

PURCHASE SPECIFICATIONS

FOR

SET OF

TB INTERFACING ELECTRONICS CARDS

FOR

BHEL Bpl-CoMoS



SPECIFICATION NO. : PS407170

REVISION NO. : REV 01

DATE OF REVISION : 27/09/2016

DISTRIBUTION : AS PER REQUIREMENT

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ISSUED BY

**CONTROL EQUIPMENT ENGINEERING DIVISION
BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL**

GENERAL SPECIFICATIONS: Set of TB interfacing electronics cards for BHEL Bpl-CoMoS

The specification is in two parts namely part-A related to technical requirements of this tender specification and part- B related to commercial requirements of these tender specifications.

Supplier to ensure the following while submitting the bid:

There should be one sealed envelope mentioning enquiry number and opening date on top of envelope. This envelope should consist of two sealed individual envelopes – one for technical bid and another for commercial bid . Enquiry No., opening date and bid type i.e. Technical / Commercial should also be mentioned on each individual envelope. On tender opening date only technical bid will be opened while commercial bid will only be opened for those parties who would be found technically suitable acceptable by BHEL in line with technical requirement of the specifications .

PART-A (Technical Requirements)

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.

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

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 - 475 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 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. Supplier should be thoroughly conversant with the latest electronics control rack technology.

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

1. SCOPE :

This specification applies to the requirement of TB interfacing electronics cards for BHEL Bpl-CoMoS

Following items are included in the requirement of this purchase specification:

I. ITEM 1 (BP9048107164) comprising of following set of TB interfacing cards for GT:

- | | |
|---|-------|
| a) TB interfacing card 219.1/GN/HM/IL as per BHEL dwg no. 36730100004 | 1 no. |
| b) TB interfacing card 219.1/EP as per BHEL dwg no. 36730100005 | 1 no. |
| c) TB interfacing card 219.1/FO as per BHEL dwg no. 36730100006 | 1 no. |
| d) TB interfacing card 219.1/DQ as per BHEL dwg no. 36730100007 | 1 no. |
| e) TB interfacing card 219.1/ABCRST as per BHEL dwg no. 36730100008 | 2 no. |
| f) Surge protection card as per BHEL dwg no. 36730100079 | 6 no. |

II. ITEM 2 (BP9048107172) comprising of following set of TB interfacing cards for ICT:

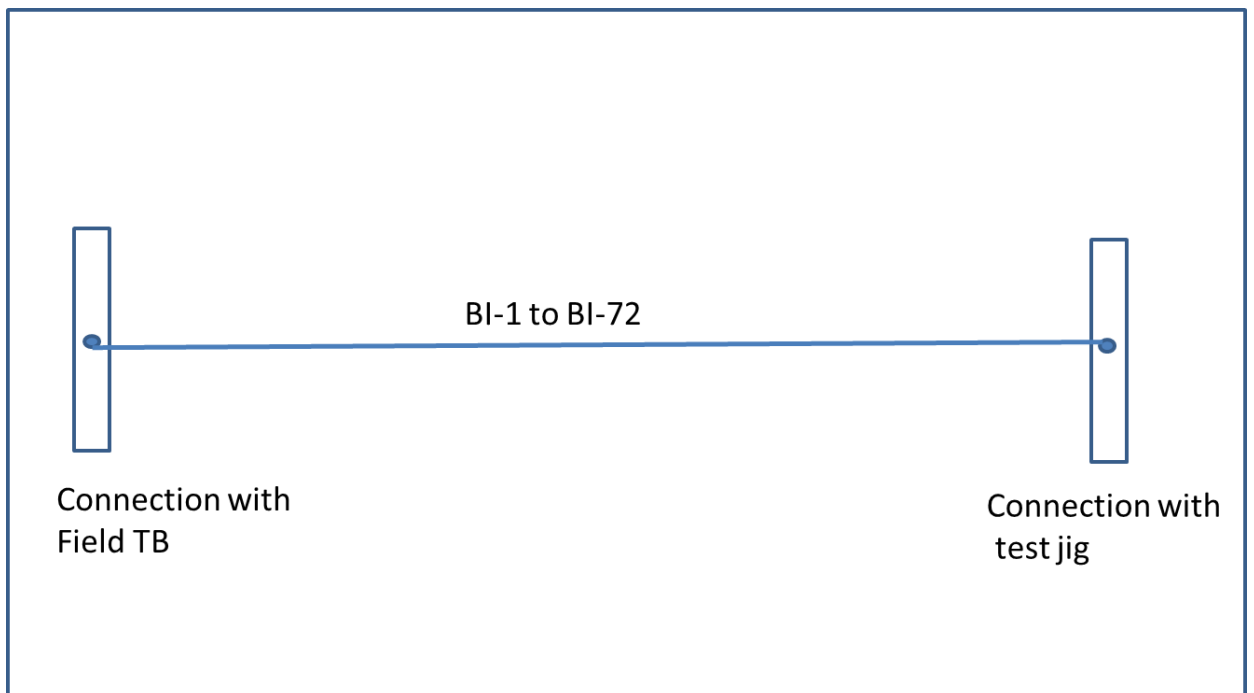
- | | |
|---|-------|
| a) TB interfacing card 219.1/GN/HM/IL as per BHEL dwg no. 36730100004 | 1 no. |
| b) TB interfacing card 219.1/EP as per BHEL dwg no. 36730100005 | 1 no. |
| c) TB interfacing card 219.1/FO as per BHEL dwg no. 36730100006 | 1 no. |
| d) TB interfacing card 219.1/DQ as per BHEL dwg no. 36730100007 | 1 no. |
| e) TB interfacing card 219.1/ABCRST as per BHEL dwg no. 36730100008 | 2 no. |
| f) Surge protection card as per BHEL dwg no. 36730100079 | 6 no. |

1.0 TB interfacing card 219.1/GN/HM/IL

Mechanical dimensions & connector/components type: as per BHEL dwg no. 36730100004

Block Schematic

1. COPPER CLADDING SHOULD NOT BE LESS THAN 70 MICRONS.
2. TRACK WIDTH TO BE MAINTAINED FOR CURRENT UPTO 8A.
3. PCB TO BE PTH TYPE.
4. PCB TO BE UL MARKED.
5. PINS OF ALL THE CONNECTORS TO BE GOLD PLATED TYPE.



NOTE: gnd to be shorted to the body gnd

Marking on connectors

Marking on Connector	Field Input
1	BI-1
2	BI-2
3	BI-3
4	BI-4
5	BI-5
6	BI-6
7	BI-7
8	BI-8
9	BI-9
10	BI-10

11	BI-11
12	BI-12
13	BI-13
14	BI-14
15	BI-15
16	BI-16
17	BI-17
18	BI-18
19	BI-19
20	BI-20
21	BI-21
22	BI-22
23	BI-23
24	BI-24
25	BI-25
26	BI-26
27	BI-27
28	BI-28
29	BI-29
30	BI-30
31	BI-31
32	BI-32
33	BI-33
34	BI-34
35	BI-35
36	BI-36
37	BI-37
38	BI-38
39	BI-39
40	BI-40
41	BI-41
42	BI-42
43	BI-43
44	BI-44
45	BI-45
46	BI-46
47	BI-47
48	BI-48
49	BI-49
50	BI-50
51	BI-51
52	BI-52
53	BI-53
54	BI-54
55	BI-55
56	BI-56
57	BI-57
58	BI-58
59	BI-59
60	BI-60
61	BI-61
62	BI-62
63	BI-63
64	BI-64

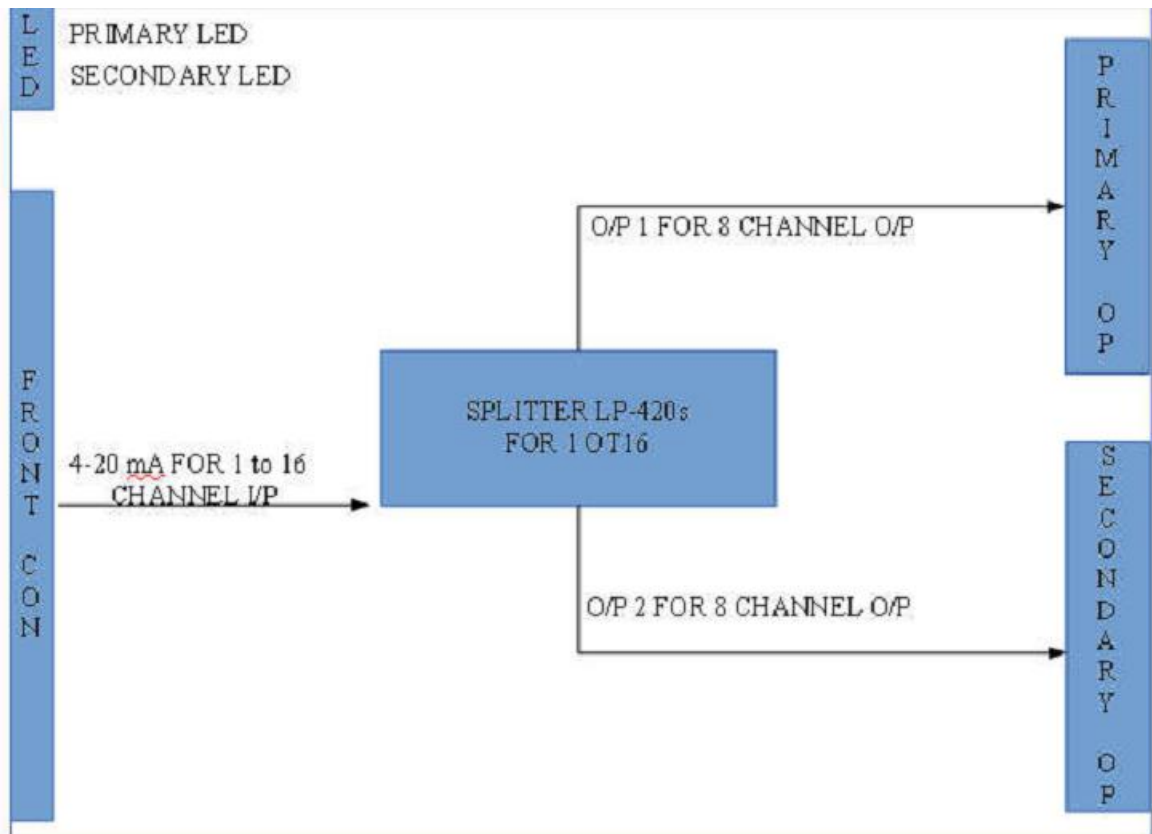
65	BI-65
66	BI-66
67	BI-67
68	BI-68
69	BI-69
70	BI-70
71	BI-71
72	BI-72
+24	+24
G	GND

2.0 TB interfacing card 219.1/EP

Mechanical dimensions & connector type: as per BHEL dwg no. 36730100005

Block Schematic

1. COPPER CLADDING SHOULD NOT BE LESS THAN 70 MICRONS.
2. TRACK WIDTH TO BE MAINTAINED FOR CURRENT UPTO 8A.
3. PCB TO BE PTH TYPE.
4. PCB TO BE UL MARKED.
5. PINS OF ALL THE CONNECTORS TO BE GOLD PLATED TYPE.



NOTE: All the channels to be tapped for test connector also.

Marking on connectors

Marking on Connector	Field Input (4-20mA) 219.1 / TB-AI
1	IN1+
2	IN1-
3	IN2+
4	IN2-
5	IN3+
6	IN3-
7	IN4+
8	IN4-
9	IN5+
10	IN5-
11	IN6+
12	IN6-
13	IN7+
14	IN7-
15	IN8+
16	IN8-
17	IN9+
18	IN9-
19	IN10+
20	IN10-
21	IN11+
22	IN11-
23	IN12+
24	IN12-
25	IN13+
26	IN13-
27	IN14+
28	IN14-
29	IN15+
30	IN15-
31	IN16+
32	IN16-
Marking on Connector	Primary IOD (4-20mA)
41	IN1+
42	IN1-
43	IN2+
44	IN2-
45	IN3+
46	IN3-
47	IN4+
48	IN4-
49	IN5+
50	IN5-
51	IN6+
52	IN6-
53	IN7+
54	IN7-
55	IN8+
56	IN8-
57	IN9+
58	IN9-
59	IN10+

60	IN10-
61	IN11+
62	IN11-
63	IN12+
64	IN12-
65	IN13+
66	IN13-
67	IN14+
68	IN14-
69	IN15+
70	IN15-
71	IN16+
72	IN16-
Marking on Connector	Secondary IOD (4-20mA)
81	IN1+
82	IN1-
83	IN2+
84	IN2-
85	IN3+
86	IN3-
87	IN4+
88	IN4-
89	IN5+
90	IN5-
91	IN6+
92	IN6-
93	IN7+
94	IN7-
95	IN8+
96	IN8-
97	IN9+
98	IN9-
99	IN10+
100	IN10-
101	IN11+
102	IN11-
103	IN12+
104	IN12-
105	IN13+
106	IN13-
107	IN14+
108	IN14-
109	IN15+
110	IN15-
111	IN16+
112	IN16-
G	GND
+24	+24
E	EARTH
121	P-X1-CHK-1
122	P-X1-CHK-2
123	P-X2-CHK-1
124	P-X2-CHK-2
125	P-X3-CHK-1

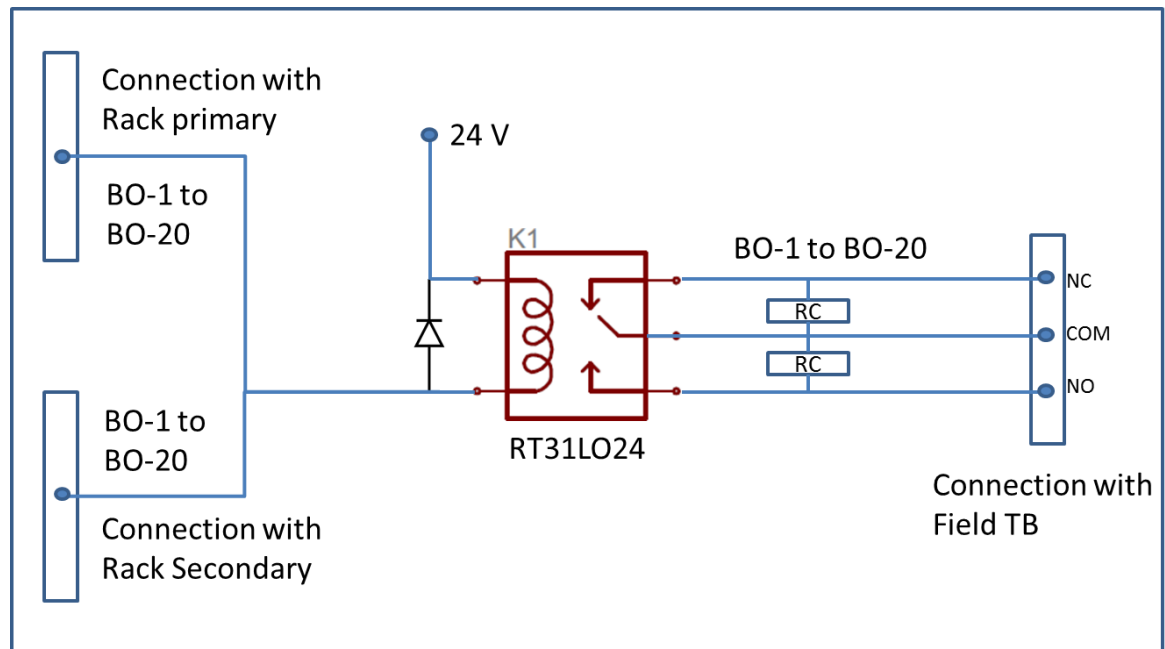
126	P-X3-CHK-2
127	S-X1-CHK-1
128	S-X1-CHK-2
129	S-X2-CHK-1
130	S-X2-CHK-2
131	S-X3-CHK-1
132	S-X3-CHK-2

3.0 TB interfacing card 219.1/FO

Mechanical dimensions & connector type: as per BHEL dwg no. 36730100006

Block Schematic

1. COPPER CLADDING SHOULD NOT BE LESS THAN 70 MICRONS.
2. TRACK WIDTH TO BE MAINTAINED FOR CURRENT UPTO 30A.
3. PCB TO BE PTH TYPE.
4. PCB TO BE UL MARKED.
5. PINS OF ALL THE CONNECTORS TO BE GOLD PLATED TYPE.



NOTE: All the channels to be tapped for test connector also.

Marking on connectors

Marking on Connector	Primary/Secondary Input
1	DO1
2	DO2
3	DO3
4	DO4
5	DO5
6	DO6

7	DO7
8	DO8
9	DO9
10	DO10
11	DO11
12	DO12
13	DO13
14	DO14
15	DO15
16	DO16
17	DO17
18	DO18
19	DO19
20	DO20
Marking on Connector	DO Output Connection
23	DO1-NC
22	DO1-COM
21	DO1-NO
26	DO2-NC
25	DO2-COM
24	DO2-NO
29	DO3-NC
28	DO3-COM
27	DO3-NO
32	DO4-NC
31	DO4-COM
30	DO4-NO
35	DO5-NC
34	DO5-COM
33	DO5-NO
38	DO6-NC
37	DO6-COM
36	DO6-NO
41	DO7-NC
40	DO7-COM
39	DO7-NO
44	DO8-NC
43	DO8-COM
42	DO8-NO
45	DO9-NC
46	DO9-COM
47	DO9-NO
48	DO10-NC
49	DO10-COM
50	DO10-NO
Marking on Connector	DO Output Connection
51	DO11-NC
52	DO11-COM
53	DO11-NO
54	DO12-NC
55	DO12-COM
56	DO12-NO
57	DO13-NC
58	DO13-COM

59	DO13-NO
60	DO14-NC
61	DO14-COM
62	DO14-NO
63	DO15-NC
64	DO15-COM
65	DO15-NO
66	DO16-NC
67	DO16-COM
68	DO16-NO
69	DO17-NC
70	DO17-COM
71	DO17-NO
72	DO18-NC
73	DO18-COM
74	DO18-NO
75	DO19-NC
76	DO19-COM
77	DO19-NO
78	DO20-NC
79	DO20-COM
80	DO20-NO
81	P-X1-CHK-1
82	P-X1-CHK-2
83	P-X2-CHK-1
84	P-X2-CHK-2
85	P-X3-CHK-1
86	P-X3-CHK-2
87	S-X1-CHK-1
88	S-X1-CHK-2
89	S-X2-CHK-1
90	S-X2-CHK-2
91	S-X3-CHK-1
92	S-X3-CHK-2
G	GND
+24	+24
E	EARTH

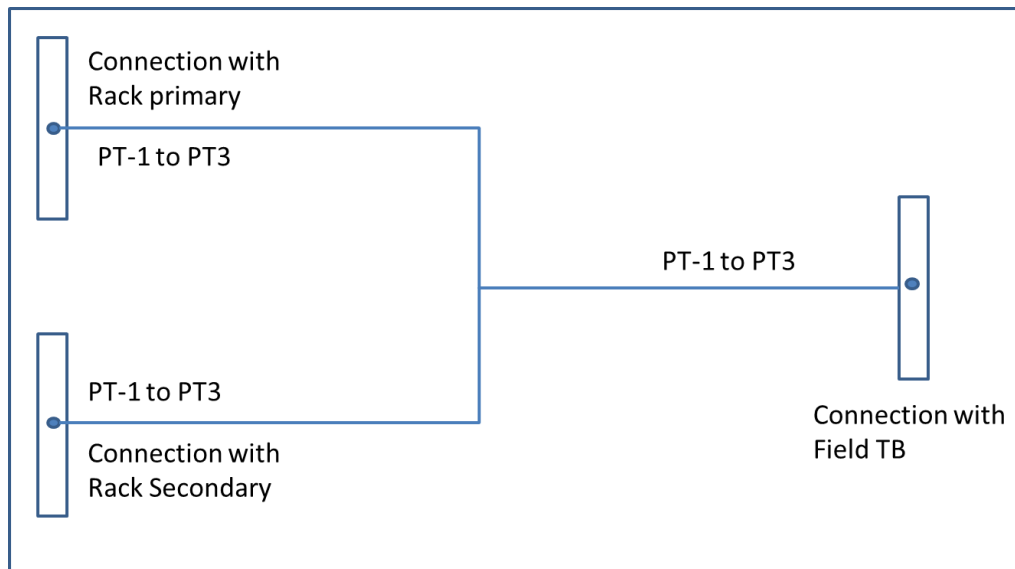
4.0 TB interfacing card 219.1/DQ

Mechanical dimensions & connector type: as per BHEL dwg no. 36730100007

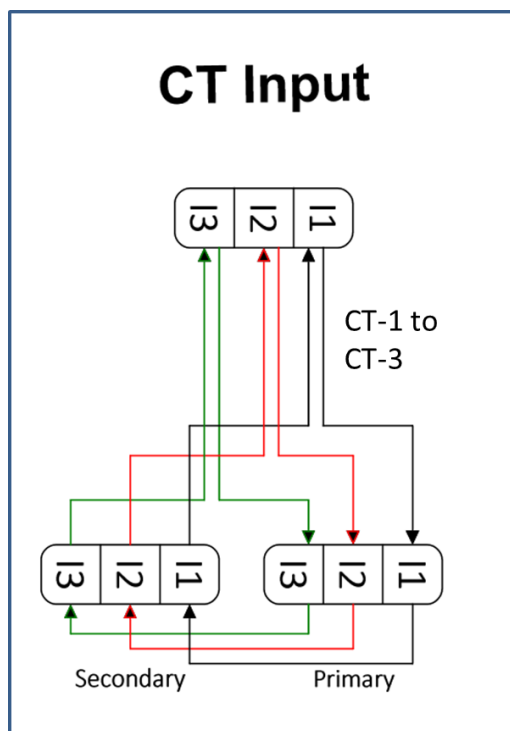
Block Schematic

1. **COPPER CLADDING SHOULD NOT BE LESS THAN 70 MICRONS.**
2. **TRACK WIDTH TO BE MAINTAINED FOR CURRENT UPTO 8A.**
3. **PCB TO BE PTH TYPE.**
4. **PCB TO BE UL MARKED.**
5. **PINS OF ALL THE CONNECTORS TO BE GOLD PLATED TYPE.**

FOR PT:



FOR CT:



**NOTE: All the channels to be tapped for test connector also.
Marking on connectors**

Primary PT Input	Marking on Connector
DQ/P-X1	
V1+	1
V1-	2
V2+	3
V2-	4
V3+	5
V3-	6

Secondary PT Input	Marking on Connector
DQ/S-X1	
V1+	7
V1-	8
V2+	9
V2-	10
V3+	11
V3-	12

TB/PT (Input from Field)	
V1 +	45
V1 -	46
V2+	47
V2-	48
V3+	49
V3-	50

Primary CT Input	Marking on Connector
DQ-P-X3	
current_in1	13
return_in1	14
current_relay_in1	15
current_relay_out1	16
current_in2	17
return_in2	18
current_relay_in2	19
current_relay_out2	20
current_in3	21
return_in3	22
current_relay_in3	23
current_relay_out3	24

Secondary CT Input	Marking on Connector
DQ-S-X3	
current_in1	25
return_in1	26
current_relay_in1	27
current_relay_out1	28
current_in2	29
return_in2	30
current_relay_in2	31
current_relay_out2	32
current_in3	33
return_in3	34
current_relay_in3	35
current_relay_out3	36

TB/CT (Input from Field)	
CT1+	51
CT1-	52
CT2+	53
CT2-	54
CT3+	55

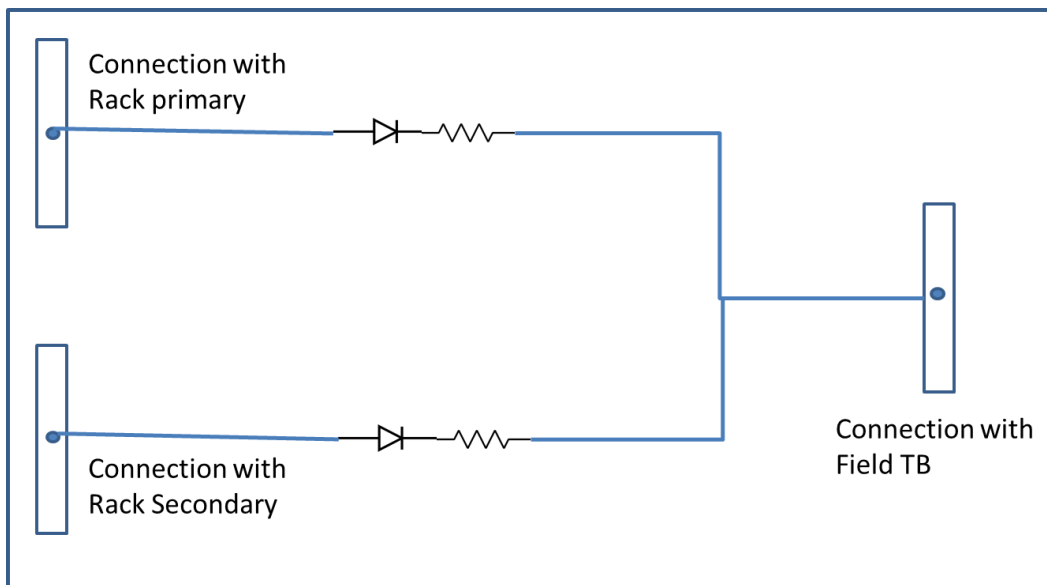
Marking on Connector	
+24	+24
G	GND
E	EARTH
37	PT-S-LED-1
38	PT-S-LED-2
39	PT-P-LED-1
40	PT-P-LED-2
41	CT-S-LED-1
42	CT-S-LED-2
43	CT-P-LED-1
44	CT-P-LED-2

5.0 TB interfacing card 219.1/ABCRST

Mechanical dimensions & connector type: as per BHEL dwg no. 36730100008

Block Schematic

1. COPPER CLADDING SHOULD NOT BE LESS THAN 70 MICRONS.
2. TRACK WIDTH TO BE MAINTAINED FOR CURRENT UPTO 20A.
3. PCB TO BE PTH TYPE.
4. PCB TO BE UL MARKED.
5. PINS OF ALL THE CONNECTORS TO BE GOLD PLATED TYPE.



Marking on connectors

Primary PS	Marking on Connector
PS1	
+24	1
+15	2
-15	3
+5	4
GND	G

Secondary PS	Marking on Connector
PS1	
+24	5
+15	6
-15	7
+5	8
GND	G

	Marking on Connector
OUTPUT	
+24	9
+15	10
-15	11
+5	12
GND	G

3. QUALITY OF ELECTRONIC CARD ASSEMBLY:

The cards shall be used in Power plants, 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 firms 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.

4. CONFORMAL COATING OF THE PCB'S:

Conformal coating is very essential for long life and trouble free operation in dusty and hazardous environment. 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 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.

5. WARRANTY.

PCB modules along with all the components mounted thereon shall be guaranteed for 24 months from the date of supply or 18 months from date of commissioning whichever is earlier.

TESTING & TEST REPORTS:

1. Each card has to be burn-in at 60 Degree C for minimum 2Hour. Test result shall be generated and compiled for all the cards.
2. Each card has to be cooling tested as per IEC 60571 cl 10.2.3.

Type Test compliance:

The complete set of cards should be complied with following type tests:

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 dB μ V, 500kHz-30 MHz, 73 dB μ V Average: 150kHz-500kHz, 66 dB μ V 500kHz-30 MHz, 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 Immunity RF	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

6. Documents to be furnished along with offer

- i) The schematic/PCB layouts of the card to be developed by the supplier in close consultation with BHEL.

NOTE: Supplier to get final schematic and BOM of the electronics cards approved from BHEL before going for production.

7. Documents required along with consignment

- i) User manual 6 copies
- ii) Electrical schematics

PART-B (COMMERCIAL REQUIREMENTS)

Bidder to submit commercial bid including details of scope of work , basis for scope of work and necessary price breakup for scope defined in 2 A/I & 2A/II of this specification and as BHEL enquiry calls for. Bid should also contain delivery time and payment terms, warranty offered for bidder's scope of work etc.

The commercial bid has to be kept in separate sealed envelope.