

**PURCHASE SPECIFICATION
FOR
MANUFACTURING & TESTING
OF
COMPLETE IOD ELECTRONICS RACK
(RKIOD.812)**

Specification No. : PS407183
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PREPARED BY



APPROVED BY



CONTROL EQUIPMENT ENGINEERING DIVISION

The specification is for the requirement of the IOD Electronics rack and its spare component developed through BHEL Corp. R&D PO no. **58150258-1-01** based on technical specification **ANNEXURE-1** of BHEL Corp R&D. The complete IOD electronics Rack is a combination of various Electronics card assembly and precision mechanical structure.

1. GENERAL

This specification covers the requirements of infrastructure, quality of manpower considered essential for quality and reliability of design ,development , manufacturing testing & supply of various high tech Electronics cards//modules involving multilayer PCBs , ASICs , SMT components and digital electronics components like FPGA, DSP , Micro controllers , Micro processors etc .

The supplier should confirm availability of the required infrastructure and manpower in technical bid as given in this specification.

a INFRASTRUCTURE FACILITIES

The supplier should have the following manufacturing facilities :

1. Dust Free environment for card assembly.
2. Stencil Printer .
3. Automatic Glue Dispenser
4. High speed component placement machine
Following features would be preferred :
 - Board size capability - 400 mm x 300 mm min.
 - Placement Range - 0603 to SOIC's , 0402 compatible
5. Dual wave Soldering machine
6. 4 zone Reflow oven
7. Digital / Analog Temperature controlled solder stations .
8. Component lead forming machines.
9. Details of Electrostatic discharge protection
& ESD procedure adopted to be submitted with offer .
10. Semi Automatic component insertion machines.

b. TESTING FACILITIES :

The supplier should have the following test facilities :

- (a) Digital oscilloscope Dual channel Min.100 MHZ Band width with following advance features would be preferred. .
 - Advanced signal processing
 - TDR measurement
 - Eye pattern analyzer
 - Cross talk and ringing analysis

- (b) Spectrum analyzer with following features preferably :-
 - Electromagnetic Interference Analysis.
 - High frequency analysis.
 - Harmonic Distortion Measurement.
 - AM / FM Measurement

- (c) Multi channels / 100 MHZ band width logic analyzer
- (d) Multi channels Digital Pattern Generator.
- (e) Computer added Functional Testing facilities for electronic card.

c. Qualified Manpower

Supplier should have at least engineering graduate (electronics) who would be responsible for execution of order . Experience in multilayer PCB manufacturing using latest state of art technology components like SMT , digital electronics components, ASICS & microcontrollers would be preferred. Technical persons responsible for the execution of the contract should be competent enough to substitute / suggest suitable alternatives for the components which are getting obsolete / not available in the market .

Based on technical bid received from supplier , BHEL may depute their team of engineers for on spot inspection at supplier works for confirmation of infrastructure facilities available with the party before considering them for assigning the contract.

d. Experience

Supplier to confirm at least 2 orders have been executed by them involving latest state of art components as mentioned in the specification. Supplier to submit copies of purchase order /contract of such orders executed in past involving SMT components, microcontroller/DSP or ASIC based cards .

e. Willingness for Confidentiality Agreement

Supplier to confirm their willingness for unconditional confidentiality agreement on stamp paper as per the attached annexure A to qualify for their consideration in technical scrutiny of tender.

2. SCOPE OF WORK & Technical requirement

A. SCOPE OF WORK:

Bidder to Design & develop PCB manufacturing documents / PCB Gerber files & test jig and take approval on the same from BHEL before arranging the PCBs and testing of the card .

I. Manufacturing & Supply of Complete IOD electronics rack comprising of following cards :-

- | | |
|---|--------|
| ➤ Binary Input electronics Card (DI2401) | 6 nos. |
| ➤ Binary output electronics Card (DO2001) | 2nos. |
| ➤ 4 to 20 mA analog input electronics Card (AI1601) | 2 nos. |
| ➤ Bus coupler electronics Card (BCRT01) | 2 nos. |
| ➤ CT/PT Electronics card (AI0302) | 2 nos. |
| ➤ Assembly of complete Electronics Rack with Backplane. | 1 no. |
| ➤ Axial Fan with 230V AC input & 119x119mm frame size | 2 no. |

II. Testing of individual cards.

III. Testing of complete electronics rack with test jigs for functionality and communication.

Test schedules for the modules will be provided by BHEL to the successful bidder only. Two copies of Test Certificate for each card to be provided by the party along with consignment for each of the card supplied by them after assembly and testing.

Supplier to provide Programmable tools (supplier's own or /and third party instruments, software/GUI) for downloading and modifying software for individual PCB's and complete Rack free of cost.

B. QUALITY OF ELECTRONIC CARD ASSEMBLY:

The module shall be used in traction application, the quality of the assembly , soldering, handling of the components & assembled cards(EMI/EMC), sourcing of semiconductor components are of vital importance. Therefore, each of the above should be carefully monitored and sources of the components must be from OEM/reputed international farms who adhere to strict quality norm.

To improve, maintain Quality, and highest level of reliability, it is essential to generate statistical data of any failure during testing and also after burn in, rework done. So, that



improvement in the assembly and process can analyzed. Supplier should provide the statistical report to BHEL.

C. FITTINGS OF CARDS & MECHANICAL ASSEMBLY:

As quality of soldering is predominant in performance of the individual electronics card, final assembly like fixing heat sinks with MOSFETS, fixing of vertically mounted cards, electrolytic capacitors, fiber optic connectors are crucial for reliable functioning of the modules in traction application. Supplier must ensure use of proper size of hardware and insulating fixing material. All hardware are of stainless steel. Each fixing screw must contain proper plain washer & spring washer.

D. CONFORMAL COATING OF THE PCB'S:

Conformal coating is very essential for long life and trouble free operation in dusty and hazardous environment. The conformal coating should be in line with ABB document, It is recommended multiple layers of coating is applied on each PCB's and proper time delay between two layers of coating is followed.

CAUTION:

1. Before applying coating, the PCB's should be tested in all respect.
2. All contacts for connectors and test points & **fiber optic ports** must be protected thoroughly by providing suitable cover on it. This cover only be opened after the coating is dried up.
3. Standard EMI/EMC protective norms must be followed during the entire process.

F. TESTING & TEST REPORTS:

The test schedule calls for testing of individual cards and complete assembly. Each module should comply 100% with the test parameters as per the test schedule. Each module has to be burn-in at 60 Degree C for minimum 2Hour. Test result shall be generated and complied for every module with each cards.

Type Test compliance:

The complete electronics rack should be complied with following type tests and certificate for the same to be provided by the supplier.

| Type Testing / Environment Testing For electronics RACK | | | |
|--|--------------------|------------------|---|
| Sr.No | Test | Standard | Specification |
| EMI / EMC Test | | | |
| 1 | Conducted Emission | CISPR 11 Class A | Quasi peak: 150kHz-500kHz, 79 dBµV, 500kHz-30 MHz, 73 dBµV Average: 150kHz-500kHz, 66 dBµV 500kHz-30 MHz, |

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|-------------------------------|---|--|---|
| | | | 60 dB μ V |
| 2 | Radiated Emission | CISPR 11 Class A | Quasi peak: 30-230MHz, 40dB μ V at 10m measurement distance 230-1000 MHz, 47 dB μ V at 10m measurement distance |
| 3 | Radiated susceptibility | IEC 61000-4-3 | 80 MHz-1000MHz, 30V/m |
| 4 | Conducted RF Immunity | IEC 61000-4-6 | Power port: 0.15-80MHz :10Vrms 1kHz, 80% AM Signal port: 0.15-80MHz :10Vrms 1kHz, 80% AM |
| 5 | Power Frequency Magnetic field | IEC 61000-4-8 | 100 A/m for continuous 1min 1000 A/m for 3 sec |
| 6 | Ring Wave immunity | IEC 61000-4-12 | Power Port: non-repetitive damped oscillatory transients (ring waves) with 2 kV line to ground as voltage of the first peak (maximum or minimum) in the test waveform & 1kV line to line as voltage of the first peak (maximum or minimum) in the test waveform Signal port: non-repetitive damped oscillatory transients (ring waves) with 1 kV line to ground as voltage of the first peak (maximum or minimum) in the test waveform & 0.5kV line to line as voltage of the first peak (maximum or minimum) in the test waveform |
| Environment Test | | | |
| 7 | Damp Heat Test - Steady State | IEC 60068-2-78 | +40°C / 4 days / 93% RH |
| 8 | Cold Test - Operating | IEC 60068-2-1 | - 40°C / 16 H |
| 9 | Dry Heat Test - Operating | IEC 60068-2-2 | +70°C / 16 H |
| 10 | Damp Heat Test Cyclic | IEC 60068-2-30 | +55°C,95% RH / 6 Days |
| Mechanical Stress Test | | | |
| 11 | Vibration (during operation and Transportation) | IEC 60255-21-1 Vibration Response - Powered ON, Class 1 | Acceleration: 1g from 10 to 150Hz, 1 sweep in each axis total 3 axes |
| | | IEC 60068-2-6 | Acceleration: 1g from 10 to 150 Hz 20 sweep |
| Dielectric Test | | | |
| 12 | Dielectric Test | IEC60255-27 Cl no. 10.6.4.3; cl no. 10.6.4.3.3 table no. 14 | For Power Supply, Ct & PT - AC test voltage 2 kV For digital I/O, analog I/O & 4 to 20 mA I/O - AC test voltage 0.5 kV |

3. DOCUMENTS TO BE SUBMITTED TO BHEL FOR APPROVAL .

While executing the PO, supplier shall submit to BHEL and take approval for the following documents for each of the modules mentioned in the enquiry.

1. Test Certificate
2. Burn-in test report

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3. Warranty certificate
4. Card Schematics
5. BOM

4. WARRANTY.

PCB/ modules along with all the components mounted thereon shall be guaranteed for 30 months from the date of supply or 24 months from date of commissioning whichever is earlier.

5. SERIAL NUMBERING / IDENTIFICATION .

All the individual cards and complete rack to be numbered as per following convention:

CARD NAME or RACK NAME/WORK ORDER NO./MMYY-Serial no.

Work Order no. shall be provided by BHEL

5. Document to be submitted with technical Bid

Following document duly filled must be submitted by the bidder party as annexure to their **technical bid** (to be kept in separate sealed envelope) . Otherwise bid will be technically rejected.

A. Infrastructure details

| SNo. | Description/Equipment | Make / details # |
|------|---|---|
| 1 | Dust Free environment for card assembly | Area to be specified with temperature & humidity information. |
| 2 | Automatic Glue Dispenser | |
| 3 | High speed component placement machine | |
| 4 | Dual wave Soldering machine | |
| 5 | 4 zone Reflow oven | |
| 6 | Digital / Analog Temperature controlled solder stations | |
| 7 | Component lead forming machine | |
| 8 | Details of Electrostatic discharge protection & ESD procedure adopted . | |
| 9 | Semi Automatic component insertion machines | |
| 10 | Digital sampling oscilloscope Dual channel Min.100 MHZ Band width . | |

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| | | |
|----|---|---|
| 11 | Digitizing oscilloscope with Min.100MHz band width | |
| 12 | Multi channel Spectrum analyzer | - |
| 13 | Multi channels , 100 MHZ band width logic analyzer | |
| 14 | Multi channels Digital Pattern Generator. | |
| 15 | Multi channel temperature scanner. | |
| 16 | Computer aided Functional Testing facilities for electronic card. | |

Machine details like model / Type No. make ,features ,capacity etc to be given.

- B. Qualified manpower details
- C. Confirmation for Confidentiality agreement
- D. Details of the order executed (see Para 1-d)