card’
- 4.3.1.5. The embedded software provided shall be programmed prior to ‘Piggyback Card’ testing. URSC will provide the necessary software after placement of Purchase order.
- 4.3.1.6. Module/Card level testing shall be carried out at vendor facility

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 16 of 48

4.3.1.7. URSC reserves the right to witness testing of any card or unit at the vendors premises as and when required

4.3.2. TESTING OF EQUIPMENTS


Vendor shall carryout testing of TM-TC interface unit and produce the test results as per the Test Procedure provided by URSC. URSC will provide the Test Procedure document for the same after placement of Purchase order.

4.3.3. FUNCTIONAL TEST

- 4.3.3.1. TM-TC Interface unit shall be tested and confirmed against ‘System specifications’ provided in section-3
- 4.3.3.2. TM-TC Interface unit shall be tested as per Test Procedure document provided by URSC
- 4.3.3.3. Test Results in prescribed format shall be prepared and submitted to URSC for review and approval.
- 4.3.3.4. Additional tests if suggested by URSC, shall be performed by Vendor.
- 4.3.3.5. Unit level testing shall be carried out at vendor facility
- 4.3.3.6. URSC reserves the right to witness testing of any card or unit at the vendors premises as and when required

4.3.4. BURN-IN TEST

- 4.3.4.1. Vendor shall carryout burn-in test (continuous 168 Hrs) for all TM-TC interface units and deliver the units along with test data
- 4.3.4.2. Burn-in test shall be conducted under NTP conditions
- 4.3.4.3. To conduct **continuous 168 Hrs burn-in**, vendor shall ensure suitably rated Electricity, electrical signal inputs to the unit and round the clock monitoring of electrical parameters (including unit temperature).

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 17 of 48

4.3.4.4. The test results are logged at regular intervals during the Burn-In test. URSC will provide Burn-in test procedure after placement of Purchase order.

4.3.5. ACCEPTANCE TEST

Upon delivery of systems at URSC, acceptance test shall be carryout by URSC, prior to acceptance of the systems.

4.3.5.1. Acceptance test shall be performed at URSC

4.3.5.2. All TM-TC Interface unit supplied shall under go Acceptance Tests at URSC. Vendor shall participate in the test.

4.3.5.3. Qualification of first unit with simulation of actual interfaces, as per the Acceptance Test Procedure will be carried out by URSC. Vendor shall participation in these tests at URSC.

4.3.5.4. After Acceptance and clearance by URSC for the first unit, the Fabrication & testing of the remaining units are to be carried out by the vendor.

4.4. DEFINITION OF WORK- SUPPLY

Vendor shall supply items as prescribed in section 'DELIVERY POLICY' in this RFP.

5. APPROVAL TO BE OBTAINED BY VENDOR


Vendor shall obtain following approvals from URSC while execting the work. Various stages at which these approvals to be obtained are :

5.1.1.1. Approval of Schematic of 'Function Card' before taking up PCB design

5.1.1.2. Approval of Component Placement of 'Function Card' before taking up PCB routing

5.1.1.3. **Mandatory Inspection Point [MIP-1]** : Approval of PCB design of 'Function Card' before generation of Gerber and manufacturing of PCB

5.1.1.4. Approval of Equipment Enclosure requirements and design

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 18 of 48


- 5.1.1.5. Approval of fabricated Equipment enclosure.
- 5.1.1.6. **Mandatory Inspection Point [MIP-2]:** Inspection and approval of PCBs and / Sub-Rack wrt workmanship standards by URSC and clearance for further activities.
- 5.1.1.7. **Mandatory Inspection Point [MIP-3]:** After Module level testing of Power supplies and Boards. Review of results, resolution of Non-Conformance and clearance for further activities by URSC
- 5.1.1.8. **Mandatory Inspection Point [MIP-4]:** After Equipment assembly and wiring of first unit. Inspection of first unit for its workmanship by URSC and clearance for further activities
- 5.1.1.9. **Mandatory Inspection Point [MIP-5]:** After System level testing of the first unit, including burn-test. Review of results, resolution of Non-Conformance clearance for further activities by URSC
- 5.1.1.10. Before start of Burn-In test, for Review of test setup, test conditions and measurement arrangements by URSC
- 5.1.1.11. **Mandatory Inspection Point [MIP-6]:** After Burn-In test, Review of results, resolution of Non-Conformance clearance for further activities by URSC
- 5.1.1.12. **Mandatory Inspection Point [MIP-7]:** Proto Unit Acceptance & Clearance by URSC for fabrication of remaining units

6. BILL OF MATERIAL

ONE quantity of TM-TC interface unit consists of following items given below. Detailed Bill of materials(BOM) is provided in annexures indicated against each item.

6.1. Definition of ONE quantity of TM-TC interface unit

S No	Description	Quantity	REFERENCE
1.	Power Supply Card	1	Annexure-A
2.	Function Card	1	Annexure-B
3.	Micro-controller Piggy back card	1	Annexure-C
4.	Front panel card	1	Annexure-D
5.	Connectors and accessories	1 set	Annexure-E
6.	Sub-rack with rack mount kit	1	Annexure-F
7.	AC Power cable (3 Core) of 2m length	2	
8.	LAN cable CAT-6, of length 5 mtrs	1	
9.	Warranty certificate	1	
10.	Module level Test Result Document	1	
11.	System level Test Result Document	1	
12.	Burn-in test result Document	1	


 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 20 of 48

7. LIST OF DELIVERABLES BY VENDOR

Following materials shall be delivered for successful completion of the work.

7.1. List of deliverables by Vendor

Sl.No.	Items/ description	Quantity	Complied/ Not Complied
1	Fully functionally tested TM-TC Interface Unit (as defined in 'Bill of Materials' in Section -6.1 : Definition of ONE quantity of TM-TC Interface Unit)	As per PO quantity	
2	Soft copy of 'Function card' PCB design consists of: a) Schematic design file b) PCB Board design file c) Gerber output files	1 set	
3	Soft copy of Equipment enclosure design consists of: a) Equipment enclosure box drawings b) Front & back panel cutout drawings c) Front & back panel screen print drawings	1 set	


 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 21 of 48

8. LIST OF INPUTS TO VENDOR BY URSC

URSC will provide the vendor with the following design details and test software to enable them to execute the work. These details are intellectual property of URSC and shall be used only for the work specified in this RFP.

8.1. List of deliverables by URSC

Sl No	Description	Quantity	Delivery Schedule
1	Request for proposal (RFP) containing details of work. Comprising scope of work, Bill of material, Delivery Schedule, Compliance matrix, Instruction to Vendore etc.	1	Public Tender
2	TM-TC Interface Unit User Manual, Design document ,Technical details including Schematic	1 set	After release of work Order / Purchase Order
3	Gerber files of PCBs	1 set	After release of work Order / Purchase Order
4	Embedded controller Program (firmware)	1	After completion of Card assembly
5	Test Procedure Document Card level Test Procedures and integrated unit level test procedures	1 set	After completion of proto unit assembly

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 22 of 48

9. DELIVERY TERMS

After reception of the purchase order, vendor shall execute the work as per table below.

9.1. Vendor Compliance for delivery terms

Sl. No.	Milestone Activity	Delivery Schedule	Remarks	Compliance (Complied/ Not Complied)
1.	[T0] Order Acknowledgement			
2.	[T1] Completion of work Development - PCB and Sub-Rack	delivery within four months of order acknowledgement [T0].	LD not applicable	
3.	Delivery of Proto Unit (first unit) after Testing including Burn-in test	delivery within six months of completion of development work [T1].	LD not applicable	
4.	[T2] Acceptance of Proto unit by URSC	-	-	
5.	Delivery of remaining units after Testing including Burn-in test	delivery within four months of Acceptance of Proto unit by URSC [T2].	LD applicable	
6.	[T3] Acceptance of remaining units by URSC	-	-	



Development, Fabrication and Testing of TM-TC INTERFACE UNIT

Doc. No: SCG-OCOS-TMTC-2024-01
Issue Date: 30-09-2024

Issue: A Rev: 00
Page 23 of 48


10. WARRANTY

Vendor shall provide warranty as given below

- 10.1.1.1. All TM-TC Interface units supplied should be free from defects and faults in material workmanship. Vendor shall provide warranty for a period of **one year from date of acceptance** by URSC.
- 10.1.1.2. During warranty period, upon receipt of notice about faults, the vendor shall repair or replace the defective module or parts thereof, free of cost. The vendor shall take over the replaced modules/parts after providing their replacements and repair and no claim, whatsoever shall lie on the URSC for such replaced parts thereafter. Transportation cost and custom charges if any, for re-export/re-import of defective modules to the foreign supplier country for repairs shall be borne by vendor only.
- 10.1.1.3. Vendor has to comply warranty obligations, even in case of change of company management.

11. TERMS OF PAYMENT

- 11.1.1.1. 100% payment on pro-rata basis upon completion of Development, Fabrication, Testing, delivery and acceptance clearance by user division/URSC [As mentioned in the delivery schedule]
- 11.1.1.2. Part Delivery is acceptable
- 11.1.1.3. Any slippage in Delivery schedule, LD Clause as per norms will be applicable.
- 11.1.1.4. In case proto-model is rejected by URSC for non-compliance, purchase order shall be cancelled and no payment will be made for the proto-model to the vendor.

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 24 of 48

12. COMPLIANCE BY VENDOR

It is mandatory to provide compliance for the following section of RFP while submitting quotation.

- Section 7.1: List of deliverables by Vendor
- Section 9.1: Vendor Compliance for delivery terms
- Section 12.1: Technical Compliance wrt Specifications of TM-TC Interface unit
- Section 12.2: Vendor Compliance against RFP
- Section 12.3: Vendor Compliance - General
- Section 12.4: Cover Letter/ Undertaking/ Declaration

It is mandatory to provide the Compliance for above sections in the specified format by the vendor, else the offer will be rejected. URSC has the right to reject the Item and offer, if it is not meeting technical specifications, general terms and conditions. Vendor shall go through above listed section of RFP in detail, before providing the compliance statement. **Quotations without compliance for all the above listed sections will be rejected.**

12.1. TECHNICAL COMPLIANCE OF TM-TC INTERFACE UNIT

Sno	Specification			Complied/ Not Complied
TELEMETRY				
1.	No of TM channel	:	2	
2.	Data rate	:	100 bps to 6Mbps	
3.	Input Signal types	:	TTL, CMOS, Differential TTL, RS232	
4.	Output Signal level	:	+5 V into 1 M Ω , 3.2/2.5V into 50 Ω , RS232	
5.	Functional blocks	:	c. Differential TTL to CMOS converter d. Optical-isolator e. Signal conditioner f. 50 Ω Line driver g. RS-232 level converter h. Signal Activity Indicator	


Sno	Specification					Complied/ Not Complied
TELECOMMAND						
6.	No of channels	:	2 Analog (1 out of 2 Selectable for output) 6 PCM (3 out of 6 selectable for output)			
7.	Input		<u>Analog</u>	<u>Base band</u>		
	Signal types	:	5V pp bi-polar	TTL / CMOS / RS422		
	Frequency / data rate	:	1 KHz to 100KHz	100bps to 64Kbps		
	Impedance	:	>1k ohm	>1k ohm		
8.	Output		<u>Analog</u>	<u>Sinle ended</u>	<u>Differential</u>	
	Output Type	:	bi-polar	CMOS	RS422	
	Output Level	:	5Vpp into 1MΩ, 2.5V into 50Ω, ±2.4V voltage limiter	5V into 1MΩ, 270Ω series termination	Differential driver with 100Ω series termination	
9.	Functional blocks	:	i. TTL Optical-Isolator j. Analog Optical-Isolator k. Single ended driver l. Differential driver m. Voltage limiter n. Remote Control & Monitoring o. Selection Logic			
POWER						
10.	AC Mains	:	230V, 50Hz 2 inlets with Fuse & Line filter			
11.	DC Supply	:	12V, 2.5A			
12.	Power Supply Requirement	:	p. Main & Redundant supplies q. Many DC/DC follow single AC/DC r. Two AC-MAINS inputs s. isolated supplies for S/C signals t. ORed supply for selection logic			

Sno	Specification			Complied/ Not Complied
INTERFACE				
13.	Front Panel Disply/Controls	:	u. MAINS Indication - LED v. Spacecraft / SIM Sel - Push Button w. TC-MAIN / TC-REDT-Push Button x. TC –ENA/DIS Sel - Push Button y. D1, D2 Sel - Push Button z. TM1, TM2 Sel - LED aa. TC-M, TC-R Sel - LED bb. TC Activity Indicator - LED cc. LOCAL / REMOTE Sel - LED	
14.	Back Panel Connectors	:	dd. J1 - 50 pin Plug ee. J2 -50 pin Socket ff. J3- RJ45 Ethernet connector gg. AC IN-1- AC mains inlet with SW hh. AC IN-2 - AC mains inlet with SW ii. Reset switch jj. DC supply Connector	
OTHER				
15.	EquipmentEnclosure	:	19”, 1U, full depth standard instrument, with rack mountable slides, material MS, powder coated	
16.	Weight	:	< 10Kg	
17.	Operating Temperature	:	+10° C to +40° C	
18.	Burn-in test to be completed	:	168 Hrs	
19.	Warranty	:	kk. One Year standard free warranty from date of Unit Acceptance by URSC ll. All components warranty from OEM shall be passed on to the realized product warranty.	

(Signature of the Authority Signatory with Seal)

12.2. VENDOR COMPLIANCE AGAINST RFP


SNo.	Compliance to Statements given under Sections	Complied /Not complied
1.	Section-4. STATEMENT OF WORK	
2.	Section-4.1. DEFINITION OF WORK- DEVELOPMENT	
3.	Section-4.1.1 PCB DESIGN FOR 'FUNCTION CARD' 12	
4.	Section-4.1.2 EQUIPMENT ENCLOSURE DESIGN	
5.	Section-4.2. DEFINITION OF WORK- FABRICATION	
6.	Section-4.2.1. PROCUREMENT OF COMPONENTS	
7.	Section-4.2.2. PROCUREMENT OF AC-DC & DC-DC MODULES	
8.	Section-4.2.3. FABRICATION OF PCB	
9.	Section-4.2.4. FABRICATION OF EQUIPMENT	
10.	Section-4.3. DEFINITION OF WORK- TESTING	
11.	Section-4.3.1. TESTING OF MODULES	
12.	Section-4.3.2. TESTING OF EQUIPMENTS	
13.	Section-4.3.3. FUNCTIONAL TEST	
14.	Section-4.3.4. BURN-IN TEST	
15.	Section-4.3.5. ACCEPTANCE TEST	
16.	Section-4.4. DEFINITION OF WORK- SUPPLY	
17.	Section-5. APPROVAL TO BE OBTAINED BY VENDOR	
18.	Section-6. BILL OF MATERIAL	
19.	Section-6.1 Definition of ONE quantity of TM-TC interface unit	
20.	Section-7. LIST OF DELIVERABLES BY VENDOR	
21.	Section-7.1 List of deliverables by Vendor	
22.	Section-8. LIST OF INPUTS TO VENDOR BY URSC	
23.	Section-8.1 List of deliverables by URSC	
24.	Section-9. DELIVERY TERMS	
25.	Section-9.1 Vendor Compliance for delivery terms	
26.	Section-10. WARRANTY	
27.	Section-11. TERMS OF PAYMENT	
28.	Section-12. COMPLIANCE BY VENDOR	
29.	Section-12.1 Technical compliance of TM-TC INTERFACE UNIT	
30.	Section-12.2 Vendor compliance against RFP	
31.	Section-12.3 Vendor compliance - General	
32.	Section-12.4 Cover Letter/ Undertaking/ Declaration	
33.	Section-13. CONFIDENTIALITY	
34.	Section-14. Instructions to Vendor	

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 28 of 48


(Signature of the Authority Signatory with Seal)

12.3. VENDOR COMPLIANCE - GENERAL


Sl. No.	Parameter	Specifications	Compliance (Complied/ Not Complied)
1.	Indian company	An Indian Company would be deemed to be owned by Indian Citizen and by an Indian Company if more than 51 percent of equity interest in the company is beneficially owned by Resident Indian Citizens and Indian Companies that are, in turn, ultimately owned and controlled by Resident Indian Citizens (Company Profile)	
2.	Company profile	Detailed brochure about company to be submitted	
3.	Valid GST number	<p>The vendor should also have a valid GST registration. The Vendor should submit Self attested copy(ies) of the Certificates of Incorporation and other certificates that are legally required for carrying out its business activities.</p> <p>The certificates should be valid at the time of RFP submission and should be certified by an authorized signatory. A copy of PAN Card should also be submitted.</p>	

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 29 of 48

Sl. No.	Parameter	Specifications	Compliance (Complied/ Not Complied)
4.	Undertaking	<p>An undertaking (self-certificate) is to be submitted that, the Organization hasn't been blacklisted by any Central/ State Government Department/ Central Government funded organizations/ State Government funded organizations/ World Bank, or other World Bank organizations and is not under any illegal expression by Government of India. The applicant, should not have, during the last five years, either failed to perform on any agreement, or been expelled from any project or agreement or have any agreement terminated for breach by the applicant.</p> <p>An undertaking (self-attested) is to be submitted that there has been no outstanding bankruptcy, judgment or pending legal action that could impair operating as a going Concern. Also, the Vendor shall be solvent, in the Legal Court of Law.</p>	
5.	Committee /Employees of ISRO	Persons who are individually or institutionally, in any manner, involved with the selection/screening process of the RFP, and employees of ISRO are ineligible for applying.	
6.	ISO/AS certificate	The company should have ISO 9001: 2015 certificate/AS9100D certificate. Certification copy to be submitted.	

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 30 of 48

Sl. No.	Parameter	Specifications	Compliance (Complied/ Not Complied)
10	Suitable ESD table for assembling the electronic units shall be present with the firm which is quoting. Hiring other's facility is not acceptable.	ESD Tables – 2 Nos Provide supporting document with photographs of the facility. URSC will visit the facility, If required.	
11	Availability of electronic fabrication instruments. Parties shall attach the list of the instruments available.	1. Temperature controlled Soldering Irons-	
		2. 4 Nos	
		3. Wire strippers- 2 Nos	
		4. Wire Cutters- 2 Nos	
		5. De-soldering pumps- 2 Nos	
		6. Personal Computer- 2 Nos	
		7. Oscilloscopes – 1 No	
		8. Function generator – 1 No	
19	Focal Point	9. Digital Multi-Meters- 2 Nos.	
		1. Vendor shall identify a focal point for all communications / instructions / clarification during realization process to have better management	
		2. Focal point shall submit the status report on fabrication, testing and documentation for review to URSC focal point	

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 31 of 48

Sl. No.	Parameter	Specifications	Compliance (Complied/ Not Complied)
22	Technical Expertise	Vendors require expertise in the engineering fields of digital Electronics, Embedded systems, analog electronic systems and system integration.	
23	Quotation Terms and Conditions	1. Vendors to quote in two parts, Technical bid and Price bid separately	
		2. Technical compliance will be decided based on the compliance provided in Sections 7.1, 9.1 and 12.1 to 12.4, and supporting documents provided by the vendor.	
		3. Price bid to quote with one-year free warranty	
		4. Quotations having technical and price bid quoted together will be rejected	
24	Ordering Terms and Conditions	Price bid will be opened for shortlisted vendors based on their technical compliance.	

(Signature of the Authority Signatory with Seal)



Development, Fabrication and Testing
of TM-TC INTERFACE UNIT

Doc. No: SCG-OCOS-TMTC-2024-01
Issue Date: 30-09-2024

Issue: A Rev: 00
Page 32 of 48

12.4. COVER LETTER/ UNDERTAKING/ DECLARATION

(Company letterhead)

[Date]

To,

HEAD, PURCHASE & STORES

U R Rao Satellite Centre

HAL Airport Road, Vimanapura Post

Bangalore -560017

Karnataka


Dear Sir,

Ref: RFP for “Development, Fabrication Testing and Supply of TM-TC Interface Unit”

Having examined the Request for Proposal (RFP), the receipt of which is hereby duly acknowledge, we, the undersigned, intend to submit a proposal in response to the Request for Proposal (RFP). We attach hereto the response as required by the RFP, which constitutes our proposal.

Primary and Secondary contacts for our company are:

	Primary Contact	Secondary Contact
Name:		
Title:		
Company Name:		
Address:		
Phone:		
Mobile:		
Fax :		

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 33 of 48

E – mail:		
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We confirm that the information contained in this response or any part thereof, including its exhibits, and other documents and instruments delivered or to be delivered to URSC is true, accurate, verifiable and complete. This response includes all information necessary to ensure that the statements therein do not in whole or in part mislead URSC in its short-listing process. We fully understand and agree to comply that on verification, if any of the information provided here is found to be misleading the short-listing process, we are liable to be dismissed from the selection process or termination of the contract during the execution of the contract. We agree for unconditional acceptance of all the terms and conditions set out in the RFP document.

It is hereby confirmed that I / We are entitled to act on behalf of our company/ corporation/ firm / organization and empowered to sign this document as well as such other documents, which may be required in this connection.

Dated this

(Signature)

(In the capacity of)

(Name)


Duly authorized to sign the RFP Response for and on behalf of:

(Name and Address of Company) Seal / Stamp of Vendor

Witness Signature:

Witness Name:

Witness Address:

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 34 of 48

13. CONFIDENTIALITY

All documents prepared for fabrication, test procedures, log books, drawings, schematics and any other communications, codes revealed during the process of testing will be exclusive property of URSC and vendor shall have no right what so ever on them. These documents are to be strictly confidential and should not be reproduced, copied/transmitted to any media without explicit permission of URSC. Further, the vendor must not quote any of these works in any publications or to any of their customers without explicit permission from URSC and adhere to strict confidentiality.

14. INSTRUCTIONS TO VENDOR

- 14.1.1.1. Vendors have to go through the “Request for Proposal for the “*Development, Fabrication, Testing and Supply of TM-TC Interface Unit*” document and understand the nature of work thoroughly.
- 14.1.1.2. Vendors have to quote in 2 parts separately for
 - A) Technical Bid and
 - B) Commercial / Price Bid
- 14.1.1.3. Vendors have to quote Commercial / Price bid separately
- 14.1.1.4. Vendors have to quote Price bid in prescribed format as per Section 14.2 ‘Prescribed format for Quotation’
- 14.1.1.5. **The Technical bid shall mandatorily give the compliance** as per Sections 7.1, 9.1 and 12.1 to 12.4 in the RFP document. Offers without compliance tables will be rejected.
- 14.1.1.6. Vendors to go through the delivery terms, ordering terms and deliverables carefully. Vendor has to quote in the below given format

14.1.1.7. Vendors to mandatorily quote in the prescribed format given in table-6 below.

14.1.1.8. Price bid will be opened for shortlisted vendors based on their technical compliance.

14.2. Prescribed format for Quotation

Sl.No	Item Description	Slabs	Unit Price	Quantity In Numbers	Total Cost
1	One-time Development Charges			1 No	
2	Fabricated and tested TM-TC Interface unit				
	Slab-1	1-10			
	Slab-2	11-20			
	Slab-3	21-30			
3	GST				
4	Total Work Order cost				

15. ANNEXURES

15.1. ANNEXURE-A: BILL OF MATERIALS - POWER SUPPLY CARD

15.1.1. PCB Details

1. PCB dimension (Length* Width): 3-inch x 3.25 inch
2. PCB Thickness: 1.7 mm \pm 0.15mm
3. Base material: FR4, ϵ_r 4.5, $T_g > 175$ -Deg. Celsius
4. PCB Type: Multilayer (4 LAYER) / Double sided (Normal PTH)
5. Solder mask & Silk Screen: YES (S.M to be epoxy green colour 17.5 microns thickness)
6. Type of protective plating: Solder coating on solderable areas
7. Copper Thickness

Total Copper thickness and film description (No. of plating joints shall not be more than 3, and PTH copper thickness shall be minimum 25 microns)	Layer Nos.& layup order	1	2	3	4
	Total Copper thickness in micron	70	70	70	70
	VCC / GND layers		GND	VCC	



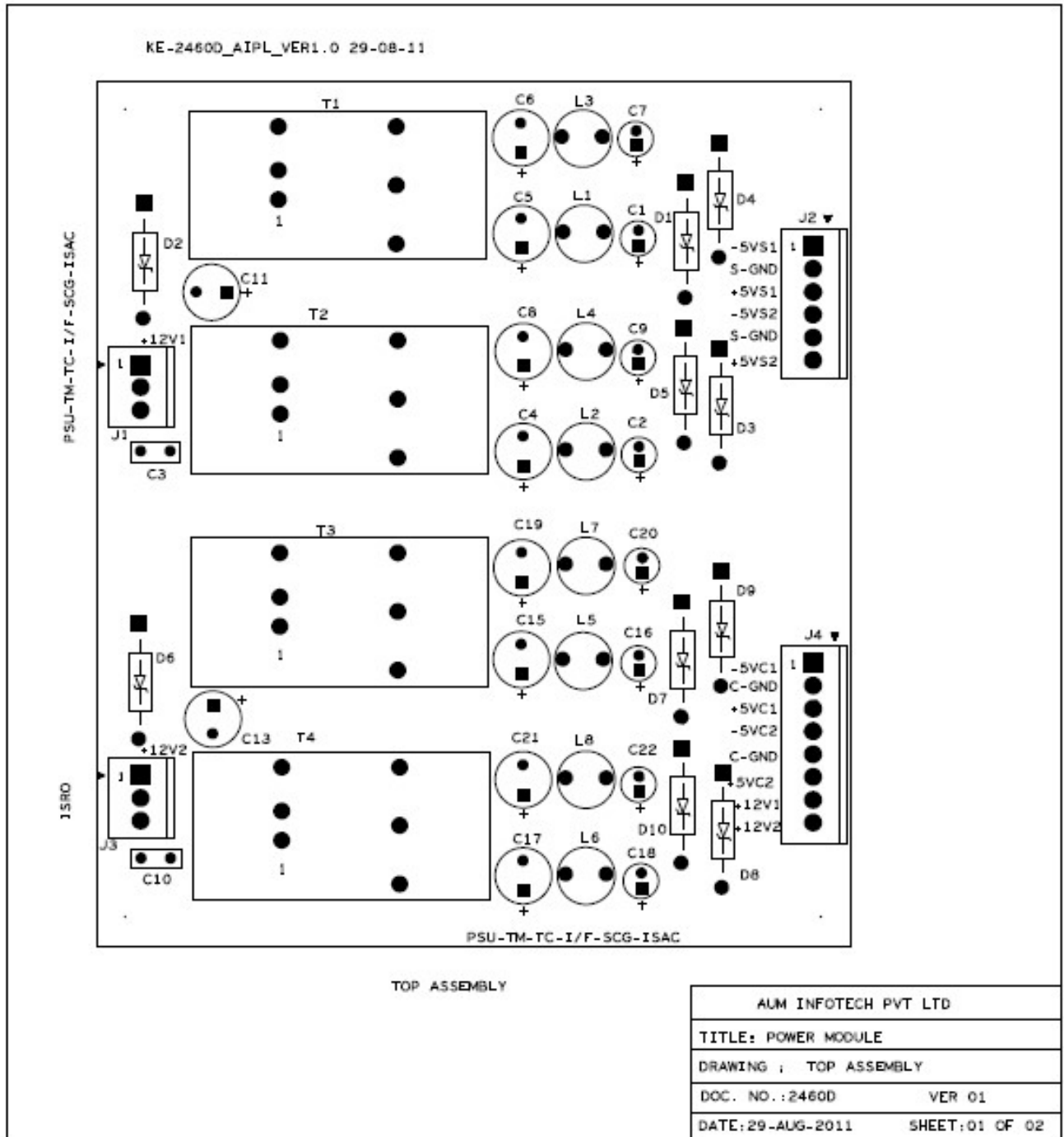
SCG, URSC

Development, Fabrication and Testing of TM-TC INTERFACE UNIT

Doc. No: SCG-OCOS-TMTC-2024-01
Issue Date: 30-09-2024


Issue: A Rev: 00
Page 37 of 48

15.1.2. Component Placement



15.1.3. Component List

POWER MODULES							
Bill Of Materials							
SL NO	Reference	Description	Value	Mfr	Mfr Part #	Package	Qty
1	C1,C2,C7,C9,C16,C18,C20,C22	Electrolytic Capacitor	100 uF 25V 20%	Philips		Th Hole	8
2	C3,C10	MLC Capacitor	0.1 uf 500V 10%	AVX	SR407C104 MAA	Th Hole	2
3	C4,C5,C6,C8,C15,C17,C19,C21	Electrolytic Capacitor	330 uF 16V 20%	Philips		Th Hole	8
4	C11,C13	Electrolytic Capacitor	470 uF 25V 20%	Philips		Th Hole	2
5	C12,C14,C23,C24,C25,C26,C27,C28,C29,C30,C31,C32,C33,C34,C35,C36,C37,C38,C39,C40	MLC Capacitor	0.1 uF 25V 10%	AVX	12063C104 MAT2A	SMD 1206	20
6	D1,D3,D4,D5,D7,D8,D9,D10	Zener Diode_5.6V, 5 Watt	1N5339B_5.6V, 5 Watt	ON Semiconductor	1N5339B	Th Hole	8
7	D2,D6	Zener Diode_13V, 5 Watt	1N5350B_13V, 5 Watt	ON Semiconductor	1N5350B	Th Hole	2
8	J1,J3	Power Connector	PMC 3P 3.96mm	Molex		Th Hole	2
9	J2	Power Connector	PMC 6P 3.96mm	Molex		Th Hole	1
10	J4	Power Connector	PMC 8P 3.96mm	Molex		Th Hole	1
11	L1,L2,L3,L4,L5,L6,L7,L8	Inductor	10 uH 3A Th Hole			Th Hole	8
12	R1,R2,R3,R4	Resistor	4.7K 1%	Philips		SMD 1206	4
13	T1,T2,T3,T4	Power Module	Dc Dc Converter(12V to 5V)	Lambda	PXD15-12DO5	Th Hole	4
14	C41,C42,C43,C44 (Additional Components)	Ceramic Capacitor	0.01uF 2KV	Philips		Th Hole	4
15	HWS30-12/A - 12V 2.5A	AC-DC power supply		lambda	HWS30-12/A - 12V 2.5A		2

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 39 of 48

15.2. ANNEXURE-B: BILL OF MATERIALS - FUNCTION CARD

15.2.1. PCB Details

PCB Fabrication – Function card


1. PCB dimension (Length x Width) : 9.8 inch x 7.9 inch
2. PCB Thickness: 1.7 mm \pm 0.15mm
3. Base material: FR4, ϵ_r 4.5, Tg > 175-Deg. Celsius
4. PCB Type: Multilayer (4 LAYER) / Double sided (Normal PTH))
5. Solder mask & Silk Screen: YES (S.M to be epoxy green colour 17.5 microns thickness)
6. Type of protective plating: Solder coating on solderable areas
7. Copper Thickness

Total Copper thickness and film description (No. of plating joints shall not be more than 3, and PTH copper thickness shall be minimum 25 microns)	Layer Nos.& layup order	1	2	3	4
	Total Copper thickness in micron	70	70	70	70
	VCC / GND layers		GND	VCC	

15.2.2. Component Placement

15.2.3. Component List

Function card TM-TC-UNIT							
Bill Of Materials							
Sl no	Reference	Description	Value	Mfr	Mfr Part #	Footprint	Qty
1	C1,C22	Capacitor	100PF 16V 10%	AVX		SMD 1206	2

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 40 of 48

	C2,C3,C7,C13,C14,C16,C17, C18,C21,C23,C24,C29,C34, C35,C36,C37,C38,C39,C42, C55,C56,C57,C70,C73,C74, C75,C79,C80,C81,C90,C91, C92,C93,C94,C100,C101,C1 02,C103,C104,C105,C107,C1 09,C111,C113,C115,C117,C1 19,C121,C123,C125,C126,C1 28,C129,C15,C19,C20,C40,C 41,C43,C46,C48,C51,C53,C5 8,C61,C63,C65,C68,C71,C72 ,C76,C77,C78,C82,C83,C84, C127,C130,C131,C132,C133, C134,C135,C136						
2		Capacitor	0.1uF 16V 10%	AVX		SMD 1206	84
3	C4,C6,C31,C25	Capacitor	100 PF / 110PF 16V 10%	AVX		SMD 1206	4
4	C5,C26	Capacitor	330PF 16V 10%	AVX		SMD 1206	2
5	C44,C49,C52,C54,C59,C64, C66,C69	Electrolytic Capacitor	10 uF 16V 20%	Philips		Th Hole	8
6	C106,C108,C110,C112,C114, C116,C118,C120,C122,C124	Electrolytic Capacitor	100uF 25V 20%	Philips		Th Hole	10
7	C45,C47,C60,C62	Capacitor	2.2PF 16V 10%	AVX		SMD 1206	4
8	C50,C67	Capacitor	10PF 16V 10%	AVX		SMD 1206	2
9	C8,C9,C10,C11,C12,C27,C2 8,C30,C32,C33,C85,C86,C87 ,C88,C89,C95,C96,C97,C98, C99	Capacitor	1uF 16V 10%	AVX		SMD 1206	20
10	D1,D3,D4,D6,D15,D16,D17, D18,D19,D20,D33,D34,D57, D58,D71	Schottky Diode	BAT54	Fairchild	BAT54	SMD sot23	15
11	D2,D5	Diode Zener 4.7V	1N4732A 1W (4.7V)	ON Semiconductor	1N4732A	Th Hole	2
12	D7,D8,D9,D10,D11,D12,D13 ,D14	Diode Zener 3.3V	1N4728A 1W (3.3V)	ON Semiconductor	1N4728A	Th Hole	8
13	D21,D22,D27,D28,D29,D30, D39,D41,D43,D45,D46,D51, D52,D53,D54,D63,D65,D67, D31,D38,D40,D42,D44,D55, D62,D64,D66,D68	Diode	1N4148	ON Semiconductor		SMD 1206	28
14	D69,D70,D72,D73	Schottky Diode	MBR360	ON Semiconductor	MBR360	Th Hole	4
15	F1,F2	Fuse	1A Fuse Subminiature	Schurter	0034.6915	Th Hole	2
16	JMP1,JMP2,JMP3,JMP4,JM P5,JMP6,JMP7,JMP8	Jumper	Single strand wire			Th Hole	8



SCG, URSC

Development, Fabrication and Testing
of TM-TC INTERFACE UNITDoc. No: SCG-OCOS-TMTC-2024-01
Issue Date: 30-09-2024Issue: A Rev: 00
Page 41 of 48

17	JMP9,JMP10,JMP11,JMP12, JMP13,JMP14,	Jumper	1 Pin Burg	Protection		Th Hole	6
18	JP1,JP2,JP3,JP4,JP5,JP6	Jumper	Multi strand Teflon wire			Th Hole	6
19	J1	Connector	D-50 P Male CON (S GND ref)	FCI	DD 50 P 564	Th Hole	1
20	J2	Connector	D-50 P F.Male CON (C GND ref)	FCI	DD 50 S 564	Th Hole	1
21	J3	Power Connector	PMC 6P 3.96mm	Molex		Th Hole	1
22	J4	Power Connector	PMC 8P 3.96mm	Molex		Th Hole	1
23	J5	Connector	Mu CON 9 Pin Male 2.54mm pitch	Molex		Th Hole	1
24	J6	Connector	Mu CON 7 Pin Male 2.54mm pitch	Molex		Th Hole	1
25	J7	Connector	Mu CON 16 Pin Male 2.54mm pitch	Molex		Th Hole	1
26	K1,K2,K3,K4,K5,K6,K7,K8	Relay	Relay 12 V DPDT Hermetically Sealed	OEN	30-07-D-X	Th Hole	8
27	R1,R14,R18,R31,R71,R77,R 83,R88,R94,R101,R107,R108 ,R110,R111,R112,R114,R115 ,R117,R120,R121,R123,R124 ,R125,R127,R128,R130,R134 ,R136,R137,R138,R139,R140 ,R141,R142,R143,R144,R145 ,R146,R175,R176,R177,R178	Resistor	470E 1%	Philips		SMD 1206	42
28	R2,R19	Resistor	3.3K 1%	Philips		SMD 1206	2
29	R3,R17,R20,R34,R105,R106, R109,R113,R116,R118,R119, R122,R126,R129	Resistor	68K 1%	Philips		SMD 1206	14
30	R4,R21	Resistor	390E 1%	Philips		SMD 1206	2
31	R5,R7,R23,R24,R42,R49,R5 9,R64,R72,R73,R78,R79,R84 ,R85,R90,R91,R96,R97,R102 ,R103	Resistor	50E 1%	Philips		SMD 1206	20
32	R6,R22,R15,R32	Resistor	100E 1%	Philips		SMD 1206	4
33	R9,R10,R12,R13,R26,R27,R 29,R30	Resistor	2.2K 1%	Philips		SMD 1206	8
34	R11,R16,R28,R33	Resistor	10K 1%	Philips		SMD 1206	4
35	R35,R52	Trim Pot	100K Trim Pot	Philips	3296	Th Hole	2
36	R36,R44,R51,R53,R61,R65, R147,R148,R149,R150,R173, R174,R179,R180,R181,R182	Resistor	1K 1%	Philips		SMD 1206	16
37	R37,R57	Trim Pot	5K Trim Pot	Philips	3296	Th Hole	2

38	R38,R54	Resistor	220K 1%	Philips		SMD 1206	4
39	R45,R46,R47,R48,R50,R62, R63,R66,R67,R68	Resistor	20K 1%	Philips		SMD 1206	10
40	R39,R56	Resistor	196K 1%	Philips		SMD 1206	2
41	R40,R58	Resistor	2K 1%	Philips		SMD 1206	2
42	R69,R75,R81,R87,R93,R99, R133	Resistor	200E 1%	Philips		SMD 1206	7
43	R41,R55,R70,R76,R82,R89, R95,R100	Resistor	270E 1%	Philips		SMD 1206	8
44	R43,R60,R74,R80,R86,R92, R98,R104,R135	Resistor	100K 1%	Philips		SMD 1206	9
45	R131,R132	Resistor	1.5K 1%	Philips		SMD 1206	2
46	R151,R152,R153,R154,R155, R156,R157,R158	Resistor	5.6K 1%	Philips		SMD 1206	8
47	R159,R160,R161,R162,R163, R164,R165,R166	Resistor	3.9K 1%	Philips		SMD 1206	8
48	R167,R168,R169,R170,R171, R172	Resistor	4.7K 1%	Philips		SMD 1206	6
49	T1,T2	Transformer	PT4	OEP	PT4	Th Hole	2
50	U1,U4,U8,U9,U10,U13,U17, U18,U31,U33,U34,U35,U36, U38,U39,U41,U42,U44,U45, U46,U47,U48,U49,U50,U51, U52,U53,U54,U55,U56,U57, U58,U59,	IC	74LVC2G04	NXP	74LVC2G04 GV	TSOP	33
51	U2,U11,U32,U37,U40,U43,U 60,U65,U66	IC	HCPL2630	Agilent Technologies	HCPL- 2630#300	SMD Gull wing	9
52	U3,U12	IC	MAX7419	MAXIM	MAX7419CU A	MSOP	2
53	U5,U14	IC	DG441	Intersil	DG441DY	SOIC	2
54	U6,U15	IC	MAX232	Texas Instruments	MAX232DW	SOIC	2
55	U7,U16	IC	26C32	National Semiconductor	DS26C32AT M	SOP	2
56	U19,U21,U28,U23,U25,U30	IC	AD823	Analog Devices	AD823AR	SOIC	6
57	U20,U27	IC	HCNR201	Hewlett Packard	HCNR201#30 0	SMD Gull wing	2
58	U22,U26	IC	LT1227	Linear Technology	LT1227CN8	Th DIP	2
59	U24,U29	IC	LH0002	National Semiconductor	LH0002H	TO 99	2
60	U61	IC	74HCT640	Texas Instruments	CD 74HCT640M	SOIC	1
61	U62,U63	IC	ULN2803	Allegro	ULN2803LW	SOIC	2



Development, Fabrication and Testing of TM-TC INTERFACE UNIT

Doc. No: SCG-OCOS-TMTC-2024-01
Issue Date: 30-09-2024

Issue: A Rev: 00
Page 43 of 48

62	U64	IC	74HCT245	Philips	74HCT245D	SOIC	1
63	Breakupboard-U1	IC	26C31	National Semiconduc tor	26C31	SOP	2
64	Power switch on back panel, with line filters and switch indicator in FP						2
65	AC Mains IN						2
66	Signal Diodes	diode	IN4148	ON Semiconductor	IN4148		6
67	U67, U68, U69, U70, U71, U72	Differential driver	26C31	-			

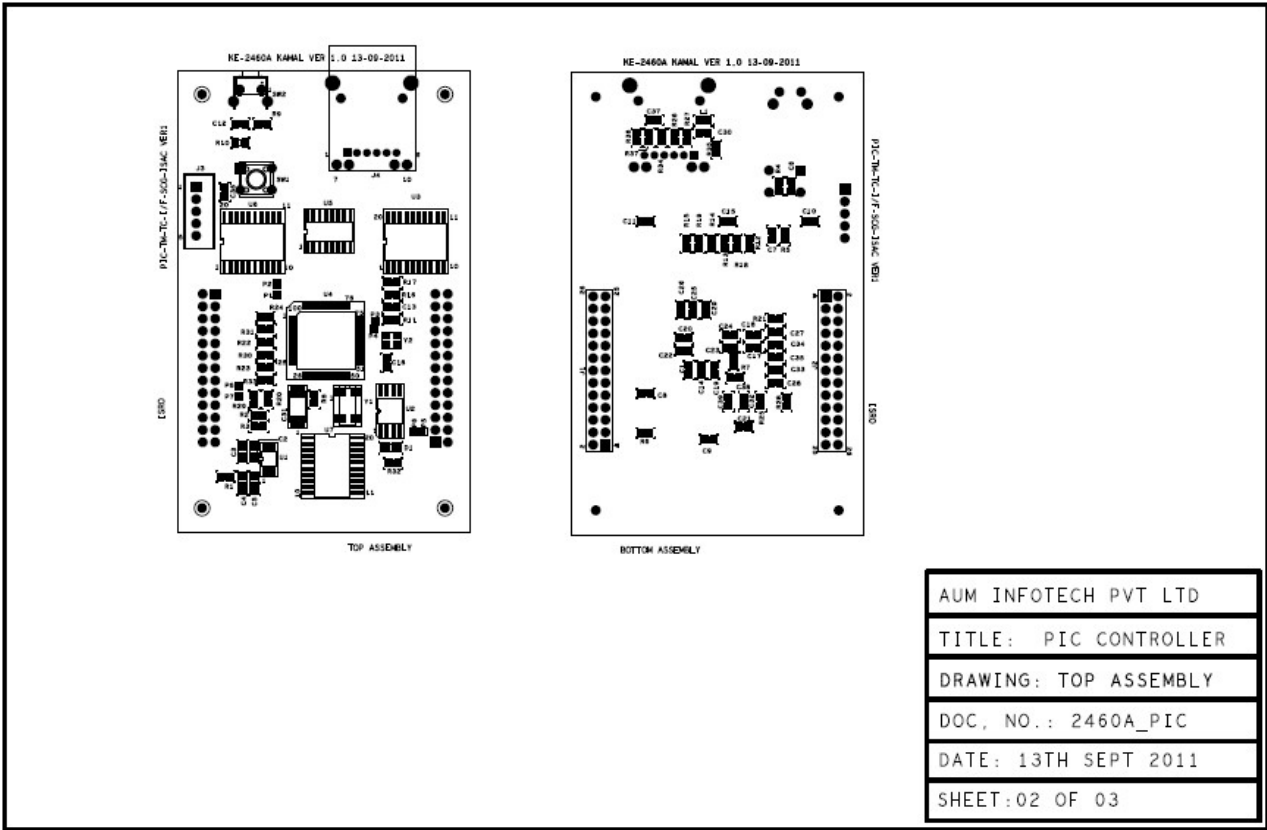
15.3. ANNEXURE-C: BILL OF MATERIALS - PIGGYBACK CARD

15.3.1. PCB Details

1. PCB dimension (Length x Width) : 3 inch x 3.5 inch
2. PCB Thickness: 1.7 mm \pm 0.15mm
3. Base material: FR4, ϵ_r 4.5, Tg > 175-Deg. Celsius
4. PCB Type: Multilayer (4 LAYER) / Double sided (Normal PTH))
5. Solder mask & Silk Screen: YES (S.M to be epoxy green colour 17.5 microns thickness)
6. Type of protective plating: Solder coating on solderable areas
7. Copper Thickness


Total Copper thickness and film description (No. of plating joints shall not be more than 3, and PTH copper thickness shall be minimum 25 microns)	Layer Nos.& layup order	1	2	3	4
	Total Copper thickness in micron	70	70	70	70
	VCC / GND layers		GND	VCC	

15.3.2. Component Placement




15.3.3. Component List

PIC CIRCUIT (PIGGY BACK)							
Bill Of Materials							
Sl no	Reference	Description	Value	Mfr	Mfr Part #	Footprint	Qty
1	C1,C14	Capacitor	15 PF 16V 10%	AVX		SMD 0805	2
2	C3	E.Capacitor	220uF 16V 20%	Philips		Th Hole	1
3	C2,C4,C5	Capacitor	4.7 uF 16V 10%	AVX	TAJA475KO16RNJ	SMD 1206	4
4	C6,C8,C9,C10,C11,C12,C15,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C32,C33,C34,C35,C36,C37,C38,C39	Capacitor	100 nF 16V 10%	AVX		SMD 0805	29
5	C13,C16	Capacitor	33 PF 16V 10%	AVX		SMD 0805	2

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 46 of 48

6	C31	Capacitor	47 uF 10V 10%	AVX	TAJC476K010RNJ	SMD 2312	1
7	D1	LED	LED GREEN	Philips		SMD 1206	1
8	J1,J2	Connector	13x2 BURG Pin ST	FCI		Th Hole 2.54mm	2
9	J3	Connector	5Pin Mu ST Male CON	FCI		Th Hole 2.54mm	1
10	J4	Connector	RJ45 Ethernet 10/100 Base	Bel Fuse Inc	BM0810-1X1T-06	Th Hole	1
11	L1	Inductor	FERRITE BEAD 1.5A 100Mhz	Steward	MI0805K400R-10	SMD 0805	1
12	R1	Resistor	0 E	Philips		SMD 0805	1
13	R2,R3	Resistor	9.6 K 1%	Philips		SMD 0805	2
14	R4,R9,R12,R13,R14,R15,R18,R19,R20,R21,R24,R28,R29	Resistor	10 k 1%	Philips		SMD 0805	13
15	R5,R10,R22,R23,R30,R31,R32,R33	Resistor	330 E 1%	Philips		SMD 0805	8
16	R6	Resistor	100 k 1%	Philips		SMD 0805	1
17	R7,R8	Resistor	2.4 K 1%	Philips		SMD 0805	2
18	R11	Resistor	1 M 1%	Philips		SMD 0805	1
19	R16	Resistor	2 K 1%	Philips		SMD 0805	1
20	R17,R25	Resistor	270 E 1%	Philips		SMD 0805	2
21	R26,R27,R34,R37	Resistor	49.9 E 1%	Philips		SMD 0805	4
22	R35,R36	Resistor	180 E 1%	Philips		SMD 0805	2
23	SW 2	Tact Switch	Tact Switch Rt Angle	Tyco	FSMRA2JH	Th Hole	1
24	SW1	Tact Switch	Tact switch-ST	Tyco	FSM2JH	Th Hole	1
25	U1	IC	ADP124-LDO3.3V	Analog Devices	ADP124ARHZ-3.3-R7	mini-S0-EP 8P	1
26	U2	IC	AT45DB011D	Atmel	AT45DB011D	SOIC 8P	1
27	U3,U7	IC	74HCT245D	NXP	74HCT245D	S020	2
28	U4	IC	PIC18F97J60	Microchip	PIC18F97J60	TQFP 100P	1
29	U5	IC	74HCT138D	NXP	74HCT138D	S016	1
30	U6	IC	74HCT374D	NXP	74HCT374D	S020	1
31	Y1	Crystal	32.768 KHz	Epson Toyocom corporation	MC-306 32.768K-E3	SMD	1

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 47 of 48

32	Y2	Crystal	25 MHz	Fox Electronics	FQ3225B-25	SMD	1
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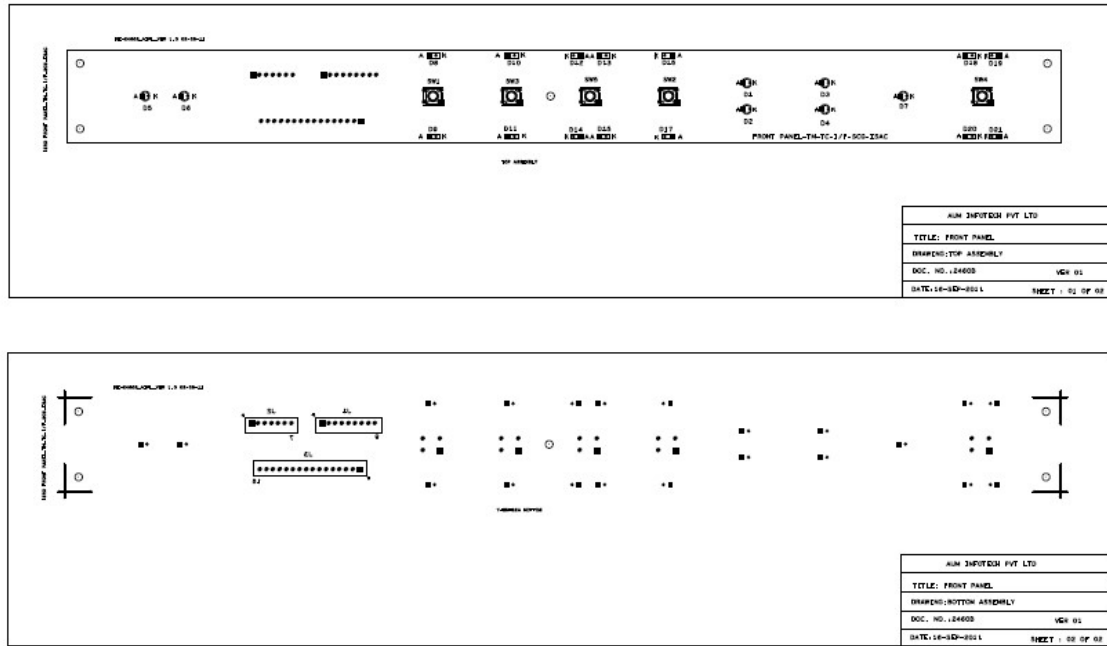
15.4. ANNEXURE-D: BILL OF MATERIALS - FRONT PANEL CARD

15.4.1. PCB Details

8. PCB dimension (Length x Width): 1 inch x 6 inch
9. PCB Thickness: 1.7 mm + 0.15mm
10. Base material: FR4, ϵ_r 4.5, $T_g > 175$ -Deg. Celsius
11. PCB Type: 2 LAYERS (Normal PTH)
12. Solder mask & Silk Screen: YES (S.M to be epoxy green colour 17.5 microns thickness)
13. Type of protective plating: Solder coating on solderable areas
14. Copper Thickness: 70 microns

Total Copper thickness and film description (No. of plating joints shall not be more than 3, and PTH copper thickness shall be minimum 25 microns)	Layer Nos.& layup order	1	2
	Total Copper thickness in micron	70	70
	VCC / GND layers	-	-

15.4.2. Component Placement



15.4.3. Component List

FRONT PANEL

Bill Of Materials

Sl NO	Reference	Description	Value	Mfr / part no	Footprint	Qty
1	D1,D2,D3,D4,D5,D6,D7	LED	Green LED 3 mm Round	osram	Th Hole	7
2	D8,D9,D10,D11,D12,D13,D14,D15D16,D17,D18,D19,D20,D21	LED	White LED Rectangle 2 x 5 mm	osram	Th Hole	14
3	J1	Connector	Mu CON 9 Pin Male 2.54mm pitch	Molex	Th Hole	1
4	J2	Connector	Mu CON 7 Pin Male 2.54mm pitch	Molex	Th Hole	1
5	J3	Connector	Mu CON 16 Pin Male 2.54mm pitch	Molex	Th Hole	1
6	SW1,SW2,SW3,SW5	Tact Switch	Tact Switch Straight 6 x 6 mm	Tyco / FSM8JH	Th Hole	4

15.5. ANNEXURE-E: BILL OF MATERIALS - CONNECTORS & WIRING

15.5.1. MECHANICAL CONFIGURATION OF THE INSTRUMENT

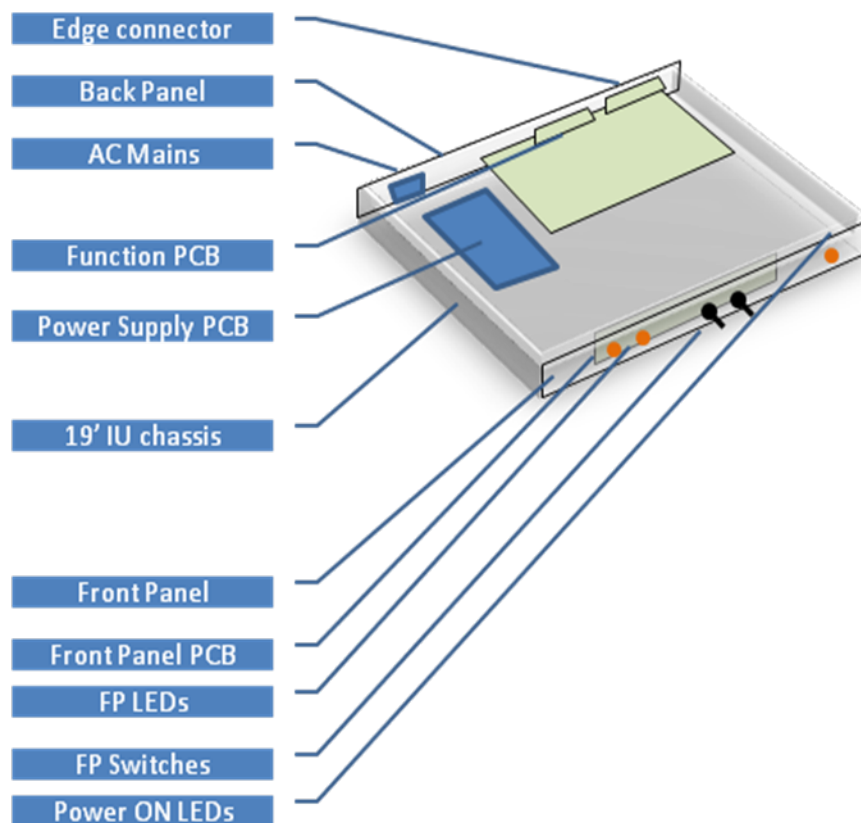



Figure: Mechanical configuration of the Instrument

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 50 of 48

15.5.2. UNIT WIRING

15.5.2.1. Internal wiring and placement of PCBs shall be as shown below.



15.5.2.2. 12V DC inlet and fuse shall be incorporated in back panel

15.5.2.3. 12V DC ORing diodes shall be incorporated in wiring.

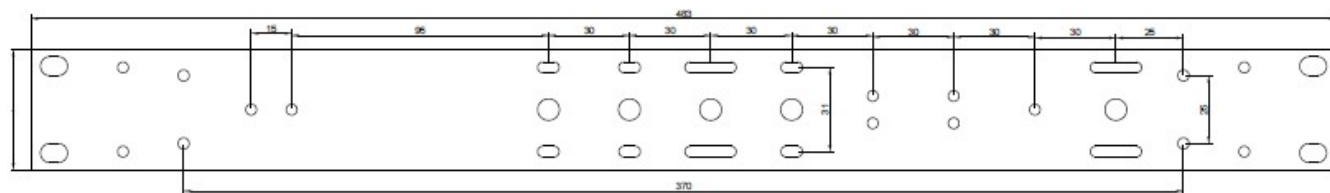
15.6. ANNEXURE-F: EQUIPMENT ENCLOSURE

15.6.1. Mechanical Description - Subrack

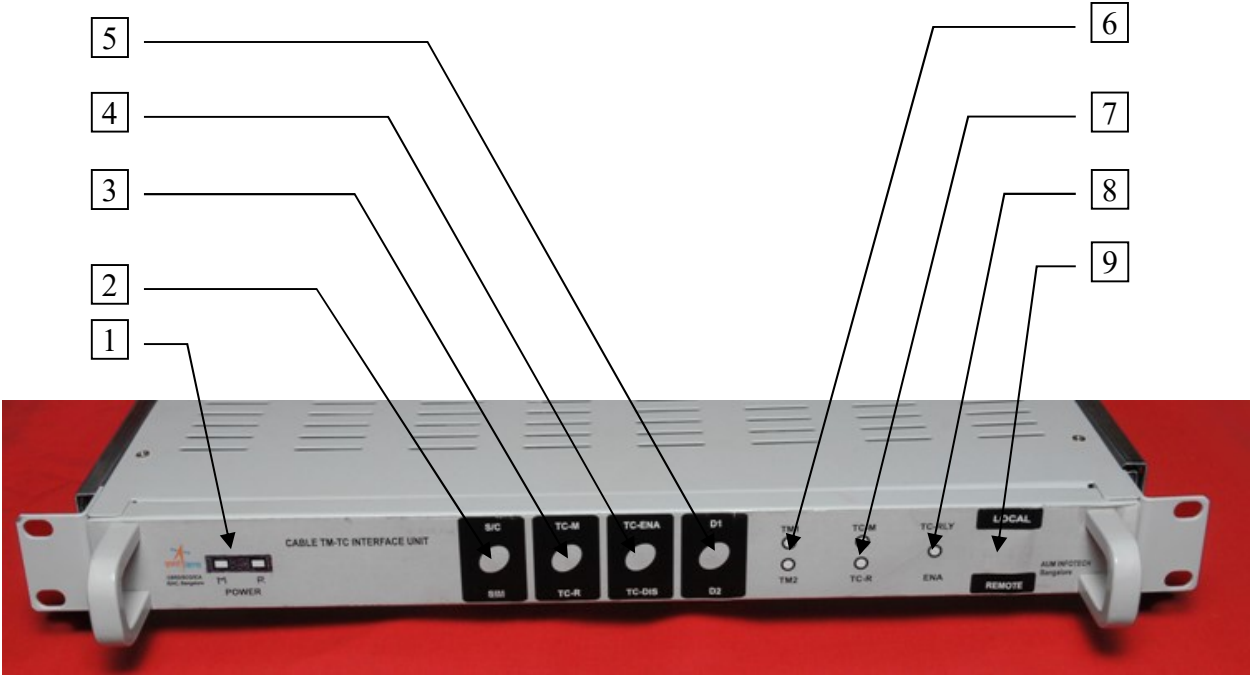
15.6.1.1. PCB and Module mounting points shall be welded to base plate, such that no screw heads are visible on the bottom exterior.

15.6.1.2. Shall provide harness anchoring points on the bottom plate

15.6.2. Mechanical Description - Front Panel



15.6.3. Front Panel controls

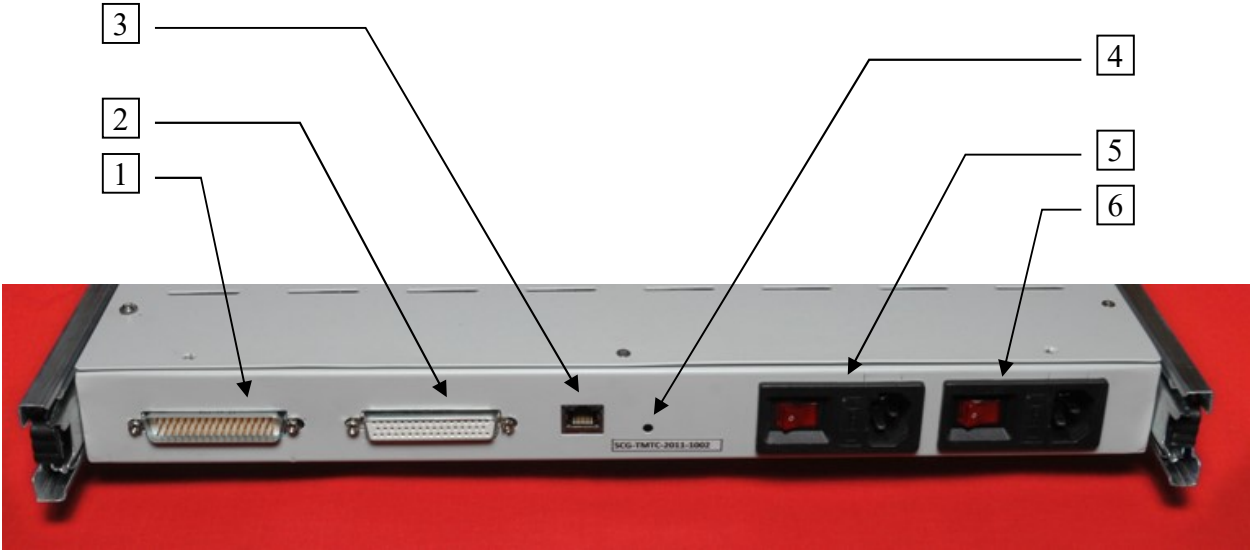


Location	FUNCTION	Switch / LED
1	MAINS	LED
2	Spacecraft / SIM	Push Button Switch with back-lit
3	TC-MAIN / TC-REDT	Push Button Switch with back-lit
4	TC –ENA/DIS	Push Button Switch with back-lit
5	D1, D2	Push Button Switch with back-lit
6	TM1, TM2	LED
7	TC-M, TC-R	LED
8	TC	LED
9	LOCAL / REMOTE	LED

15.6.4. Front Panel Screen Print

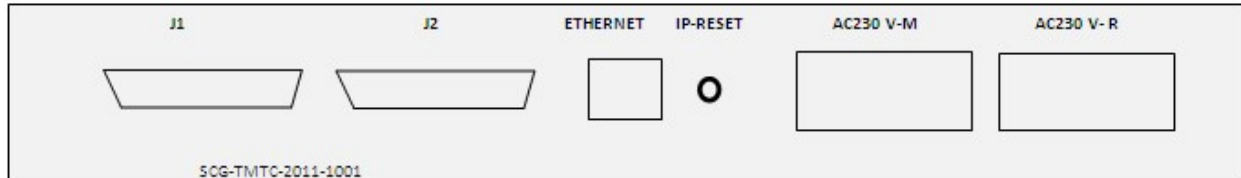


15.6.5. Back Panel connectors



Location	Connector
1	J1 (D50)
2	J2 (D50)
3	J3 (RJ-45)
4	RESET (push button)
5	AC IN (MAIN)
6	AC IN (REDT)

15.6.6. Back Panel Screen Print




15.6.7. Telescopic Slide

Set of telescopic slide for Zero Stacking with loads capacity of 10kg, with rack mounting flanges
//specification/part no


15.7. ANNEXURE-G: PCB DESIGN GUIDELINES

- 15.7.1.1. No separate analog and digital ground plane. Maintain Single GND plane for entire circuit
- 15.7.1.2. Provide dedicated PCB layer for GND plane
- 15.7.1.3. Power supply decoupling capacitors shall be placed close to IC's power pin
- 15.7.1.4. Avoid long routings.
- 15.7.1.5. Use controlled impedance traces, wherever specified in Schematic
- 15.7.1.6. Every signal shall have shortest return path, provide GND plane below live paths
- 15.7.1.7. Signal shall be routed in top and bottom layers, preferably.
- 15.7.1.8. Traces for Power Should be wide (40 mil). Allocate a layer fully for POWER plane.
- 15.7.1.9. Provision for heat sink shall be provided for high power dissipating devices
- 15.7.1.10. Running different signals parallel to each other shall be minimized
- 15.7.1.11. Reduce the no of via in signal path
- 15.7.1.12. Provide component reference for pin 1 of ICs, polarity of capacitors and diodes including LEDs in silk screen
- 15.7.1.13. Standard Component to Component spacing to be followed
- 15.7.1.14. Standard Component to Board outline spacing to be followed
- 15.7.1.15. Standard spacing between copper to board outline to be followed
- 15.7.1.16. Use thermal via on GND plane, wherever required

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024 Issue: A Rev: 00 Page 56 of 48
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15.8. ANNEXURE-H: GUIDELINE FOR MARKINGS ON EQUIPMENT

- 15.8.1.1. The 'ISRO logo' and the entity name ('SCG/URSC, Bangalore') shall be shown prominently on the front panel of the equipment.
- 15.8.1.2. The panel screen print design shall be submitted to URSC for approval, before printing.
- 15.8.1.3. Unique serial number for the equipment shall be obtained from URSC and the serial number shall be painted on the back panel as indicated in the back panel drawing.


 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024
		Issue: A Rev: 00 Page 57 of 48

15.9. ANNEXURE-J : FABRICATION GUIDELINES

- Tools and Equipment: Tools shall be suitable for the purpose intended and shall cause no damage to the parts, board and solder connections.
- Component Tinning & Cleaning: Tinning of the components is mandatory. Clean the component if required in isopropyl alcohol before mounting on PCB
- Soldering: Soldering shall be free from bridging, blow hole, pin hole, crack/dry solder, excess solder and avoid damage to sensitive components.
- Wires / Harness: Sharp bends in wires and harness shall be avoided. Harness shall not have frictional contact with any mechanical part. Use Teflon grommet of suitable shape and size whenever a wire or harness passes through a metallic part. Wires shall not be pulled, twisted or stressed during assembly. Harness bunch shall be free from dirt, chips, loose hardware and lacing tape scraps etc.
- All cards shall be stored and handled in conductive bags only. Wiremen/ test personnel shall wear well-grounded conductive wrist bands.
- PCB: PCBs shall be stored prior to component mounting or after wiring in a controlled environment, in order to avoid corrosion and oxidation problem, which impairs the performance of the PCB/wired assembly.
- Harness: Harness fabrication and routing as per approved drawing only. Harness shall be properly fixed to chassis, shall not touch any sharp metal surfaces
- Connectors shall be covered with anti-static dust caps
- Post fabrication inspection shall be carried-out

15.10.ANNEXURE-K : ESD CONTROL GUIDELINES

- Use static sensitive zone sign to alert the personnel about ESD control

 SCG, URSC	Development, Fabrication and Testing of TM-TC INTERFACE UNIT	Doc. No: SCG-OCOS-TMTC-2024-01 Issue Date: 30-09-2024 <hr/> Issue: A Rev: 00 Page 58 of 48
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- Wear anti-static aprons
- Use anti-static wrist strap
- Use conductive flooring, don't use vinyl and wax finished floors.
- Use conductive mat in work surface. Avoid synthetic and Formica mats
- Chairs shall be conductive, do not use wooden and fiber glass chairs
- Store ESD sensitive components and assemblies in conductive (ESD safe) bags. Don't use polythene bags
- Avoid use of compressed air gun
- Avoid equipment like printers, copiers and CRT monitors near ESD sensitive assemblies.
- Use of ionized air blowers
- Handle ESD sensitive device by holding on body rather than pins
- Handle ESD sensitive assemblies by holding on chassis rather than circuitry
- Ensure ESD grounding every day

15.11.ANNEXURE-L: WIRE SPECIFICATIONS

Teflon PTFE Insulated Silver Plated Copper Wires specifications

<u>Parameter</u>	<u>Specification</u>
Conductor	Stranded conductor made of Silver plated copper wire with a silver coating > 1.00 micron
Insulation Breakdown Voltage	600 Vrms Min
Conductor Tensile strength	303 N/mm ² Max
Operating temperature	0°C to 50 °C
Conformance	JSS 51034
Overall Insulation	Teflon

26 AWG Teflon Insulated Silver Plated Copper Wires spool details between function card to front panel card. Different colorsto be chosen accordingly

20 AWG Teflon Insulated Silver Plated Copper Wires spool details between function card to power supply card, power supply card to AC-DC converter.

- Wire spool Test report from manufacturer shall be provided to URSC

15.12.ANNEXURE-M: PCB SPECIFICATIONS

PCB SPECIFICATIONS

S/N	CHARACTERISTICS	NOMINAL VALUES									
1	PCB (Card) Name / no.	To be printed on PCB in copper text									
2	Base material and dielectric constant	FR4, ϵ_r 4.5, Tg > 175-Deg. Celsius									
3	PCB Type	Multilayer (4 LAYER) / Double sided (Normal PTH)									
4	Total PCB Thickness with tolerance (metal to metal)	1.7 mm \pm 0.15mm									
Total Copper thickness and film description (No. of plating joints shall not be more than 3, and PTH copper thickness shall be minimum 25 microns)		Layer Nos.& layup order	1	2	3	4					
		Total Copper thickness in micron	70	70	70	70					
		VCC / GND layers		G N D	V C C						
5	Track width	Track width should be \geq 8 mil									
6	Finished pattern variation compared to films	a) Increase 0.00mm b) Maximum decrease in pattern shall not exceed double the copper thickness									
7	Type of protective plating	Solder coating on solderable areas									
8	Solder mask required	Yes	Colour Green	Thickness 17.5 micron minimum	Material Epoxy						
9	Legend printing	Required.									

SOLDERING AND PCB QUALITY

Solder joint should be free from pin/blow hole, excess solder, insufficient solder. It should be shiny and have a smooth surface. Component mounting should be uniform and proper. Component lead bending should be free from nic/damages.

