

**ELECTRONICS CORPORATION OF INDIA LIMITED**  
(A Government of India Enterprise)  
**RADIATION DETECTORS AND INSTRUMENTATION DIVISION**  
**CONTROL SYSTEMS GROUP**  
**ECIL POST, HYDERABAD – 500062, INDIA**

Telephone: +91-40-27182714

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**TENDER DOCUMENT**  
**FOR**  
**TWO PART BID**  
**FOR**

**DESIGN, DEVELOPMENT, TESTING & SUPPLY OF**  
**“NIS ATE”**

**TENDER No. ECIL/PUR/RID/3400-342720**


**DUE DATE: 26 / 05 /2013**

1 of 60

  
वाई.वी.वी.एस.बी. बोस  
Y.V.V.S.B. BOSE  
उप महा प्रबंधक/Dy. General Manager  
आर आई डी/क्रय/ई सी आई एल  
RID/PURCHASE/ECIL  
हैदराबाद/HYDERABAD-500 062.

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**INSTRUCTION SHEET**

Instruction to tenders indicating the tender number, due date and time of receipt of tender, places at which tender can be submitted and the date/time and venue wherein the tenders will be opened.

Tender No. : ECIL/PUR/RID/3400-342720

1.0 Last date and time for receipt of both “part –I” ( technical bid) and “Part-II” ( Price bid) of the tender in sealed enveloped at the following address	: 26 / 05 /2014 16:00 hrs
Mr. YVVS B Bose, Dy. General Manager( Purchase) Radiation Detectors & Instrumentation Division, Control Systems Group, ECIL , ECIL Post Hyderabad - 500062	
2.0 Date & Venue of opening the tenders	: 27 /05 /2014 13: 30 hrs PURCHASE , RID , ECIL HYDERABAD - 500062
Mr. YVVS B Bose, Dy. General Manager( Purchase) Radiation Detectors & Instrumentation Division, Control Systems Group, ECIL , ECIL Post Hyderabad - 500062	

  
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3.0 The vendor shall take note of the following important aspects of the two part tendering

3.1 Two Part Tender shall be defined as under:

“Part-I” Technical Bid consist of

- a. Unpriced schedule as per section Section E (with out price information)
- b. Compliance to Qualification & Evaluation criteria as per section A (table 1) with supporting documentation. Financial status shall include copies of Balance Sheet, P&L account, and IT returns for past 3 years.
- c. Compliance to our generalm terms & conditions and details of taxes, freight and insurance etc. as per Section D
- d. Technical data indicating the compliance to Section C and Annexures 1- 5 with design methodology, data sheets & other supporting litratures etc.
- e. Deviation from our technical specification ( refer setion C and Annexures 1-5)

“Part-II” Price Bid consist of

- a. Price ( as per format in Section E)

3.2 Both “Part-I” and “Part-II” together form the complete bid. Therefore both the parts are required to be submitted within the due date and time indicated in para 1.0 in duplicate. Any violation of this condition shall lead to rejection of bid.

3.3 The vendor shall take special care not to mix up price details submitted against “part-II” (Price bid) with “Part –I” (technical bid) and vice versa. Any violation of this condition may lead to rejection of the bid.

3.4 All communication in respect of the tender shall only be addressed to

Mr. YVVS Bose,  
Dy. General Manager (Purchase)  
Radiation Detectors & Instrumentation Division,  
Control Systems Group, ECIL, ECIL Post  
Hyderabad – 500062

From the date of issue of tender till the finalization of the tender

  
वाई.वी.वी.एस.बी. बोस  
Y.V.V.S.B. BOSE  
उप महा प्रबंधक/Dy. General Manager  
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## TWO PART TENDER



### SECTION – A

#### INVITATION TO TENDER, TENDERING CONDITIONS, QUALIFICATION AND EVALUATION CRITERIA

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## 1 Invitation to tender

Electronics Corporation of India Limited (A Government of India Enterprise) invites sealed tenders for the Design, Development, Testing and supply of “**NIS ATE**” as per the specifications given in “section C” of the tender document. The conditions of contract, which will govern the contract pursuant to the tender, are as contained in “section B” of the tender document. If you are in a position to quote for supply in accordance with the technical specification indicated in “section B”, Please submit your offer in a manner and method specified hereinafter.

### 1.1 Qualifying Requirements

The vendor shall submit all supporting documents/information necessary for establishing the qualification of the vendor with respect to the qualifying requirements specified, along with “part-I” ( Technical bid) and “part-II” ( Price bid) of the tender. Failure to comply with this requirement shall lead to the rejection of the tender.

### 1.2 Manner and method of submission of offers

- 1.2.1 All pages of the offer should be typed on the letter head of the bidder and duly signed and stamped by company’s authorized signatory. Hand written quotation will be summarily rejected. Quotation erased or over written will summarily rejected unless all corrections are duly authenticated with signature of bidder on the seal of the company.
- 1.2.2 All tenders in response to this invitation shall submit in TWO PARTS and in different envelopes. All technical specifications and technical details along with commercial terms and conditions shall be included only in “part-I” of the tender, which shall herein after referred as “Part-I” (Technical bid). It shall comprise of two sections namely Technical section and Commercial Section and both sections shall be submitted in a single envelope only. “Part-II” (Price bid) comprising of price and quantity schedule shall be submitted in separate envelope. The above two envelopes shall be put in a single envelope and submitted.
- 1.2.3 The tender shall be submitted with envelope super scribing the TENDER NUMBER and the due date. Quotations through Telex, Fax or email will not be considered. ECIL does not take the responsibility of for the loss of tender /offer in transit.
- 1.2.4 Technical section of “Part-I” (Technical bid) should contain /include only technical specifications, Technical details, literature, references of earlier supplies of similar equipment s, time required for submission of approval of ATP and QAP, the delivery schedule, PERT Chart etc. Price details should be furnished only in

  
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“part –II” (price bid) of the tender. The vender should also mention any specific assumptions made by him or approach to be adopted by him with respect to various aspects of design, development and manufacturing in the technical section.

- 1.2.5 Commercial bid section of “part-I”( Technical bid) should contain/ include all details relating to price basis, formula for price variation /escalation if allowed along with ceiling thereof, applicability of statutory levies like excise duty, central sales tax/state sales tax, Octroi duty if applicable / freight charges /delivery terms ( free delivery. FOR destination /Mode and terms of payment and all related commercial terms and conditions and also compliance or deviation to the conditions of contract per “section B”
- 1.2.6 The tender will co-relate the price and quantity schedule of terms in “part-II”( price bid) of the tender with description of plant /machinery/equipment/component indicated in “part –I” ( technical bid) . Only Indian parties shall submit the quotation.

### 1.3 Opening of part –II ( Price Bid)

The “part-II” bid of only such vendors whose “part-I” bids are found acceptable will be opened.

## 2.0 Criteria for technical Evaluation

Offers of the vendors who meet the following criteria shall only be considered for technical evaluation. Criteria for technical evaluation is given in table 1

- The vendor shall be an ISO 9001 certified Company
- The vendor shall be an approved supplier to organizations of Ministry of Defense or Department of Atomic Energy.
- The vendor shall have a minimum turnover of Rs. 5.0 crores per Annum for the last 3 years.
- The vendor shall have in-house facilities of design, development & service and repair of hardware and software (AutoCAD 2004 or higher based mechanical CAD facility). The vendor shall also have in-house facility of software for electronic design like OrCAD 16.0 or higher.
- The vendor shall have similar experience of executing this type of jobs. Vendor shall furnish copies of purchase orders executed by them for similar items procured in the recent 3 years
- The Vendor shall have similar experience in developing ATE with NI Labview /other and integration of systems based on PCI/CPCI/VME/LXI etc
- The vendor must comply with technical specifications of the equipment, provided in the tender document.

**Note1:** The vendor shall give adequate and clear documentation to illustrate the technical specifications of the equipment / solutions offered. List of instruments/electronic cards or any other COTS items to be used in the ATE shall be given along with their make, type No. and brief catalog to assess the suitability from functional and accuracy requirement .

**Note2:** The vendor shall provide documentary proof to prove his adherence to

Sl No.	Criteria	Compliance
a	Certified Vendor	YES/NO
b	Approved Supplier	YES/NO
c	Financial Status	YES/NO
d	In-House facilities for design, Development & service/repair	YES/NO
e	Experience in ATE development	YES/NO
f	Experience with NI Labview/other platform used	YES/NO
g	Compliance of technical specification	YES/NO

the qualifying criteria. Claims without supporting documentation shall not be considered.

Table 1




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## TWO PART TENDER



## GENERAL TERMS AND CONDITIONS

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## **1.0 Earnest Money Deposit (EMD)**

Earnest money deposit of Rs. 3.6 Lakhs shall be submitted in the form of Demand Draft /Bank Guarantee at the time of submitting tenders in separate envelope. Quotes received without EMD shall be summarily rejected.

## **2.0 Validity**

We require validity of quotation for three months from the date of opening "Part-II" (price bid).

## **3.0 Security Deposit**

Security deposit of value 10% of the contract value by way of bank guarantee/Demand Draft from any nationalized bank shall be submitted immediately after the award of contract. This bank guarantee shall be valid till the end of the contract.

## **4.0 Confidentiality**

All source information given in this tender document and to the successful bidder for the execution of the job are confidential and proprietary to ECIL and no part of these designs should be reproduced or published in any form or means, electronic or mechanical, including photocopy, on any information storage or retrieval system, nor should these designs be disclosed to third party without the explicit authorization of ECIL.

ECIL has the right to use/modify the designs and equipment delivered under this contract for its products at will, without any separate payment to vendor and without any kind of authorization from vendor.

## **5.0 Non-disclosure agreement**

The successful bidder would have to submit a non-disclosure agreement in prescribed format to receive the final purchase order.

The vendor shall not prepare any catalog/brochure regarding the development/manufacturing carried out under this contract until ECIL permits for the same in writing.

  
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## 6.0 Delivery period and schedule

The total equipment shall be delivered with in 10 months of receipt of the purchase order by the vendor. The vendor shall furnish a brief PERT chart regarding the schedule of activities along with quotation.

The first set of ATE and all design documentation shall be delivered with in 8 months from the receipt of purchase order by vendor.

The second set of ATE and documentation shall be delivered with in 2 months from the acceptance of first set of ATE.

## 7.0 Liquidated damages

In the event of any delay in supply beyond agreed delivery schedule, ECIL shall recover liquidated damages @ 0.5% per week of the value of the undelivered goods subject to a maximum of 5% of the value of the purchase order. For applicability of LD, the inspection call together with test certificate will be treated as delivery date provided materials are accepted during inspection.

## 8.0 Performance Bank Guarantee

Vendor need to submit a performance bank guarantee to cover warranty period (24 months from date of installation) for a value of 10% of individual ATE order value and valid till warranty period of ATE.

## 9.0 Payment Terms


- a) 90 % of the Order value + taxes with in 90 days of completion of SAT (at ECIL) and acceptance along with all documentation & training.
- b) 10 % of the order value shall be paid after completion of warranty period and within 30 days of receipt of supplimentaruy invoice. Alternatively this payment can be made against submission of bank guarantee for an equal amount and valid till the expiry of warranty period.

## 10.0 Taxes and Levies

Customs duty exemption certificates, excise duty exemption certificates shall **NOT** be provided by ECIL. All taxes and levies shall be payable by vendor and claimed from ECIL. All payments shall be made in Indian Rupees only.

## 11.0 Force Majeure:

If the execution of the contract / supply order is delayed beyond a period stipulated in the contract/supply order as an outbreak of hostilities, declaration of an embargo or blockage or fire, flood, acts of nature or any other contingency beyond the suppliers control due to act of God, then ECIL may allow such additional time by

  
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extending the delivery period as ECIL considers to be justified by the circumstances of the case and its decision in this regard shall be final and binding. If and when additional time is granted by the purchaser, the contract/supply order shall be read and understood as if it had contained from its inception the delivery date as extended. Power failure/outage will not be considered as a Force Majeure condition.

The successful bidder will advise, in event of having resort to this clause, by a registered letter, duly certified by the local chamber of commerce, or any statutory authorities, the beginning and end of the cause of the delay, within 15 days of the occurrence and cessation of such Force Majeure conditions. In the event of delay last out of Force Majeure, ECIL will reserve the right to cancel the contract, and provisions governing termination of contract as stated in bid documents will apply.

For delay arising out of Force Majeure, the bidder will not claim the extension in completion date for a period exceeding the period of delay attributable to the causes of Force Majeure and neither ECIL nor the bidder shall be liable to pay extra cost provided it is mutually established that Force Majeure conditions did actually exist.

## **12.0 Risk Purchase:**


In the event of failure of the vendor to comply with the purchase order terms, ECIL has a right to cancel the order and proceed with an alternative source. In the event of proceeding with such an alternative source, the default vendor shall be liable to bear the extra cost, which may be incurred by ECIL. Such extra cost could be on account of either a higher unit price or any higher rate of foreign exchange conversion rate by such delayed alternative procurement. Recovery of such extra cost would be affected from the available credit in the account of default vendor by invocation of any guarantees issued in favor of ECIL available.

## **13.0 Arbitration**

- a) Any dispute arising out of Contract/Purchase Order or interpretation of any clause or terms and conditions hereof shall be settled through conciliation by both the purchaser viz. ECIL and the Supplier / Seller, under the specific provisions of arbitration Conciliation Act 1996.
- b) In case the conciliation fails, the parties are at liberty to pursue other lawful options.
- c) Only courts in Ranga Reddy District, State of Andhra Pradesh, INDIA have exclusive jurisdiction over this contract/order notwithstanding the claim for concurrent jurisdiction of other courts.

## **14.0 Short Closure:**

ECIL has the right to short close the tender even after evaluating the quotations without assigning any reason.

  
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## 15.0 Inspection and Testing

The vendor shall be responsible for and shall perform the tests and inspections as per approved ATP. The ATP shall be prepared by vendor and approved by ECIL. These tests are necessary to assess the required performance of the ATE as per detailed test procedures. The tests shall be witnessed by ECIL.

The vendor shall generate a detailed "Test Report" for the tests as per ATP and submit to ECIL. The ATE shall be accepted only if it passes all tests as per ATP.

The QAP to be followed during the execution of the job also shall be prepared by vendor and approved by ECIL. The performance of the ATE shall confirm to this specification.

Failure to meet the quality, inspection or test requirements specified herein or the approved QAP shall be reported to ECIL and shall be considered as sufficient cause for rejection of particular item.

### ***ATE Inspection***

- 15.1 The ATE covered by this contract shall be subjected to stage inspection and testing apart from final acceptance testing. The vendor shall provide all services to establish and maintain quality of workmanship to ensure the mechanical and electrical performance of components, compliance with drawings, identification and acceptability of all materials, any sub-parts and COTS items.
- 15.2 The vendor shall perform his internal inspection and testing before offering the ATE for ECIL inspection. Only after ensuring that his inspection and test results are satisfactory, Vendor shall offer the ATE for ECIL inspection.
- 15.3 The minimum inspection requirements for the ATE shall conform to the design and development requirements. It shall include, if applicable, inspection procedures prescribed by set standards or codes and regulations recognized by the governmental authority having jurisdiction over the installed goods.
- 15.4 ECIL will give notice in writing to the Vendor of any objection to any drawings, COTS items or workmanship of ATE, which is not in accordance with the contract. The vendor shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to ECIL giving reasons therein that no modifications are necessary to comply with the 'contract'. However, ECIL has the final authority to accept or reject the vendor's views. The equipment or material after rectification by

the vendor shall be offered to the ECIL for his final inspection and acceptance without any additional cost to ECIL.

- 15.5 In all cases where the 'Contract' provides for tests whether at a third party's premises or at the works of the vendor, except where otherwise specified, the vendor shall provide general facilities, apparatus and instruments as may be reasonably demanded by ECIL to carry out effectively, such tests of the equipment in accordance with the 'Contract'.
- 15.6 The inspection by ECIL and issue of inspection certificate thereon shall in no way limit the liabilities and responsibilities of the vendor in respect of agreed quality assurance plan forming a part of the 'Contract'.
- 15.7 In the case of stage inspection, the vendor shall proceed from one stage to another only after ECIL gives permission to proceed further after inspecting the drawings/equipments. The same procedure shall be adopted for any rectifications and/or repairs suggested by ECIL. At all customer hold points, the Vendor shall compulsorily offer drawings/equipments for inspection of ECIL and waiver, if and by ECIL, shall be obtained in writing for record purposes.
- 15.8 Should ECIL waive the right to inspect anytime of the equipment/ATE, such waiver shall not relieve the vendor in any way from his obligation under the contract. In the event of ECIL on inspection revealing poor quality of goods, ECIL shall be at liberty to specify additional inspection procedures, if required, to ascertain the vendor's compliance with the equipment specifications.
- 15.9 Supplier shall dispatch equipment on the express written instruction from ECIL after satisfactory testing only. Material sent without proper authority will be summarily rejected.

## 16.0 Acceptance

Acceptance of the equipment shall be subject to its meeting the specifications and fulfillment of various requirements covered in this document. The vendor shall prepare an acceptance test procedure and submit for approval by ECIL. The acceptance testing shall be carried out, as per the approved procedure, by the vendor at purchaser's premises. The cost of these tests shall be borne by the vendor. The items can be supplied only after the completion of the acceptance test and obtaining a shipping release from the purchaser.

## 17.0 Certification

Three copies of inspection reports and test reports covering all aspects of inspection and testing shall be signed by both vendor and ECIL before delivery of the equipment.

## 18.0 Quality Assurance and Surveillance:

### 17.1 Quality Assurance

The contract requires conformance to international and national standards/codes for assured quality and reliability. In line with these requirements, the vendor shall have documented quality assurance program to assure quality at all stages, ie. Design, engineering, procurement, manufacture, handling, shipment, installation and commissioning.

### 17.2 Quality Surveillance

The vendor shall provide test details and results as required by ECIL. If any test fails to comply with requirements, ECIL may reject the equipment.

Stage inspections have to be carried out by vendor's internal QA department. Where the inspection has to be carried out by ECIL, It has to be necessary carried out jointly by vendor's internal QA departments and ECIL.

Based on the QAPs included in the tender documents, the vendor shall prepare a detailed QAP covering all activities and submit the same for approval of ECIL.

Calibrated instruments shall be used during inspection examination and testing. Quality control, inspection, testing at vendors works during manufacture and supply is total under the scope of the vendors QAP. ECIL will be verifying and auditing the QA reports duly reviewed and submitted by the vendor as per the QAP and shall also witness the tests at some important critical and hold points as per the QAP.

## 19.0 Packing and Transportation:

The equipment shall be packed for safe transportation at purchasers end. The item shall be delivered at ECIL, Hyderabad- 500062, and India.

Cost of packing and freight & Insurance (if any) shall be explicitly mentioned by the vendor in quotation and shall be borne by the vendor only.

  
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## 20.0 Technical support /Warranty:

Supplier shall provide free on-site technical support and warranty for a period of 24 months on-site (Hyderabad/ Vishakhapatnam) from the date of installation of ATEs. Technical support involves but not limited to any minor design optimizations (both hardware and software) that may arise in the course of application development and usage of modules. Additionally, the vendor shall also provide clarifications regarding technical queries that may arise during the usage of ATE.

The supplier shall be responsible for any defect that may arise under proper use because of faulty design and shall remedy such defect. Such a design rectification shall be made by the supplier within reasonable period of 2 to 4 weeks, without any extra cost to ECIL.

## 21.0 Training

The supplier shall impart 1week training in the design technology, methodology adapted in designing, operation and maintenance of the ATE in detail at ECIL premises free of cost.

## 22.0 Ownership

The requirement being development in nature the total and absolute ownership of the Intellectual Property Rights (IPR) of the project ("NIS ATE") shall be with ECIL. ECIL shall have the perpetual license for the Hardware and the software developed for the ATE and no license fee or royalty shall be chargeable at any time. ECIL also has the right to modify & reuse the H/W or S/W modules at its will.

  
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## TWO PART TENDER



## SECTION – C

## TECHNICAL SPECIFICATIONS

## 1.0 Introduction

This enquiry covers design, development, testing and supply of Automatic Test Equipment (ATE) for NIS Modules.

The automatic Test equipment for NIS module is envisaged as a computer controlled equipment that tests modules for functionality, performance and to diagnose fault. It shall perform the test with minimal human interaction and should generate test/diagnostic reports automatically. The ATE shall be completely stand alone with own sets of power supplies, control and monitoring Hardware and software that configures the tests, collects , analyses the test results and archives the test data. The design shall be modular in nature and also should have easy serviceability.

## 2.0 Scope of Work

The major work packages are:

- a) Design, Development & Assembly of ATE Hardware
- b) Development of ATE software for test configuration, execution, reporting and archival of test data with diagnostic of faulty module. The software also shall archive the data for traceability of modules with its unique identification No.
- c) Documentation( Mechanical Drawings, Electrical schematic, PCB Layout(if any), Wiring diagrams, Test Procedure, User Manual, Test Reports, Software documentation, source code, Maintenance Manual , Software licenses, calibration reports of instruments including documentation for individual sub parts of ATE).

## 3.0 Considerations for development of NIS ATE

The following are important considerations to be taken care in the design of NIS ATE

### a) Standardization

The ATE must employ standard hardware technologies for ease of integration, maintenance, up gradation keeping in view of modularity and cost effectiveness. The test data/ reports shall be useful across various platforms/software and hence standard data formats are essential. Industry standard technologies shall be used. Hardware or software listed for end of life or for obsolescence shall not be used in the development of ATE.

### b) Ease of use

The ATE shall be designed keeping in view of ease of configuration and test administration. The testing should be as simple as plugging a module, the ATE detecting the module offered for test and allowing the user to interactively select

any of the test criteria/scenario/configuration relevant for the module from drop down menu. The result shall be reported with PASS/FAIL or diagnostic information. The activity on the ATE shall also be logged with time stamping.

**c) Simulation of Field scenarios**

The ATE shall incorporate efficient ways of simulating field signal conditions efficiently and accurately.

**d) Test Accuracy**

Features shall be incorporated in ATE to measure the source/simulation signal at the point of application and not merely going by the set values. The O/P shall also be measured with required accuracy, which is mentioned in the module description/IP. Four wire method shall be adapted for measurement.

**e) Flexibility in testing**

Virtual instrument control shall be employed for flexibility to create and control tests with added system intelligence that can store and repeat test procedure, automatic setting and measurement logs.

**f) Technology Proposed for use in NIS ATE**

Considering the advantages in terms of cost size, performance, flexibility it is preferable to use PXI/VXI/LXI based systems in construction of ATE. Considering the non availability of certain equipments with out PXI/VXI/LXI interfaces other common instrument I/F like RS232/Ethernet/GPIB may be used.

Suppliers may suggest alternate implementation technologies, if more suitable than the proposed ones, along with a thorough justification for using alternate technology.

#### **4.0 ATE Hardware**

It is a fully integrated and functional ATE consisting of Computers, electronic boards, enclosures, instruments, bins etc.

**4.1 Free supply items:**

For the modules listed in Section 7.0/Annexure 5, custom/special connectors for I/O and power supply terminations shall be provided by ECIL as free supply items ( Marked as "Fr supply" in Annexure 5 and in table below)

The modules shall be given for the purpose of testing of ATE and shall be returned immediately after testing. Back plate drawing information and guide

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हैदराबाद/HYDERABAD-500 062.



rail information shall be made available for connector positioning for ATE back plates

SI	Description of Free supply item	qty	supply
1	30 Pin Connector ( socket )	25	After PO
2	62 pin Connector ( socket)	10	do
3	N type plug	10	do
4	Module Guide blocks for each conn.	70	do
5	Modules for testing	15(types)	After rack assy.

#### 4.2 COTS items:

The following COTS items, which forms the part of ATE shall be from reputed vendor and shall be readily available in the market. All these items should support standard control interface. Items marked for the end of life by their respective vendors / obsolete items shall not be used in the development of ATE.

- Programmable Power supply sources with required power rating, ripple, load regulation, EMI/EMC compliance and isolation.(0-50V, 5Amp rating)
- Precision ultra low current source with a range of *Pico* Amps ( $10^{-12}$ A) to *micro* Amps ( $10^{-6}$  Amps) and with a programming resolution of 100 *femto* Amps ( $10^{-15}$ A) and an accuracy of  $\pm 0.5\%$  +2pA in the lowest range (1nA) . e.g. 6221 Make: Keithley.
- Arbitrary waveform generators (AWG) with variable pulse generation modes and programmability. The rise time (10ns to 40 $\mu$ s), fall time (10ns to 40 $\mu$ s), pulse width (20ns +200s) & polarity of pulse shall be programmable. Shall be capable of generating pulse frequency up to 10MHz for ranges from 10mVp-p to 10Vp-p eg. TG5011 make: TTI.
- Programmable voltage source to generate low varying signals (1 $\mu$ V/sec to 50mV/sec) with 0-10V range and 100 $\mu$ V resolution and accuracy of  $\pm 0.016\%$  +240 $\mu$ V. e.g .GS200 Make: Yukogawa
- Thermo couple calibrator to simulate various types of thermocouples( Specifically E Type) in the range of 0°C to 600°C with resolution of 0.1°C and accuracy of  $\pm 0.02\%$  +0.4°C. eg. CA150 Make : Yukogawa
- Storage Oscilloscopes with adequate sampling frequency(min 500MHz)
- Data Recorders to record O/P in the range of  $\pm 10$ V for longer duration (24hrs) with measurement interval of 10ms for 6/8 channel concurrently.



- h. Multimeters with required accuracy to measure analog O/P and HV. Analog measurements range from -10 to +10 V (100uV accuracy) and HV in the range of 0 to 1000V (10mV accuracy).
- i. Programmable Current sources with a range of (0-22 mA), 1uA resolution and accuracy of  $\pm 0.025\% + 3 \mu A$ . Eg. CA150 Make: Yukogawa.
- j. Programmable Voltage sources with a range of  $\pm 15V$ , resolution of 100 $\mu V$  resolution and accuracy of  $\pm 0.01\% + 200\mu V$
- k. Logic I/P cards to simulate potential free contacts
- l. Logic O/P cards to monitor potential free contacts.
- m. Environment sensors/probes to monitor temperature and Humidity.
- n. Communication H/W, switching equipment to connect various measuring instruments to MUT and other accessories.
- o. Control computer for test administration. The computer shall be Intel i5 or above with Intel chipset.
- p. One A4 size laser jet colour printer shall be provided for the generation of hardcopy of the report.

Note1: ATE system integrator is free to select instrument meeting the above or better specifications.

Note 2: Any instrument/Card/control computer selected by the vendor for development of ATE shall be of industrial grade and should operate consistently without degradation or derating in the tropical conditions (temperature & humidity).

#### **4.3 Mechanical Racks:**

There shall be suitable racks for housing Standard Test Modules (STM) and Module under Testing (MUT)

- I. Mounting cabinet/rack for Module Under Test & instruments/PS.
- II. Mounting cabinet/rack for Control computers & instruments/PS.

The ATE shall be housed in industrial racks from reputed manufacturer. The mounting cabinets must be standard 19" (width) with adequate power supplies, ventilation & lighting. They should have castors with breaks, lifting eye bolts. There shall also be some space reserved for additional modules (3WX6.3U – 1No, 2WX5U -1 Nos, 3WX5U 1 No, 6WX5U – 1No.)

#### **4.4 General Features:**

The racks shall have aesthetic look, with adequate cooling & ventilation, Wheeled and easily portable, rugged enough to withstand frequent

transportation by road, intrusion proof with door locking facility. Usage of ATE shall be authorized by physical key and software password. The ATE shall be built to perform in industrial environment and shall have protection features to prevent damage to test equipment during testing, which may be caused by a faulty MUT module, short circuit in wiring, overloading of power supplies etc. The wiring shall be carried out with Teflon (PETF) wires of gauges AWG 20-26 (power supply with AWG 20 and 22 and signal with AWG24-26). All Power cables shall be sheilded and well seperated with the signal wiring to prevent cross talk and interferences. Some of the signal wires shall also be shielded. The wires shall be colored based on the type of signal (Contact, Power supply, Analog I/P etc.). Wires of similar signals shall be bunched together and routed.

Terminal blocks shall be used for easy debugging and isolation if required. Power line filters shall be used for all input power supplies.

An emergency stop button shall be provided to abort a test administration and cut out power to the MUT.

Note: Provision for fire alarm shall be provided in the mechanical rack.

The actual Hardware may involve some more categories of equipment than listed above depending on the specific design of the system. Nevertheless, the proposed system shall be modular in nature with respect to each categories of hardware. Standard methods of interfacing of hardware shall be used to achieve high level of interchangeability, maintainability and upgradability.

## 5.0 ATE Software

- a) ATE software shall include test administration, Database for storage & retrieval of test data, I/P stimulus simulation data pertaining to the test.
- b) The test administration shall be automatic except for visual feedback (LEDs, CRO etc). The Report shall also be generated automatically after the test. Provision for manual testing shall also be provided.
- c) The function of the software shall include
  - i. Organizing a set of test routines specific to a module
  - ii. Sequencing , branching, looping through tests
  - iii. Collecting and organizing test results
  - iv. Providing consistent user interface to users
- d) To control analog and digital I/O from GUI during Module testing.
- e) Help menu for each instrument with their controls given in GUI.
- f) Provisions to select ATP of a module from selectable list.

- g) Provision for manual administration of a specific test case by the way of predefined formats specific to a MUT.
- h) The GUI should have aesthetic appearance and should be user friendly.
- i) The software shall maintain a data base to store information about MUT for traceability.
- j) Diagnostic test shall be carried out on MUT to indicate the area of failure and shall be graphically represented on the GUI.
- k) Labview® Professional Development Suite environment from National Instruments, a graphical programming language, used extensively for data acquisition and automation is suggested for use in ATE development. The licensed Development suite (Labview/other S/W) used for ATE development shall be transferred to ECIL during delivery. The Labview® Professional Suite shall be compatible with the OS used for control Computer on ATE
- l) Development of necessary GUIs and virtual instrument control panels for all instruments.
- m) Shall provide interface with printer for printing the reports/test results directly.
- n) Built in test facility to test all instruments (STM) and their functioning.
- o) Facility to calibrate all instruments thru software controls.
- p) The control computer shall have Windows OS (professional /ultimate edition 7/8), which has support for Labview® Professional Development Suite used for ATE development. The license shall be transferred to ECIL.

Manufacturers may suggest alternate software/platform, if equally suitable to the proposed one along with through justification.

### **5.1 Software licenses**

The vendor shall use only licensed software for development and delivery of ATE. The software used for development shall be transferred to ECIL along with ATE. Drivers required for all hardware components shall also be given to ECIL during delivery.

### **6.0 ATE Documentation**

Two sets of documents, each containing Mechanical drawing, Electrical schematic, PCB layouts (if any), Wiring diagrams, Test procedure, User manuals, Test reports , Software design document, , Source code etc shall be submitted as a part of deliverables under documentation. The vendor shall use all standard formats and tools for the documentation purpose. Auto CAD for mechanical drawing, OrCAD for schematic, MS

office/pdf for standard documentation. Details of documentation shall be mentioned in the quote. The documentation shall be provided in soft and hard form.

## 7.0 Description of NIS ATE

The **NIS ATE** shall be dedicated for testing of 15 Generic types (total 21 types) NIS modules. The following are the Names and short description of NIS module.

SI No	Module Name	Generic Functionality
1	HV	Generates High Voltage from 24V DC
2	IAMP	Current Amplifier
3	QPAMP	Pulse to Voltage converter
4	±HV	Generates High Voltage from 24V DC
5	TEMP.SIG.COND	Takes I/P from TC and gives Analog O/P (V)
6	FW.SIG.GEN	Takes Current I/P and give Analog O/P(V)
7	CMP/RLY	Compare set values and generates RLY logic (3 types)
8	RLY	Relay multiplication module (3 types)
9	RLY-2	Relay multiplication module
10	ISOOOUT	Analog I/P O/P Isolation ( 3 types)
11	NRHO	Generates Reactivity (V)&Contacts from Pulse and Analog I/P(V)
12	PWR/PER OUT	Generates Analog Voltages& Contacts from Analog I/P (V)
13	EP/WP.SP	Generates Analog Voltages & Contacts from Analog I/P (V)
14	LG/LGR/LIN	Generates Analog Voltages & Contacts from Analog I/P (V)
15	dT/dt OUT	Finds rate of change of Analog I/P (V) and gives Analog O/P(V)

## 8.0 Test Requirements

The tests envisaged (general) on the modules are as follows. The specific Test requirement of modules listed in the Annexure1.

- Automatic detection:** - Scanning for presence of Type of module and detection with out power on.
- Cold Test:** - The Load Resistance(LR) across power supply signals and grounds are measured with out powering on the MUT. The measured LR of a module shall be above the minimum stipulated LR defined for that specific module.
- Power ON test:** - Turn on the power supply to the specific module and monitor the supply current. Continue with functional test if the power consumption is within the stipulated max value for that module. Monitor the power requirement and record the same.

- d) **Functional Test Set up:** - Set up the input stimulus, measure source as well as the O/P as per module IP (Inspection Procedure) and record the data for reporting in specified format.
- e) **Functional Test:-**Test the Module with combination of Test stimulus and generate reports (as specified in the IP – specific to MUT).
- f) **Power supply variation test:** - Repeat step “d” above with PS reduced/increased by  $\pm 15\%$  of nominal Voltage (24/27V) and record the performance.
- g) **Power Requirement monitoring:** Monitor the power requirement of the module to compute peak and average power continuously during the test administration.
- h) Monitor the ambience of the test (module cage temperature and humidity) & shall be a part of test report.
- i) **Diagnostic test (specified in the Annexure1,sec 7 & Annexure 2 sec 5.0 ):-** Perform diagnostic test to predict the failure region/block in the module with graphical presentation on the control computer. This test shall be manually configured with flying leads provided from diagnostic port. The test leads as per the test configuration shall be connected by the operator to the test points provided on the PCBs of MUT.
- j) **Traceability:** - The report shall have information on the Unique Module No., test date and history of the module for traceability.

User shall have the option of performing any subset of the above tests manually with required stimulus. The ATE should qualify the input stimulus depending on modules in-order to protect MUT from out of range I/P.

## 9.0 ATE set up

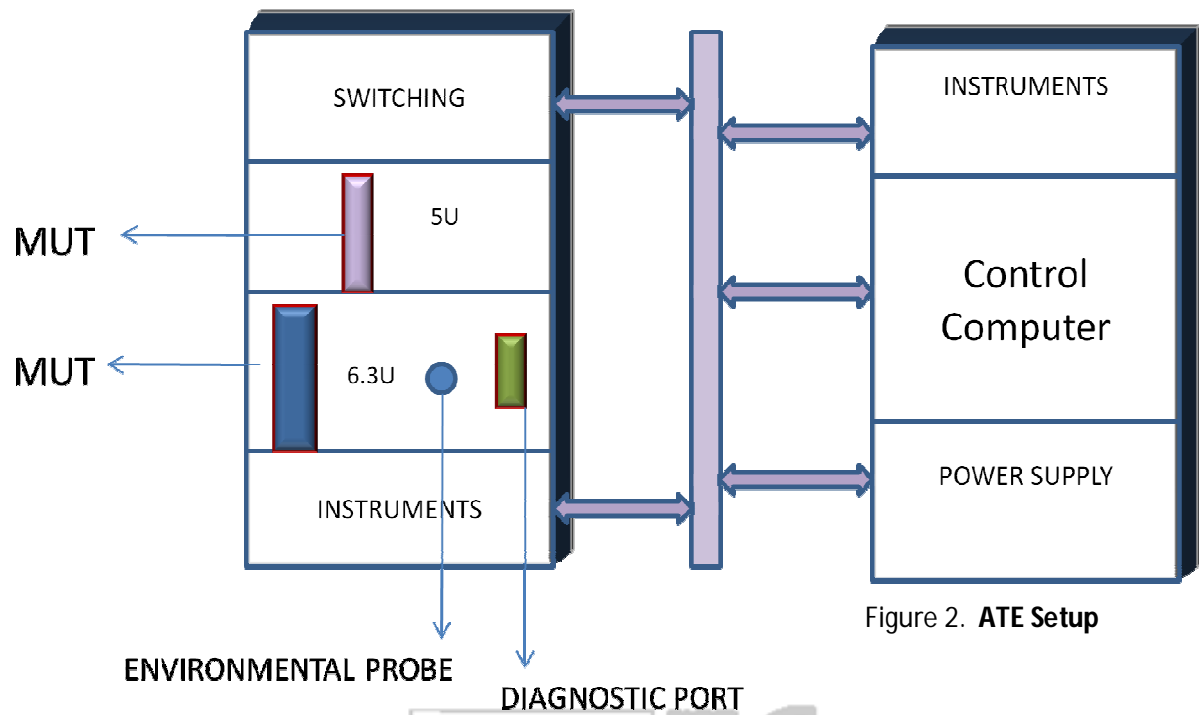


Figure 2. ATE Setup

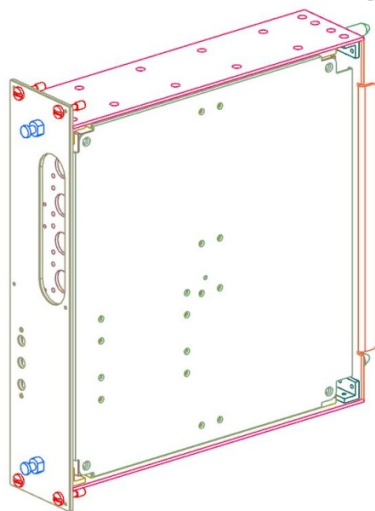


Figure 3. 6.3 U Module

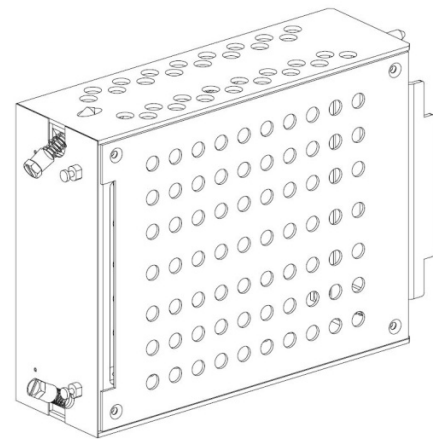


Figure 4 . 5 U Module


## TWO PART TENDER



## SECTION – D

**FORMATS TO BE USED IN SUBMISSION OF PART 1 (TECHNICAL & COMMERCIAL BID EXCEPT PRICE BID)**

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 वाई.वी.वी.एस.बी. बोस  
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उप महा प्रबंधक/Dy. General Manager  
आर आई डी/क्रय/ई सी आई एल  
RID/PURCHASE/ECIL  
हैदराबाद/HYDERABAD-500 062.

## 1. SCHEDULE OF VENDOR'S PARTICULARS

Vendor shall furnish here the following particulars:

1	Name of the Vendor	
2	Address of the vendor	
3	Telegraphic and email addresses of the vendor	
4	Name and designation of the officer of the vendor to whom all references shall be made for expeditious technical co-ordination	
5	Place of manufacture and assembly	
6	Certifications the vendor has obtained from accreditation agencies (eg. ISO etc)	
7	Whether Registered with ECIL as a vendor	YES/NO <sup>\$</sup>
8	Copies of Balance Sheet, P&L account and IT returns for past 3 years submitted	YES/NO

<sup>\$</sup> If, NO Please submit Vendor Registration form (can be down loaded from [www.ecil.co.in](http://www.ecil.co.in)) duly filled in and with supporting documents.

SIGNATURE \_\_\_\_\_

DESIGNATION \_\_\_\_\_

COMPANY \_\_\_\_\_

DATE \_\_\_\_\_

SEAL OF THE COMPANY

  
वाई.वी.वी.एस.बी. बोस  
Y.V.V.S.B. BOSE  
उप महा प्रबंधक/Dy. General Manager  
आर आई डी/क्रय/ई सी आई एल  
RID/PURCHASE/ECIL  
हैदराबाद/HYDERABAD-500 062.



## 2 SCHEDULE OF VENDOR'S EXPERIENCE

Vendor shall furnish here the list of similar jobs executed by him:

Sl	Description of Work including Qty.	Order No. and Date	Value of Order	Delivery date as per Order	Actual Date of delivery	Customer name & Contact information.


SIGNATURE\_\_\_\_\_

DESIGNATION\_\_\_\_\_

COMPANY\_\_\_\_\_

DATE \_\_\_\_\_

SEAL OF THE COMPANY

  
वाई.वी.वी.एस.बी. बोस  
Y.V.V.S.B. BOSE  
उप महा प्रबंधक/Dy. General Manager  
आर आई डी/क्रय/ई सी आई एल  
RID/PURCHASE/ECIL  
हैदराबाद/HYDERABAD-500 062.

### 3 SCHEDULE OF MANUFACTURING , DELIVERY AND OTHER RELATED ACTIVITIES

Vendor shall indicate here the time for manufacture, delivery and other activities of each module as shown below:

Sl	Task Description*	Week No. from date of PO ( start)	Week No. from date of PO ( completion)	Time requirement in weeks
1	Mechanical Design			
2	Instrument procurement			
3	QAP			
4	Software design			
5	ATP preparation			
6	Code development			
7	Assembly & integration			
8	Testing & report			
9	Acceptance test			
10	Shipping			
	Total period for execution			

\*The above task descriptions are only indicative; the supplier may elaborate and include finer details.

SIGNATURE \_\_\_\_\_

DESIGNATION \_\_\_\_\_

COMPANY \_\_\_\_\_

DATE \_\_\_\_\_

SEAL OF THE COMPANY


 वाई.वी.वी.एस.बी. बोस  
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 आर आई डी/क्रय/ई सी आई एल  
 RID/PURCHASE/ECIL  
 हैदराबाद/HYDERABAD-500 062.

#### 4 SCHEDULE OF ATE DESIGN TECHNOLOGY , COMPONENTS

Vendor shall indicate here the envisaged design technology & the components to be used in NIS ATE.

SI	Technology / Components(COTS) *	Platform	Interface	Type /Version No.	Make
1	ATE Software			Labview/other	
2	Programmable Analog Voltage I/P	PXI/VXI/LXI/	PCIe/GPIB/		
3	Analog Current I/P ( 0-25mA)	other	RS232/LAN/		
4	Ultra low Analog current I/P		VME/ other		
5	Ultra low Analog Voltage I/P( TC )				
6	Variable Power supply (0-50 V)				
7	Storage Mixed Signal Oscilloscope				
8	8 Channel Data Recorder				
9	Potential free Contacts as O/P (RLY)				
10	Contact/SPST Switch (SM) I/P				
11	DMM (6 ½digit)				
12	DMM (0-1000)V (5½ digit)				
13	Ammeter				
14	TTL pulse generator 10Mhz +				
15	Precision pulse generator 10MHz +				
16	AWG to generate I/P wave form				
17	Any other instrument /Card				

#### Note:

\*The above technology and component descriptions are only indicative; the supplier shall elaborate and include data sheets, write-ups, justification for choosing the proposed technology and components with respect to the technical requirements mentioned in "Section C" & Annexure 1 to 5 for **NIS ATE**.

SIGNATURE \_\_\_\_\_

DESIGNATION \_\_\_\_\_

COMPANY \_\_\_\_\_

DATE \_\_\_\_\_

SEAL OF THE COMPANY


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Y.V.V.S.B. BOSE  
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## TWO PARTS TENDER

### SECTION – E



### FORMATS TO BE USED IN SUBMISSION OF PART 2 (PRICE BID)

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आर आई डी/क्रय/ई सी आई एल  
RID/PURCHASE/ECIL  
हैदराबाद/HYDERABAD-500 062.

**TENDER No. ECIL/PUR/RID/3400-342720**

**ELECTRONICS CORPORATION OF INDIA LIMITED  
(A Government of India Enterprise)  
RADIATION DETECTORS AND INSTRUMENTATION DIVISION**

Price for Design, Development, Inspection and Testing of NIS ATE

SI No.	Item Description	Quantity	Price	Taxes and Levies	Total Item price
1	ATE Hardware + Software				
	a) ATE Software	1			
	b) ATE Hardware (set 1)	1			
	c) ATE Hardware (set 2)	1			
2	Documentation	2 sets			
3	Packing & Transportation				

Total order value Rs. ....

Note:

1. For each item, the vendor shall indicate all components under taxes and levies separately.
2. All prices shall be in Indian rupees.
3. The cost of individual COTS items( electronic cards/instruments), which forms the part of ATE Hardware, shall be given as an Annexure to price bid so as to enable us to order these items separately in the event of failure after the warranty period.

SEAL OF THE COMPANY

Authorized signature.

  
वाई.वी.वी.एस.बी. बोस  
Y.V.V.S.B. BOSE  
उप महा प्रबंधक/Dy. General Manager  
आर आई डी/क्रय/ई सी आई एल  
RID/PURCHASE/ECIL  
हैदराबाद/HYDERABAD-500 062.

## Annexure 1

### HV Module

- 1 Functional Description : Module generates HV in the range of 0 to +500V. Module also generates fault
- 2 Mechanical Dimensions : D = 268mm , W= 40mm , H= 274mm
- 3 Connector details : Back = 30 Pin Connectors 1 Nos ,Front = 1 N type Receptacle
- 4 Input Requirement : 1) Power Supply 0-50V , 2A - 2Nos ( 24V / 27 V normally)  
2) Electronic load to test 1ma loading on the module
- 5 Output measurement Requirement : 1) Fault LED observation ( visual ) /Snap shot  
2) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.  
3) Out put voltage measuring for each channel @ 1 points in the range of 0-1000V with accuracy of 100mV  
4) Monitoring Relay Contacts , 4Relays -4contacts  
5) monitoring ripple(rms) ,load and line regulations
- 6 Functional Test requirement : The ATE shall scan and find out the presence of HV module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered ON and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , potential free contacts, analog signals & logic levels. The total test points shall be less than 20 per module. The test result shall indicate the fault with reference to the module block for easy rectification.

## ±HV Module

- 1 Functional Description : Module generates independent HV on 2 outputs. One 0-+500 V and the other one from 0 to -500V (i.e ±500 V). Module also generates fault
- 2 Mechanical Dimensions : D = 303mm , W= 60 mm , H= 217.5mm
- 3 Connector details : Back = 30 Pin Connectors 1 Nos ,Front = 4 N type Receptacles
- 4 Input Requirement : 1) Power Supply 0-50V , 2A - 2Nos ( 24V / 27 V normally)  
2) Electronic load to test 1ma loading on the module
- 5 Output measurement Requirement : 1) Fault LED observation ( visual ) /Snap shot  
2) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.  
3) Out put voltage measuring for each channel @ 2 points in the range of 0 to +1000V and 0 to -1000V with accuracy of 100mV  
4) Monitoring Relay Contacts , Relays -5 contacts  
5) monitoring ripple (rms),load and line regulations
- 6 Functional Test requirement : The ATE shall scan and find out the presence of ±HV module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered ON and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies +-15V, potential free contacts, analog signals & logic levels. The total test points shall be less than 20 per module. The test result shall indicate the fault with reference to the module block for easy rectification.

## FW.SIG.GEN Module

- 1 Functional Description : Generates dc voltage signal in 0 to  $\pm 10V$  range from 2 inputs of current signal in 4 to 20mA range.
- 2 Mechanical Dimensions : D = 275mm , W=43mm mm , H= 217.5mm
- 3 Connector details : Back = 30 Pin Connectors 1 No , Front 15 pin front connector
- 4 Input Requirement :
  - 1) Power Supply 0-50V , 2A - 2 Nos ( 24V & 27 V normally)
  - 2) 0-20mA current source with accuracy of 1uAmp - 2Nos ( isolated)
- 5 Output measurement Requirement :
  - 1) Fault LED observation ( visual ) /Snap shot
  - 2) measure input current to the accuracy of 1uA
  - 3) Output measurement @ 2 contacts in the range of 0-10V with an accuracy of 100uV
  - 4) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.
  - 5) Monitoring Relay Contacts , 2 Relays -4 contacts
- 6 Functional Test requirement : The ATE shall scan and find out the presence of FW.SIG.GEN module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered ON and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , potential free contacts, analog signals and logic levels. The total test points shall be less than 20 per module. The test result shall indicate the fault with reference to the module block for easy rectification.



## EP/WP PWR SP Module

- 1 Functional Description : Compares input analog voltage with specified set point voltages and operates contacts and respective LEDs. Generates 48 voltage set points internally. Generates 90 sec delay for analog I/P crossing a threshold. Incorporates on board test signal generation. Module monitors power and functional failures with Fault contact & LED output.
- 2 Mechanical Dimensions : D = 275mm , W= 86 mm , H= 217.5mm
- 3 Connector details : Back = 30 Pin 4 Nos, Front= 27 pin 2Nos. Connectors
- 4 Input Requirement :
  - 1) Power Supply 0-50V , 2A - 4 Nos ( 24V / 27 V normally)
  - 2) 10 contact inputs with 500mA Capacity
  - 3) Voltage source 0-15V with accuracy of 100uV
- 5 Output measurement Requirement :
  - 1) Fault LED observation ( visual ) /Snap shot
  - 2) 4 Output LEDs
  - 3) Output measurement @ 4 contacts in the range of 0-30V with an accuracy of 10mV
  - 4) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.
  - 4) To measure time between two events
  - 5) Monitoring Relay Contacts , 6 Relays -12 contacts
- 6 Functional Test requirement : The ATE shall scan and find out the presence of EP/W PWR SP module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered ON and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , potential free contacts, analog signals, pulse train time period & logic levels. The total test points shall be less than 32 per module. The test result shall indicate the fault with reference to the module block for easy rectification.

## NRHO Module

- 1 Functional Description : Computes and generates analog O/P signals from 6 Analog and 1 pulse I/P signal. The module also generates contacts as outputs according to I/P range (computed). The module also incorporates fault detection. The module has a diagnostic RS232 port.
- 2 Mechanical Dimensions : D = 275mm , W= 64 mm , H= 217.5mm
- 3 Connector details : Back = 30 Pin Connectors 2 Nos , 1 N type connector , 2 test points, RS232 Port for diagnostic and an adjustable POT in the front panel.
- 4 Input Requirement :
  - 1) Power Supply 0-50V , 2A - 2 Nos ( 27 V normally)
  - 2) Precision voltage source to generate 0 - 15 V analog I/P (total of 6 isolated voltages sources) .The accuracy of the source shall be 1mV
  - 3) Pulse generator to generate TTL pulses from 0- 1MHz with adjustable pulse width and very good frequency stability
- 5 Output measurement Requirement :
  - 1) Fault LED observation ( visual ) /Snap shot
  - 2) Output measurement @ 2 contacts( analog V out) in the range of 0 to  $\pm 15V$  with an accuracy of 100uV
  - 3) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.
  - 4) Oscilloscope to record and monitor transient voltage output
  - 5) Monitoring Relay Contacts , 4Relays -7contacts
- 6 Functional Test requirement : The ATE shall scan and find out the presence of NRHO module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered ON and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , +5V, +3.3V, +1.5V, potential free contacts, analog signals, pulse train time period & logic levels. The total test points shall be less than 35 per module. The test result shall indicate the fault with reference to the module block for easy rectification.

## IAMP Module

- 1 Functional Description : This module converts the logarithmic current input into voltage level (differential also). This module in-corporates diagnostic and fault generation logic
- 2 Mechanical Dimensions : D = 268mm , W= 60 mm , H= 274mm
- 3 Connector details : Back = 30 Pin Connectors 2 Nos , Front: 4Nos of N type connectors and one 15 pin connector
- 4 Input Requirement : 1) Power Supply 0-50V , 2A - 3Nos ( 24/ 27 V normally)  
3) ultra low precision current source capable of generating 100pA to 400uA ( eg: Keithley /Tektronix)
- 5 Output measurement Requirement : 1) Fault LED observation ( visual ) /Snap shot  
2) Output measurement @ 3 contacts in the range of 0 to +10V with an accuracy of 100uV  
3) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.  
4) It also uses 4 contacts as I/P to simulate Test cases.  
5) Monitoring Relay Contacts , Relays -2contacts
- 6 Functional Test requirement : The ATE shall scan and find out the presence of IAMP module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered ON and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , potential free contacts, analog signals, pulse train time period & logic levels. The total test points shall be less than 20 per module. The test result shall indicate the fault with reference to the module block for easy rectification.

## QPAMP Module

- 1 Functional Description : This module converts charge/ pulse rate into voltage output (differential also). This module generates 4 analog O/P from I/P. Module also incorporates diagnostic and fault generation logic.
- 2 Mechanical Dimensions : D = 268mm , W= 60 mm , H= 274mm
- 3 Connector details : Back = 30 Pin Connectors 2 Nos , Front: 4 N type connectors
- 4 Input Requirement :
  - 1) Power Supply 0-50V , 2A - 2Nos ( 24/ 27 V normally)
  - 2) Pulse generator to generate detector pulses from 0-1MHz with adjustable amplitude (mV range), polarity, pulse width (ns), rise time (ns), fall time (ns) and very good frequency stability.
  - 3) A voltage source to generate 0-10V as threshold with an accuracy of 1mV
  - 4) It also uses 4 contacts as I/P to simulate Test cases.
- 5 Output measurement Requirement :
  - 1) Fault LED observation ( visual ) /Snap shot
  - 2) Output measurement @ 5 contacts in the range of 0 to +10V with an accuracy of 100uV
  - 3) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.
  - 4) Oscilloscope to record and monitor pulse voltage output
  - 5) Monitoring Relay Contacts , Relays -3 Contacts
- 6 Functional Test requirement : The ATE shall scan and find out the presence of QPAMP module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered ON and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , potential free contacts, analog signals, pulse train time period & logic levels. The total test points shall be less than 20 per module. The test result shall indicate the fault with reference to the module block for easy rectification.

## PWR-PER-OUT Module

- 1 Functional Description : Computes and generates analog O/P signals from 3 Analog I/P signal. Generates 1 pulse O/P from 1 pulse I/P. The module also incorporates self diagnostic using contacts and fault detection logic.
- 2 Mechanical Dimensions : D = 275mm , W=107 mm , H= 217.5mm
- 3 Connector details : Back = 62 Pin Connectors 3 Nos , Front: 1 N type connector , 30 test points, 2Nos of adjustable POT
- 4 Input Requirement :
  - 1) Power Supply 0-50V , 2A - 3Nos ( 24/ 27 V normally)
  - 2) Precision programmable voltage source to generate - 2Vto - 15 V analog I/P ( 3 Nos independent) with capability of generating slopes in the range of 1mV/sec to 500mV/sec in both directions .The accuracy of the sources shall be 1mV
  - 3) Pulse generator to generate TTL pulses from 0- 1MHz with adjustable pulse width and very good frequency stability
- 5 Output measurement Requirement :
  - 1) Fault LED observation ( visual ) /Snap shot
  - 2) Output measurement @ 7 contacts in the range of -10 to +10V with an accuracy of 100uV
  - 3) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.
  - 4)Oscilloscope to record and monitor pulse voltage output
  - 5) Monitoring Relay Contacts , 4Relays - 5contacts
- 6 Functional Test requirement : The ATE shall scan and find out the presence of PWR-PER-OUT module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered ON and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , potential free contacts, analog signals, pulse train time period & logic levels. The total test points shall be less than 20 per module. The test result shall indicate the fault with reference to the module block for easy rectification.

## TEMP.SIG.COND Module

- 1 Functional Description : Computes and generates analog O/P signals from 2 Analog I/P signal (E Type Thermo Couple Input 0°C-600°C). The module compares with preset values & generates fault contacts and LED as outputs.
- 2 Mechanical Dimensions : D = 303mm , W= 64 mm , H= 217.5mm
- 3 Connector details : Back = 30 Pin Connectors 2 Nos , Front: BSJ TC connector 1 No and 4 Trim POTs & 15 Pin connector
- 4 Input Requirement :
  - 1) Power Supply 0-50V , 2A - 4 Nos ( 27V normally)
  - 2) Precision programmable voltage source to generate 0 - 100mV analog I/P with capability of generating slopes of 1nV/sec to 100nV/sec in both directions .The accuracy of the source shall be 1nV. Thermo couple calibrator /TC simulator - CA150 ( or equivalent)
  - 3) It also uses 5 contacts as I/P to simulate Test cases.
- 5 Output measurement Requirement :
  - 1) Fault LED observation ( visual ) /Snap shot
  - 2) Output measurement @ 2 contacts in the range of 0 to  $\pm 10V$  with an accuracy of 100uV
  - 4) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.
  - 4)Oscilloscope to record and monitor voltage output over a period of time
  - 5) Monitoring Relay Contacts , Relays -11contacts
- 6 Functional Test requirement : The ATE shall scan and find out the presence of TEMP.SIG.COND module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered ON and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , analog signals & logic levels. The total test points shall be less than 20 per module. The test result shall indicate the fault with reference to the module block for easy rectification.

## dT/dt Module

- 1 Functional Description : Computes and generates analog O/P signals from 1 Analog I/P signal. The module also generates fault contacts and LED as outputs.
- 2 Mechanical Dimensions : D = 275mm , W= 43 mm , H= 217.5mm
- 3 Connector details : Back = 30 Pin Connectors 2 Nos , Front: 15 Pin connector 1 No
- 4 Input Requirement : 1) Power Supply 0-50V , 2A - 3 Nos ( 24/27 normally)  
2) Precision programmable voltage source to generate 0 - 10 V analog I/P with capability of generating slopes of 1uV/sec to 50mV/sec in both directions .The accuracy of the source shall be 1nV ( Yokogawa GS210 )
- 5 Output measurement Requirement : 1) Fault LED observation ( visual ) /Snap shot  
2) Output measurement @ 2 contacts in the range of 0 to  $\pm 10V$  with an accuracy of 100uV  
3) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.  
4) Oscilloscope to record and monitor voltage output over a period of time  
5) Monitoring Relay Contacts , 1Relays -2contacts
- 6 Functional Test requirement : The ATE shall scan and find out the presence of dT/dt module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered ON and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , +5V, +3V, +1.5V, analog signals, pulse train time period & logic levels. The total test points shall be less than 20 per module. The test result shall indicate the fault with reference to the module block for easy rectification.



## LG/LGR/LIN Module

- 1 Functional Description : Generates voltage signal proportional to current input. Generates output according to logic I/P. Generates test signal based on onboard test simulator. The module also generates fault signal
- 2 Mechanical Dimensions: : D = 275mm , W= 129mm , H= 217.5mm
- 3 Connector details : Back = 30 Pin Connectors 4 Nos , Front: 2Nos of 22 pin connectors and 1 N type connector
- 4 Input Requirement : 1) Power Supply 0-50V , 2A - 3 Nos ( 24V / 27 V normally)  
2) 7 contact inputs with 500mA Capacity  
3) ultra low precision current source capable of generating 100pA to 400uA ( eg: Keithley /Tektronix)  
4) Voltage source 0-15V wit an accuracy of 100uV
- 5 Output measurement Requirement : 1) Fault LED observation ( visual ) /Snap shot  
2) 1 Output LEDs  
3) Output measurement @ 9 contacts(Analog V out) in the range of 0-15V with an accuracy of 100uV  
4) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.  
5) To measure and record 5 analog Out put signals in the range of -15 to +15 V with data recorder.  
6) Monitoring Relay Contacts , 3 Relays -6contacts
- 6 Functional Test requirement : The ATE shall scan and find out the presence of LOG/LOGR/LIN module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered on and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , potential free contacts, analog signals, pulse train time period (with MSO) & logic levels. Transient output shall be recorded using data recorder. The total test points shall be less than 25 per module. The test result shall indicate the fault with reference to the module block for easy rectification.



## CMP-RLY Module

- 1 Functional Description : Compares the analog I/P signal to the set point values for 4 identical channels and generates contact outputs. The module incorporates fault detection logic in addition to contact generation.
- 2 Mechanical Dimensions : D = 303mm , W= 43 mm , H= 217.5mm
- 3 Connector details : Back = 62 Pin Connectors 2 Nos
- 4 Input Requirement :
  - 1) Power Supply 0-50V , 2A - 4 Nos ( 24V / 27 V normally)
  - 2) 4 SPDT contact inputs with 200mA Capacity
  - 3) It also uses 7 contacts as I/P to simulate Test cases.
  - 4) 4 voltage sources capable of generating 0V to 15V with accuracy of 100uV
- 5 Output measurement Requirement :
  - 1) Fault LED observation ( visual ) /Snap shot
  - 2) 4 Output LEDs ( visual ) /Snap shot
  - 3) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.
  - 4) Monitoring Relay Contacts , Relays -17 contacts
- 6 Functional Test requirement : The ATE shall scan and find out the presence of CMP-RLY module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered on and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , potential free contacts, analog signals, pulse train time period & logic levels. The total test points shall be less than 20 per module. The test result shall indicate the fault with reference to the module block for easy rectification.

## ISO-OUT Module

- 1 Functional Description : Provides analog isolation to analog signals for four independent channels. The module incorporates fault detection to monitor power supply failures.
- 2 Mechanical Dimensions : D = 303mm , W= 43 mm , H= 217.5mm
- 3 Connector details : Back = 30 Pin Connectors 2 Nos , Front - 30 Pin Test Jack connector
- 4 Input Requirement : 1) Power Supply 0-50V , 2A - 2Nos ( 27 V normally)  
2) 8 voltage sources capable of generating 0V to 15V with accuracy of 100uV
- 5 Output measurement Requirement : 1) Fault LED observation ( visual ) /Snap shot  
2) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.  
3) Out put voltage measuring for each channel @ 8 points  
4) Monitoring Relay Contacts , Relays -8contacts  
5) galvanic isolation from I/P to O/P
- 6 Functional Test requirement : The ATE shall scan and find out the presence of ISO-OUT module. The cold resistance of the module shall be monitored across all power supply pins. The module shall be powered on and the voltage and currents are ensured as per the IP. The Input shall be varied according to the IP and the outputs are to be recorded. Fault conditions are also to be simulated and validated for fault generation logic.
- 7 Diagnostic Test requirement : PCB internal signals are monitored using flying probes during diagnostic test. The internal signals would include power supplies  $\pm 15V$ , potential free contacts, analog signals & logic levels. The total test points shall be less than 20 per module. The test result shall indicate the fault with reference to the module block for easy rectification.

## RLY2 Module

- 1 Functional Description : Contact multiplication module. It provides galvanic isolation of contacts. IT incorporates 8 polarized Relays and 8 normal relays and multiplies 8 independent contacts to 32 contacts. Module also generates fault signal
- 2 Mechanical Dimensions : D = 303 mm , W= 43 mm , H= 217.5mm
- 3 Connector details : Back = 62 Pin Connectors 2 Nos
- 4 Input Requirement : 1) Power Supply 0-50V , 2A - 2Nos ( 27 V normally)  
2) 8 potential free input contacts capable of carrying 200mA
- 5 Output measurement Requirement : 1) Fault LED observation ( visual ) /Snap shot  
2) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.  
3) Monitoring Relay Contacts , 8 Relays -32contacts  
4) galvanic isolation from I/P to O/P
- 6 Functional Test requirement : The ATE shall scan and find out the presence of RLY2 module. The cold resistance across all input contacts shall be monitored. The module shall be powered ON. The Input contacts shall be varied according to the IP and the output contact status is to be recorded. Pickup and dropout voltages are recorded for each relay by varying the I/P power supply.
- 7 Diagnostic Test requirement : The diagnostic involves monitoring all the contacts and coils of all the Relays present in the module by toggling between energized and non energized state. The test result shall indicate the fault with reference to the module block for easy rectification.

## RLY1 Module

- 1 Functional Description : Contact multiplication module. It provides galvanic isolation of contacts. IT incorporates 15 Relays and multiplies 15 independent contacts to 58 contacts.
- 2 Mechanical Dimensions : D = 303mm , W= 43mm , H= 217.5mm
- 3 Connector details : Back = 62 Pin Connectors 2 Nos
- 4 Input Requirement : 1) Power Supply 0-50V , 2A - 1Nos ( 27 V normally)  
2) 7 potential free input contacts capable of carrying 200mA
- 5 Output measurement Requirement : 1) Instrument to measure power supply current (to compute Module power Requirement); continuous monitoring for peak and avg power requirements.  
2) Monitoring Relay Contacts , 15 Relays -58 contacts  
3) galvanic isolation from I/P to O/P
- 6 Functional Test requirement : The ATE shall scan and find out the presence of RLY1 module. The cold resistance across all input contacts shall be monitored. The module shall be powered on. The Input contacts shall be varied according to the IP and the output contact status is to be recorded. Pickup and dropout voltages are recorded for each relay by varying the I/P power supply.
- 7 Diagnostic Test requirement : The diagnostic involves monitoring all the contacts and coils of all the Relays present in the module by toggling between energized and non energized state. The test result shall indicate the fault with reference to the Relay for easy rectification.

## Annexure – 2 (Test Set –up & procedure) for PWR/PER-OUT Module)

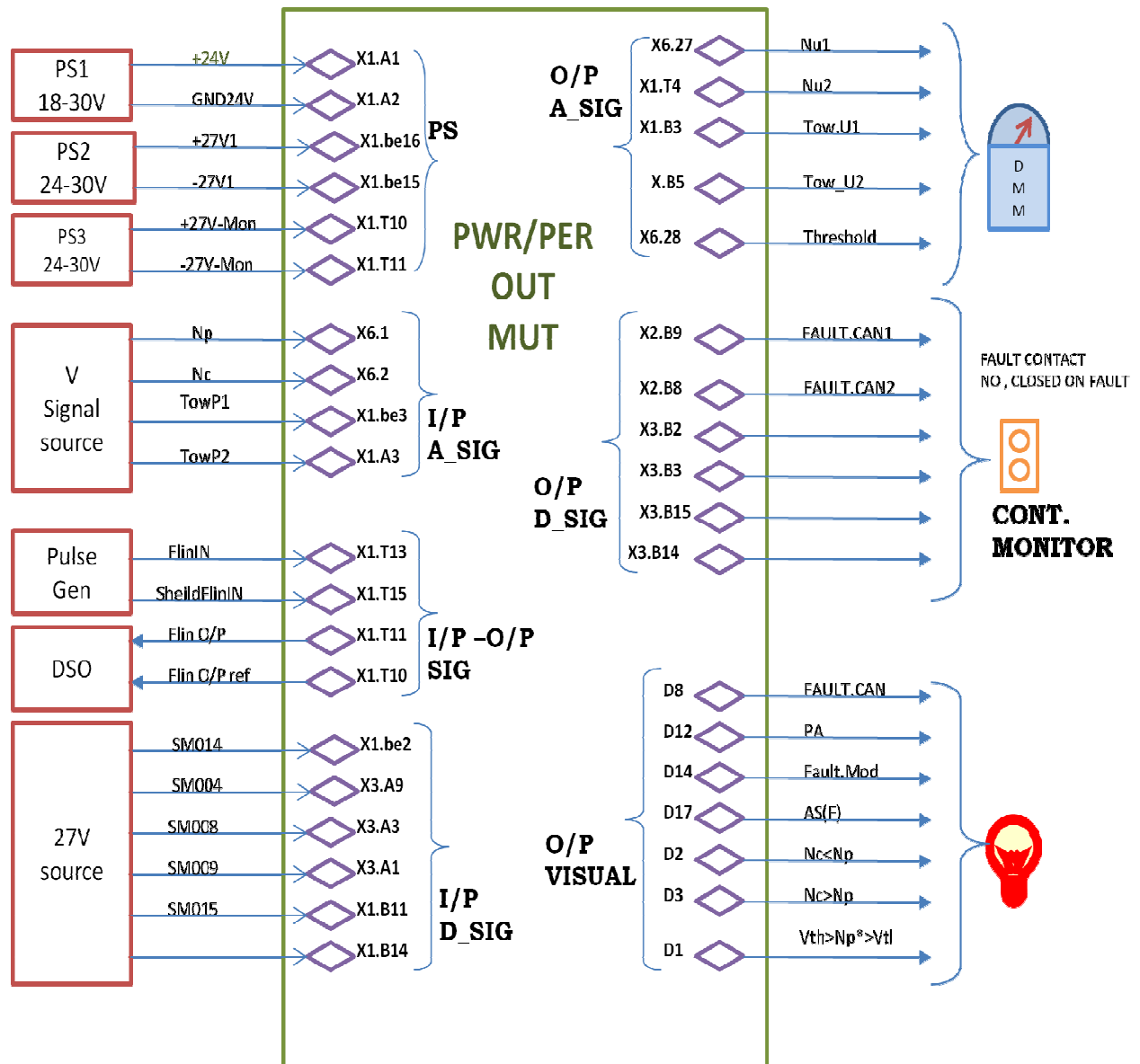
### Sample of Inspection Procedure

#### 2.0 Test setup

The Module under Test (MUT) is to be arranged as shown in the set-up diagram given below.

- PS1, PS2 & PS3 are power supplies capable of supplying 0-50V, 2A with an accuracy of 100mV (Annexure 4, item 20).
- “V Signal Source” are 3 independent isolated sources capable of sourcing 0 to  $\pm 15V$  with an accuracy of  $\pm 100\mu V$  (Annexure 4, item 16).
- “Pulse Gen” is a pulse generator with TTL pulse generation features with variable duty cycles (10ns to 1000nS turn on) (Annexure 4, item 26).
- 27V sources are switches ( 5 No) to supply 27V to SM signals.
- Nu1, Nu2, TouU1, TowU2 and Threshold are analog Output signals to be measured using multimeters (6 1/2 digit) in the range of 0 to  $\pm 15V$  with an accuracy of  $\pm 100\mu V$  (Annexure 4, item 24).
- D\* are LEDs to be observed on facia of the module during testing. And are to be recorded according to the test requirement.
- Fault contacts are to be monitored using contact monitor / multimeter.
- DSO – Oscilloscope to monitor and record output waveform (Annexure 4, item 22).

**Note: The test set-up and & procedure give in annexure -2 is indicative and there would be variation in setup and procedure for individual Module Under Test (MUT). This information shall be used for gauging the quantum & scope of work to prepare your offer only**



### 3.0 Cold Test

#### 3.1 Test for presence

ATE should scan and find out the presence of PWR/PER OUT module in the module cage from the contact information (ie two external pins shall be shorted for a valid PWR/PER Module internally). The pin shorting information and dedicated slot for the module determines the presence.

### 3.2 Tests for Cold Resistance

Once identified by the scanning ATE routine. The unit may be checked for cold resistance across the power supply pins. The readings shall be verified against the minimum requirements before powering up.

The measured cold resistance shall be recoded (in  $\Omega$ ) and be made a part of out report in the following format.

#### 3.2.1 Cold Resistance Check: Observations

Sl		+24V(X1.a1)	-24V (X1.a2)	24V GND	+27V1(X1.be16)	-27V1(X1.be15)	+27V_Mon(X1.T10)	-27V_Mon(X1.T11)	CHGND	+15V	-15V	AGND
1	+24V(X1.a1)											
2	-24V (X1.a2)											
3	24V GND											
4	+27V1(X1.be16)											
5	-27V1(X1.be15)											
6	+27V_Mon(X1.T10)											
7	-27V_Mon(X1.T11)											
8	CHGND											
9	+15V											
10	-15V											
11	AGND											

The shaded lower half the reading s are taken with probes in one direction and in the upper half the readings are taken with probes reversed.

Check the values against permissible limits and report pass or fail. If the module fails the module shall not be turned on. (Manual bypass selection shall be provided in diagnostic mode).

### 4.0 Functional Test

The module with adequate cold resistance shall be configured and powered as per the setup.

#### 4.1 Power on Test

The module power shall be turned on (PS1) in sequence. The load current is measured, recoded and checked against nominal values defined with tolerances. If the measured

value is with in the limit the other power supplies are turned on one by one and same steps are repeated till all power supplies are turned on.

The reports shall be generated as follows

sl		Load Current	Limit	pass/Fail
1	PS1(24V)			
2	PS2(27V)			
3	PS3(27V)			

If the modules draws more the stipulated upper limit from any of the power supplies, fault is reported and test is terminated (Manual bypass selection shall be provided in diagnostic mode).

#### 4.2 Unified Power ( $N_u$ ) Generation Test

The module which has cleared the Power on test is tested for Unified Power generation. V sources ( 3 Nos) are connected in addition to the power supplies. These Voltage sources are in the range of 0 to  $\pm 15V$  and they represent  $N_p$ ,  $N_c$  and  $T_p$ . The sources are varied according to the table given below and their outputs ( $N_{u1}$ ,  $N_{u2}$ ,  $D1, D4, D5$  and  $D11$ ) are monitored at the designated terminals ( $V_{out}$ , Contacts and LEDs) and tabulated to generate report in the following format. The LED status is observed by the operator and manually entered into the system.

Each of the recorded output is checked against the expected output values and it's tolerances. Error is reported if any of the readings are out of range. The same shall be reflected in the report with colour markings.



S1	Nc	Np	Nu1	Nu2	Exp Nu	%err Nu1/2	D1	Exp D1	Nc < VT	Exp D4	D 5	Exp D5	D11	Exp D11	F.CAN	
1	0V	0V			0.00			OFF		ON		OFF		OFF		
2	0V	1V			0.602			OFF		ON		OFF		OFF		
3	0V	2V			1.205			OFF		ON		OFF		OFF		
4	0V	8V			4.819			ON		ON		OFF		ON		
5	0V	9V			5.422			ON		ON		OFF		ON		
6	0V	10V			6.024			OFF		ON		OFF		ON		
7	0V	5V			3.012			OFF		OFF		OFF		OFF		
8	1V	5V			3.012			OFF		OFF		OFF		OFF		
9	2V	5V			5.205			OFF		OFF		ON		OFF		
10	8V	5V			8.819			ON		OFF		ON		OFF		
11	9V	5V			9.422			ON		OFF		ON		OFF		
12	10V	5V			10.02			OFF		OFF		ON		ON		

#### 4.3 Unified Period Generation ( $\tau_u$ ) Test

The module, which has cleared the Unified Power generation test, is tested for Unified Period generation. Programmable V sources (3 Nos) are connected in addition to the power supplies. These Voltage sources are in the range of 0 to  $\pm 15V$  and they represent Np, Nc and Tp. The sources and the Schedule Monitors (SM04, SM08 and SM09) are varied according to the table given below and their outputs are monitored at the designated terminals (Vout) and tabulated to generate report in the following format.

Each of the recorded output is checked against the std output values and it's tolerances. Error is reported if any of the readings are out of range. The same shall be reflected in the report with colour markings.

TowU Exp	2V	5.0V	0V	2V	0V	2V	8.0V	5.0V	
TowU2									
TowU1									
TowC2 EXP	0V	0V	5.0V	5.0V	0V	0V	0V	5.0V	
TowC2									
TowC1 EXP	5.0V	5.0V	0V	0V	0V	0V	0V	5.0V	
TowC1									
SM014	OFF	ON	ON	OFF	ON	OFF	XX	ON	
SM009	OFF	OFF	ON	ON	OFF	OFF	XX	ON	
SM008	ON	ON	OFF	OFF	OFF	OFF	XX	ON	
SM004	ON	ON	ON	ON	ON	ON	OFF	ON	
Towp1	2V	2V	2V	2V	2V	2V	8V	8V	
Nc/Np	0V	0V	0V	0V	0V	0V	3V	3V	
S	1	2	3	4	5	6	7	8	

#### 4.4 Fault Condition Test

The module, which has cleared the Unified Period generation test, is tested for Fault condition. PS1 is switched off and on to establish the fault condition generation as per the following table.

Each of the recorded output is checked against the required contact outputs. Error is reported if any of the contacts is out of sync. The same shall be reflected in the report with colour markings.

#### 4.5 Flin RxTx test

Connect a pulse generator and set the pulse rise time, fall time, pulse width and frequency as per the Inspection procedure and test setup. Record the output (Tx) pulse on the oscilloscope. Compare the Rx and Tx frequency and ensure that they are matching. The test may be reported for 3 to 4 frequencies in the range of 0 – 1MHz.

The observation is tabulated and reported, if any error is observed the same is highlighted with a different colour.

#### 4.6 Power Supply variation test

This test is done in two iterations

In the first iteration the PS1 is reduced by -25% of the nominal value (27V) and the above tests (section 4.1 to 4.5) are conducted. The report is generated as per the respective sections under PS1 reduced clause.

In the second iteration PS1 is incremented by +10% of the nominal value the above tests (section 4.1 to 4.5) are conducted. The report is generated as per the respective sections under PS1 incremented clause.

#### 4.7 Power consumption test

All the I/P power supplies (PS1, PS2 & PS3) are continuously monitored for Voltage and the current load. Power consumption is computed as Avg, and peak. The same shall be recorded in a table.

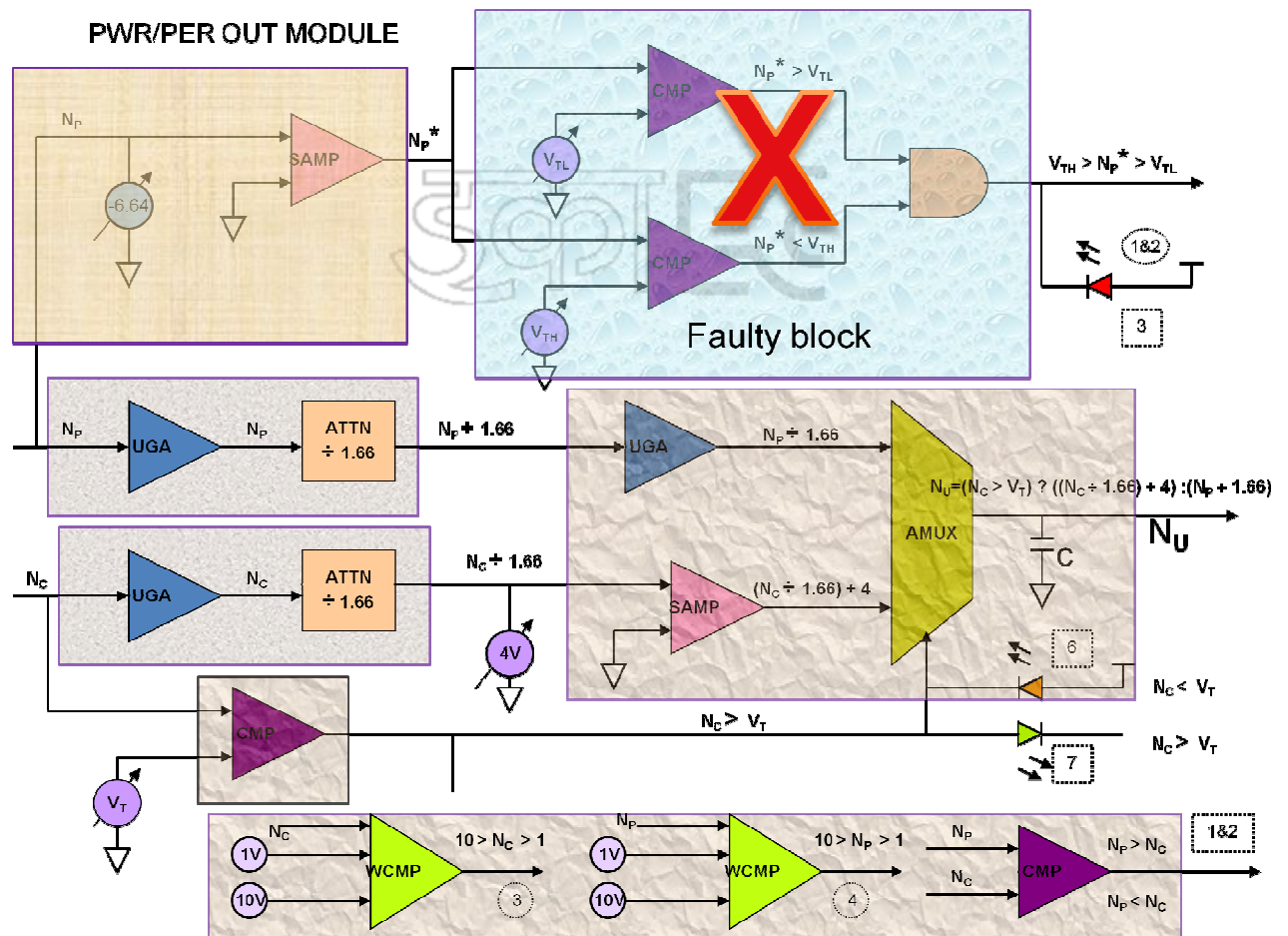
sl		PS1		PS2		PS3	
		load	pwr	load	pwr	load	pwr
1	Avg						
2	Peak						

## 5.0 Diagnostic test

Diagnostic test is a super set of Functional test with additional internal signals brought outside and tested against diagnostic test requirement of that particular module. The test setup shall include additional test points (generally O/P) monitored using flying probes. The flying probes shall be connected at the designated test points on the PCBs of the module by opening the side covers of module.

The diagnostic report shall have a graphical representation of fault area in the module with reference to block and component identity (this in detail shall be a part of Diagnostic test requirement).

Eg: graphical representation ("X" indicates a faulty block)



Each shaded block represent a testable block in diagnostic mode

## 6.0 Test report

Once all the above tests are completed (section 3.0 and 4.0 of annexure 2). The report is generated in the following format.

Test Report of < name of module>	
Module SI No.	:<SI No>      Rev      :<rev>
Date of Test	:<date>      Test Report No      : < ref>
Tested By	:<name>      Organization      <agency>
ATE Test S/W Version No.	: < rev no>      IP No/Rev      :<Ip/Rev>
Calibration status of Instruments used	:<calib>
Test Coverage :	: <Functional / Diagnostic/scenario select>
Observation	
Temperature	:<deg>      RH      :<hum>
<table Name>	:< SHORT DESCRIPTION OF TEST1 >

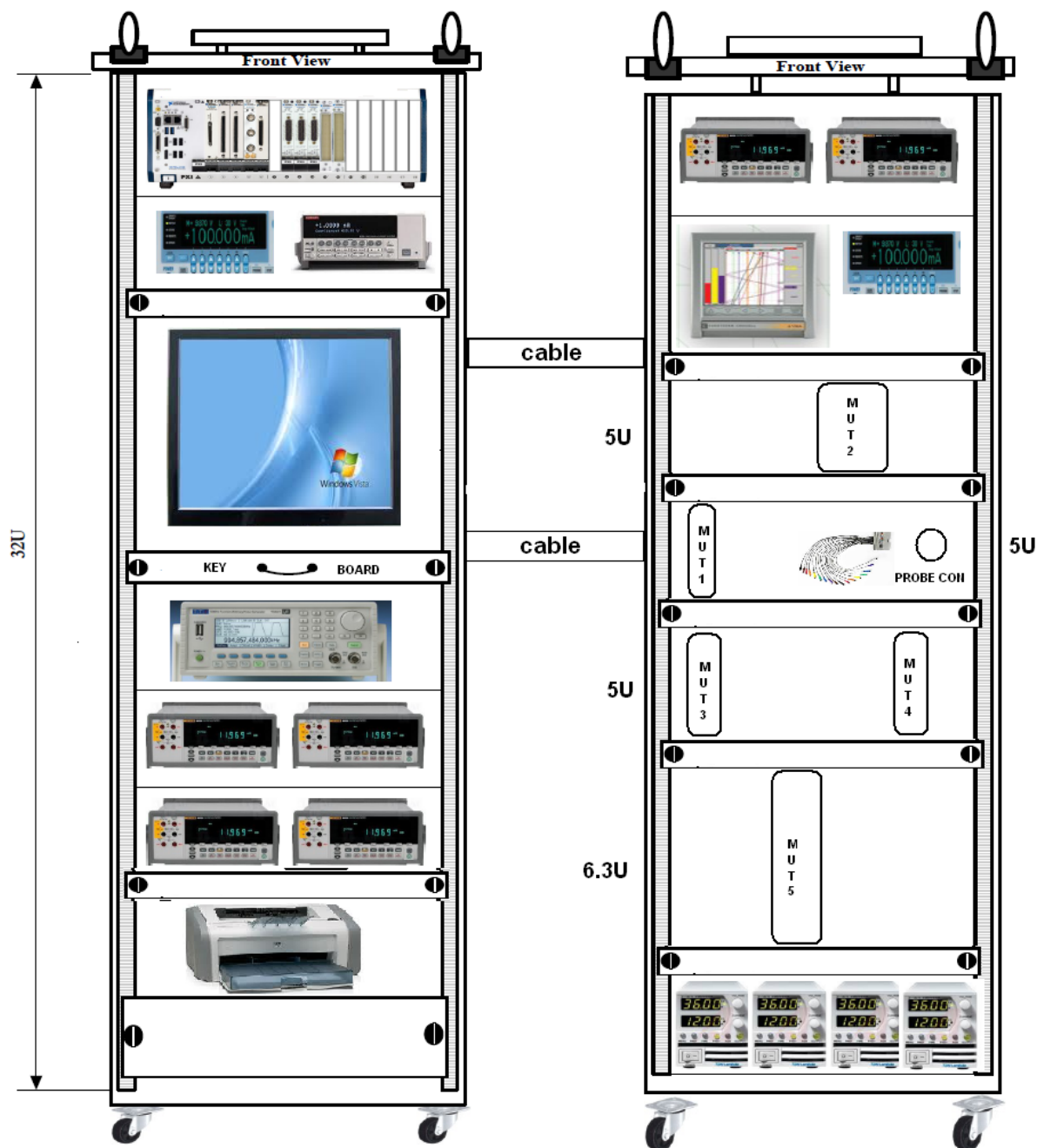
sl	I/P	I/P	expected O/P	%err	result	remarks
1					pass	
2					fail	<parm1>
3					pass	
4					pass	

<table Name>	
:< SHORT DESCRIPTION OF TEST2>	

sl	I/P	I/P	expected O/P	%err	result	remarks
1					pass	
2					pass	
3					pass	
4					pass	

Power Consumption	Peak    :< watt1>	Avg      :<watt2>
Test summary		
1	< test scenario 1 status is >	:<passed/failed>
2	< test scenario 2 status is >	:<passed/failed>
3	< test scenario 3 status is >	:<passed/failed>
4	< test scenario 4 status is >	:<passed/failed>
Overall Status		
functional	<Module has passed/Failed>	
Diagnostic	< Module is diagnosed for fault in {Nu generation Logic}>	
scenario	< Module has cleared { subsection no. xxx} of the IP >	
Report File Name	:</root/home/ATE/{module}/testReports/{date}.pdf>	

### Annexure – 3 (ATE Representative model)



REPRESENTATIVE GA MODULE ARRANGEMENT

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#### Annexure 4 – Typical NIS ATE configuration

**Note:** The following is a typical NIS ATE configuration considered during estimation. The information is not binding and may need refinement to meet the actual requirement specification. The onus of meeting the requirement lies with the vendor. The cards/instruments ( PXI/VXI/LXI ) used in the configuration shall be of international repute with adequate support and continued availability.

Sl No.	Name & Description of instrument/card
1	Yokogawa Voltage Source, GS211
2	AC and DC Current Source 100fA-105mA DC, Keithley 6221
3	Portable Multi-Function Calibrator, CA 150 , Yokogawa
4	Eurotherm 8 ch Recorder, 6100A
5	Fluke DMM, 8808A
6	Programmable Power Supply, Z60-3.5-U , Lambda
7	AWG & Pulse Generator, TG 5011 G , TTI
8	PXIe-1065, 18-Slot 3U PXIe/PXI Chassis , NI
9	NI PXIe-8135 Core i7-3610QE 2.3 GHz Controller, Win 7 (32-bit)
10	External USB CD/DVD-ROM for Use with PXI & VXI Emb Controllers
11	NI MKD-1117 Rackmount 1U LCD Monitor, Keyboard, Mouse Drawer
12	Moxa 5-Port, Industrial Unmanaged Gigabit Ethernet Switch
13	NI PXI-6221 (16 Analog Inputs, 24 Digital I/O, 2 Analog Outputs)
14	NI PXI-6514 Industrial 32 DI, 32 Source DO Isolated DIO & NI-DAQ
15	NI PXI-5152, 2 GS/s 300 MHz Digitizer w/ 64 MB/ch Onboard Memory
16	NI PXIe-4143 4-Channel Precision SMU: 24V,150mA
17	NI PXI-2520 80-Channel 2A SPST Relay Module
18	NI PXI-8430/16, 16 Port, RS232 Serial Interface
19	19" Instrumentation Rack, 32U with complete connectorization



## Annexure 5-ATE Requirements tabulated ( test points & instruments)

Note: The make and model are indicative. The Vendor may select suitable model/Type meeting the I/P requirements.

SI	Description	Range/Type	Resolution	HV	±HV	QAMP	IAMP	I SOOUT	CMPLRY	RLY1	RLY2	TMP.SIG.CON	FW.SIG.GEN	PWR/PER OUT	EPWP SP	LOG/LIN	NRHO	dT/dt	Total/maximum	Make	Ref. Model Nos.
1	30 pin Connectors			1	1	2	2	2				2	1		4	4	2	2	23	Amphenol	Fr.Sply
2	62 Pin Connectors								2	2	2			3					9	Amphenol	Fr.Sply
3	15 Pin Connectors (front)						1					1	1					1	4	Amphenol	
4	20 Pin Connectors (front)															2			2	Amphenol	
5	30 Pin Connectors ( front)							1						1					2	Amphenol	
6	N Type Connectors ( Receptacle)			1	2	4	1							1		1	1		11	Amphenol	Fr.Sply
7	TC BSI Connector											1							1	Omega	
8	RS232 Connectors																1		1	FCI	
9	LEDs on fascia			1	1		1	1	5			3	1	11	5	1	1	1	32		
10	Potential free Contacts as O/P (RLY)	500mA												8	12	6	7	2	35		
11	Contact/SPST Switch (SM) I/P	200mA				4	4		7	14		5		6	10	7		2	59		
12	Contacts/DPDT (potential free)								4		8								12		
13	Total external contacts ( O/P + I/P )			15	19	35	30	75	68	124	124	55	30	81	125	85	40	25	931		
14	Diagnostic test points(DIAG mode)			10	10	15	20	20	15	15	15	20	20	20	32	25	32	15	284		
15	Programmable Analog Voltage Source I/P	0 to ± 15V	1nV															1	1	Yukogawa	GS210
16	Programmable Analog Voltage Source I/P	0 to ± 15V	100uV			3		4	4					3	1	1	6		6		
17	Analog Current Source I/P	0 to 25 mA	1uA										2						2		
18	Ultra low Analog current I/P	100pA - 400uA	100fA				1									1			1	Keithley	6221
19	Thermo couple calibrator Source( E Type)	0°C-600°C	0.1°C									1							1	Yukogawa	CA150
20	Variable programmable Power supply	0-50V , 2Amp	100mV	2	2	2	3	2	4	1	2	4	2	3	4	3	2	3	4		
21	Ammeter	2A	1mA	2	2	2	3	2	4	1	2	4	2	3	4	3	2	3	4		
22	Storage Mixed Signal Oscilloscope , 2CH	500MHz				1								1				1	1		
23	8 Channel Data Recorder	0 to ± 15V	10ms													1			1	Eurotherm	6100A
24	DMM ( 6½ digit)	6½digit	100uV			1	1	4	4					2	1	1	1	2	4		
25	DMM (0-1000) V (5½ digit)	5½digit	10mV	1	2										1	1	1		2		
26	TTL pulse generator	0-5V	10MHz											1			1		1		
27	Precision pulse generator	0 to ± 100mV	ns rise/fall			1													1	TTI	TG5011
28	AWG to generate I/P wave form																1		1		