



BrahMos Aerospace Private Limited

आर्मी रूसीय 2012 प्रस्ताव

RFP No.: BM/RFP/OTE/PFSSPARES/25-26

RFP Date: 26 Mar 2026

REQUEST FOR SUBMISSION OF TECHNO-COMMERCIAL & PRICE BID FOR PROCUREMENT OF SPARES FOR BRAHMOS PLATFORM SYSTEMS

Dear Sir/ Madam,

1. BrahMos Aerospace Private Limited, hereinafter referred to as **Buyer**, intends to procure **SPARES FOR BRAHMOS PLATFORM SYSTEMS** and seek participation of the procurement process from prospective Bidders subject to requirements of succeeding paragraphs.
2. This RFP is divided into 7 Parts as follows:

PART I	:	General Information & Instructions for the Bidders
PART II	:	Scope of Work
PART III	:	Evaluation Criteria of Bids
PART IV	:	Special Terms & Conditions of RFP
PART V	:	Standard Terms & Conditions of RFP
PART VI	:	Format for Price Bids
PART VII	:	Compliance Statement
3. This RFP is neither an agreement and nor an offer by Buyer to the prospective Bidders or any other person. The purpose of this RFP is to provide interested parties with information that may be useful to them in submitting their proposals pursuant to this RFP. This RFP includes statements, which reflect various assumptions and assessments arrived at by Buyer in relation to the Project. This RFP document and any assumptions, assessments and statements made herein do not purport to contain all the information that each Bidder may require. The Bidder shall bear all its costs associated with or relating to the preparation and submission of proposal pursuant to this RFP. Wherever necessary, Buyer reserves the right to amend or supplement the information, assessment or assumptions contained in this RFP. Buyer reserves the right to withdraw the RFP or foreclose the procurement case at any stage. The issuance of this RFP does not imply that Buyer is bound to shortlist a Bidder for the Project. Buyer also reserves the right to disqualify any Bidder should it be so necessary at any stage on grounds of National Security.
4. The receipt of the RFP may please be acknowledged.
Thanking you.



For BrahMos Aerospace Private Limited

Abhishek Panigrahi

AGM (Commercial - Production)

BrahMos Aerospace

(Authorized Signatory)

Regd. Office : 16, Cariappa Marg,
Kirby Place, Delhi Cantt.,
New Delhi - 1100 10 INDIA
CIN-U74899DL1995PTC074334

Hyderabad Office : Brahmos Complex, (Near DRDL Complex
Rear Gate), Kanchanbagh, P.O. Hyderabad-500058, INDIA
Phone : 91-040-24087018, 24087044
Fax : 91-040-24440004, 24087195

PART-I: GENERAL INFORMATION AND INSTRUCTIONS FOR THE BIDDERS

(The terms & conditions will be amended or additional terms & conditions, if required, will be included in the RFP as decided by the competent authority)

5. The salient aspects and timelines of the acquisition are tabulated below. In case of any variation in the details furnished below or in any Annexures(s) with that mentioned in the RFP, information furnished in the main body of the RFP at referred Paragraph is to be followed.

(a) **THE ADDRESS AND CONTACT NUMBERS FOR SENDING BIDS** is given below:

Bids to be addressed to:	Mr. Abhishek Paniqrahi, Addl. GM(Commercial)
Postal address for sending the Bids	BrahMos Aerospace Pvt Ltd. 16 Cariappa Marg, Kirby Place, Delhi Cantt – 110010, New Delhi, India
Contact Nos. & E-mail	011-42285103 contracts@brahmos.com

(b) **LAST DATE AND TIME FOR DEPOSITING THE BIDS:** The sealed Bids under **Two-Bid system (separate Techno-Commercial Bid & Price Bid)** should reach at the above given address through post/in person latest by **17 APR 2026 (1100HRS)**. The responsibility to ensure this lies with the Bidder. **Early submission of the Bids is acceptable to the Buyer. E-mail quotes shall not be entertained and rejected.**

(c) **FORWARDING OF BIDS:** Bids shall be forwarded by the Bidder under their original memo/letter pad inter alia furnishing details like GST number, Bank address with EFT Account, if applicable, etc. and complete postal & e-mail address of their office. The Techno-Commercial and the Price Bids should be put in two separate envelopes and then be put in a single envelope with the '**Bidder Details, RFP No., Last Submission Date**' pasted on top Bids forwarded by the Bidder shall also include the following documents along with the technical bid, failing which, bids are liable to be rejected: -

(i) Confirmation of their acceptance of the Standard Terms & Conditions of the RFP mentioned below (refer part-VII).

(ii) An unconditional acceptance of all tender terms and conditions of RFP as per Appendix –A to be submitted by BIDDER.

(iii) **Experience Certificate.** The firm must have supplied similar Spares to Public / Private sector. The firm must submit the certificates from the procurement agencies.

(iv) **For MSME / Start-up:** The companies which have the capability to supply Ground Support equipment may be considered based on Technical Evaluation.

(v) **Annual Turnover** Average Annual Turnover of last three financial year duly audited by a licensed Chartered Accountant.

(vi) **UDYOG Aadhar No. for MSME.** UDYAM Certificate printed on or after 01 April 2024 to be clearly indicated along with supporting documents for MSME/SME (i.e MSME/SME registration certificate) should be uploaded along with the tender.

(vii) Ministry of MSME have clarified that all Central Ministries/Departments/Central Public Sector Undertakings may relax condition of prior turnover and prior experience with respect to Micro and Small Enterprises in all public procurements subject to meeting of quality and technical specifications. Exceptions for MSMEs/ SMEs can be accepted only if the MSME/SME is registered with tendered items and the validity of their registration as MSMEs should not be expired till opening of Tech Bid.



(viii) If the tenderer/bidder is a registered firm or a company under Company Act, such tenderer/ bidder must submit a **certified true copy of the registration deed** along with the tender. When a tender is submitted by a firm, all the partners of the firm shall be required to sign the tender else power of attorney in favour of the signatory is required to be submitted along with the tender. A copy of partnership deed will also be submitted along with the tender. (duly attested by Notary).

(ix) **PAN Card Number** along with clear and legible photocopy (Self attested). (refer Appendix-B).

(x) Photocopy of **GST registration certificate** clearly specifying the name of the firm/proprietor and GST registration number. Self-attested. (refer Appendix-B).

(xi) The bidder should submit **Income Tax Return** of last three years. In case of exemption of ITR. The scanned copy of document in support of exemption will have to be uploaded by the bidder along with technical bid, failing which tender is liable to be rejected (Self attested).

(xii) **Financial Stability Certificate** issued during current financial year (i.e 01 Apr 2024 onwards) from Scheduled Bank, preferably Nationalised Bank mentioning the approximate value up to which the tenderer is capable of undertaking the contract.

(xiii) A **latest Power of Attorney** in original (not more than two years old) under oath by Oath Commissioner/First Class Magistrate or equivalent (if the tender is not signed by the actual tenderer or the tender is submitted on behalf of a firm) and signature (s) of the signatory (ies) in the tender duly attested by a Class – I Gazetted Officer or Class-I Magistrate/Notary.

(xiv) All bidders are required to submit **Non-Blacklisting certificate** as per Appendix 'C' attached with the RFP along with technical bid documents. (Self Attested)

(xv) Other relevant documents, which the Bidder wishes to submit.

(d) PRE-BID CLARIFICATION:

(i) Prior to preparation of the Techno-Commercial Bid, clarifications regarding the technical terms & conditions be obtained from the **Mr. Rajesh Kumar, AGM(Design) BAPL, Delhi. Contact No. 011-42285223** within 10 working days from the date of RFP.

(ii) Prior to preparation of the Techno-Commercial Bid and Price Bid, clarifications regarding the commercial terms be obtained from **(Mr. Abhishek Panigrahi, Addl. GM (Commercial), BAPL, Delhi. Contact No. 011-42285103)** within 10 working days from the date of RFP.

(e) CLARIFICATION REGARDING CONTENTS OF THE BIDS: During evaluation and comparison of Bids, the Buyer may, at its discretion, ask the Bidder for clarification of his Bids. The request for clarification will be given in writing and no change in prices or substance of the Bids will be sought, offered or permitted. No post-Bid clarification on the initiative of the Bidder will be entertained.

(f) CONDITIONS UNDER WHICH THIS RFP IS ISSUED: This RFP is being issued with no financial commitment. The Buyer reserves the right to withdraw the RFP and change or vary any part thereof or foreclose the procurement case at any stage. The Buyer also reserves the right to disqualify the Bidder, should it be so necessary at any stage without giving any prior notice / intimation.

(g) VALIDITY OF BIDS: The Bids should remain valid till **90 Days** from the last date of submission of the Bids.



PART-II: SCOPE OF WORK

(The terms & conditions will be amended or additional terms & conditions, if required, will be included in the RFP as decided by the competent authority)

6. This section will include the following:

Sr.	Particulars	As per Enclosure
a	Detailed list of items with quantities / complete scope of work	I
b	Technical Specifications with Document references	

Note : Further, technical details/ documents if required shall be obtained by the Bidders within 10 days of receipt of this RFP from the Buyer's Design Dept, BAPL, Delhi.

Delivery of Items: 03 Months from placement of Purchase Orders.



PART-III: EVALUATION CRITERIA OF BIDS

(The terms & conditions will be amended or additional terms & conditions, if required, will be included in the RFP as decided by the competent authority)

7. The Bidder is required to submit detailed Techno-Commercial Bid containing all Terms & Conditions as enumerated at Part II, Part III, Part IV, Part V, Part VI and Part VII of this RFP and give confirmation of their acceptance of all Terms & Conditions which will automatically be considered as part of the Contract concluded with the successful Bidder (i.e., Seller in the Contract) as selected by the Buyer. The deviations, if any, may be clearly indicated in the Techno-Commercial Bid along with the Compliance Statement in the format enclosed at Part-VII. Failure to do so may result in rejection of Bid submitted by the Bidder.
8. Only those Bids will be evaluated, which are found to be fulfilling all the eligibility and qualifying requirements of the RFP, both technically and commercially.
9. **EVALUATION OF TECHNO-COMMERCIAL BID:** The Techno-Commercial Bid forwarded by the Bidders will be evaluated by a Techno-Commercial Evaluation Committee (TCEC) to confirm that the items being offered meet the requirement. The TCEC will examine the extent of variations/differences, if any, in the technical characteristics of the items offered by Bidder. The Bidder, if required, may also be called for the TCEC meeting for clarification on the Techno-Commercial Bid submitted by them.
10. **EVALUATION OF PRICE BID:**
 - (a) The Price Bids will be opened and evaluated, post clearance of technical bid has been cleared by TCEC. The unopened Price Bid will be returned back to the Bidder by the Buyer on request by the Bidders. The Price Bid will be evaluated on the basis of complete scope and not individual line-item wise basis.
 - (b) If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected.
 - (c) If there is a discrepancy between words and figures, the amount mentioned in words shall prevail.



PART-IV: SPECIAL TERMS & CONDITIONS OF RFP

(The terms & conditions will be amended or additional terms & conditions, if required, will be included in the RFP as decided by the competent authority)

The Bidder is required to give confirmation of their acceptance of Special Terms and Conditions of the RFP mentioned below which will automatically be considered as part of the Contract concluded with the successful Bidder as selected by the Buyer. Failure to do so may result in rejection of Bid submitted by the Bidder.

- 11. EARNEST MONEY DEPOSIT (EMD): Not Applicable**
- 12. APPORTIONMENT OF QUANTITY:** Not applicable.
- 13. BANK GUARANTEE:** Not Applicable
 - (a) Bank Guarantee (BG) for Advance:** Not Applicable
 - (b) Bank Guarantee for Performance cum Warranty:**
- 14. OPTION CLAUSE:** Not Applicable .
- 15. REPEAT ORDER CLAUSE:** The Contract will have a Repeat Order Clause, wherein the Buyer can order for additional quantity up to a maximum of up to 100%, of the originally contracted quantity of the original contracted quantity under the Contract within six months from the date of successful supply/successful completion of this contract. The Repeat Order will have rates on not exceeding basis (excluding taxes and duties) while the terms and conditions will remain unchanged. It will be entirely the discretion of the Buyer to exercise the Repeat order or not.
- 16. TOLERANCE CLAUSE:** To take care of any change in the requirement during the period starting from issue of RFP till placement of the Contract, Buyer reserves the right to increase or decrease up to 50% of the tendered quantity of the required goods without any change in the terms and conditions and rates quoted by the Seller. While awarding the Contract, the quantity ordered can be increased or decreased by the Buyer within this tolerance limit.
- 17. INTELLECTUAL PROPERTY RIGHT (IPR):** The rights of Intellectual Property developed under the Contract will be either the property of the Buyer or jointly owned by Buyer and the Seller. The holding of rights of intellectual property will be decided by the Buyer based on the merits of the case. Even where the IPR is jointly held, Buyer will have the marching rights on IPR i.e. the Seller will have to give technical know-how/ design data for production of the item to the designated Agency nominated by Buyer. The Seller will, however, be entitled to license fee/ royalty from the Agency as per agreed terms and conditions. The Seller will also be entitled to use these intellectual properties for their own purpose, which specifically excludes sale or licensing to any third party.
- 18. PURCHASE PREFERENCE CLAUSE:** Not Applicable.
- 19. TRANSFER OF TECHNOLOGY (TOT):** NOT APPLICABLE
- 20. PERMISSIBLE TIME FRAME FOR SUBMISSION OF INVOICE:** To claim payment (part or full), the Seller shall submit the bill(s) along with the relevant documents within 15 days from the completion of the activity/ supply.



- 21. PAYMENT TERMS:** . 100% of the order value plus applicable GST will be paid only after satisfactory delivery/completion of work dully certified by BAPL rep based on acceptance by BAPL End User & submission of Invoice in Original.
- 22. RECOVERY OF ADVANCE CLAUSE:** Not Applicable
- 23. INVOICE PREPARATION:** All original documents for payments including invoices are to be raised on and submitted to the Buyer's location at **BAPL, Nagpur**. GSTIN No. for the unit is **27AABCR8269E1Z5** and the same shall be mentioned in all invoices as applicable.

EXCHANGE RATE VARIATION CLAUSE: Not Applicable

24. INDIGENOUS CONTENT:

- (a) The Bidder is required to submit the Indigenous Content of the total basic quoted cost as per the following table only in the Price Bid.

Total Quoted Cost	IC (Value)	% of IC

- (b) The successful Bidder (i.e. Seller in the Contract) shall submit a Cost Auditors Certificate for indigenous content in the format as per DAP 2020 after completion of deliveries of each lot of the items. The right to audit shall vest in the Ministry of Defence, Govt. of India. For the purpose of calculating IC, the following elements of manufacturing/production/ assembly would be excluded:
- (i) Direct costs including Custom duties, Freight/transportation and insurance) of all materials, components, sub-assemblies, assemblies and products imported into India.
 - (ii) Direct and Indirect costs of all services obtained from non-Indian entities/ citizens.
 - (iii) All license fees, royalties, technical fees and other fees/payments of this nature paid out of India, by whatever term/phrase referred to in contracts/ agreements made by the Bidder/ its Sellers.

- 25. PRICE BENCHMARKING CLAUSE:** The Seller shall agree that the prices finalized for the items under the proposed contract shall serve as the reference ceiling for determining the cost of subsequent orders. The Seller shall guarantee that unless agreed otherwise in writing by the Buyer, the prices for items, including any sub-assembly or components developed shall not exceed the price on a per unit basis by more than the percentage to be decided during the price negotiation meeting. Any finalized escalation must be fully justified based on audited cost data and subject to negotiation and approval by the Buyer. In no event shall such escalation exceed the agreed percentage unless necessitated by Government directed changes or Force Majeure conditions. This clause shall remain valid for the period of years as mutually agreed from the completion of acceptance of the items under consideration.



26. BUY-BACK: NOT APPLICABLE.

27. FREE ISSUE MATERIAL: Not Applicable.

28. TERMS OF DELIVERY: FOR BAPL New Delhi

29. TRANSPORTATION & TRANSIT INSURANCE: The equipment(s) / material(s) will be packed, loaded onto transportation vehicle(s) as per the classification of category & class of goods and transported to the designated site location. Necessary transportation & transit insurance to the destination shall be the responsibility of Seller.

30. PACKING AND MARKING INSTRUCTIONS: The Seller shall provide packing and preservation of the equipment and spares/goods contracted so as to ensure their safety against damage in the conditions of land, sea and air transportation, transshipment, storage and weather hazards during transportation, subject to proper cargo handling. The Seller shall ensure that the stores are packed in containers, which are made sufficiently strong. The packing cases should have provisions for lifting by crane/ fork lift truck. Tags with proper marking shall be fastened to the special equipment, which cannot be packed. The packing of the equipment and spares/goods shall conform to the requirements of specifications and standards in force in the territory of the Seller's country.

(a) Item Code and Item Description along with other technical details are to be engraved on all type of raw materials, as applicable, being delivered by the Suppliers.

(b) Items being delivered should be packed in good quality wood and transport worthy packing conditions for ease of handling and storage.

(c) One type of items should be packed in one box for ease of receipt, storage and issue.

31. QUALITY & INSPECTION CLAUSE:

(a) **YEAR OF PRODUCTION:** The items should be of the latest manufacture and conform to the current production standards. The equipment shall have a minimum residual service life of 20 years at the time of acceptance.

(b) **QUALITY:** The quality of the items shall correspond to the technical conditions and standards enumerated in the RFP.

(c) **INSPECTION & ACCEPTANCE:**

BY INSPECTION AGENCY: Inspection at production/acceptance stage will be carried out under the **representative nominated by Buyer and CQAE(IN)** at the Seller's premises. The Buyer will constitute an acceptance team to accept the delivery of all items under this order as and when the items are ready. Post acceptance, Certificate of Acceptance / Certificate of Completion to that effect will be issued by the Buyer to the Seller for payment claim. In case of any shortcoming, defect, non-conformance with the technical specifications or deficiencies in the items supplied, a defect report shall be raised on the spot and handed over to the Seller for making good the deficiencies or replace the defective item(s) within a mutually agreed period without prejudice to the warranty period.



- (d) **TESTING:** Carrying out all the tests (including Destructive Testing, if applicable) as specified in the Technical Specification/ ATP documents shall be the responsibility of the Seller.
32. **WARRANTY:** As per OEM Warranty Card / 1 Year from acceptance of Stores at BAPL (Whichever is Later).
33. **PRODUCT SUPPORT:** The SELLER needs to provide Product Support on such notice by BUYER within a reasonable time period upto 3 years post delivery.
34. **ANNUAL MAINTENANCE CONTRACT (AMC)** Not Applicable
35. **TECHNICAL DOCUMENTATION: One Set** each of Technical Specification document for each item to be submitted by the SELLER.
36. **TRAINING OF MANPOWER:** Not Applicable
37. **SUPPORT DURING JOINT RECEIPT INSPECTION (JRI):** Not Applicable
38. **PROGRESS REVIEW COMMITTEE (PRC):** Not Applicable
39. **MODIFICATIONS (CHANGE IN SCOPE OF WORK), IF ANY:**
- (a) Should Buyer desire any modifications or improvements, additions or alterations to the design, drawings, specifications, place of delivery etc., the same shall be carried out by the firm.
- (i) Without additional payments: If the modifications or improvements are of minor in nature and are intimated before undertaking of the job as per existing specifications has been carried out.
- (ii) On payment of additional Expenses and extension of delivery schedule on mutual agreement, if modifications or improvements are major in nature.
- (b) The recommendations of Committee / PRC will be considered as the basis for both Minor and Major modifications and for determining the requirements of additions/ reduction in expenditure and time for the contractor.
40. **AMENDMENTS:** No provision of the Contract shall be changed or modified in any way (including this provision) either in whole or in part except when both the parties are in written agreement for amending the Contract.
41. **RISK AND EXPENSE PURCHASE:** In case Seller fails to honor the contractual obligations within the stipulated delivery period and as amended, Buyer may procure the said contracted goods/services through a fresh supply order/contract and the defaulting Seller has to bear the excess cost incurred, if any.



PART-V: STANDARD TERMS & CONDITIONS OF RFP

The Bidder is required to give confirmation of their acceptance of the Standard Terms and Conditions of the RFP mentioned below which will automatically be considered as part of the Contract concluded with the successful Bidder as selected by the Buyer. Failure to do so may result in rejection of the Bid.

- 42. EFFECTIVE DATE OF THE CONTRACT:** The date of Purchase Order will be the Effective Date of the Contract. The performance of the Purchase Order shall commence from the Effective Date.
- 43. LAW:** The Contract shall be considered and made in accordance with the laws of the Republic of India and shall be governed by and interpreted in accordance with the laws of the Republic of India.
- 44. DISPUTES:** All disputes or differences arising out of or in connection with the present Contract including the ones connected with the validity of the present contract or any part thereof, shall be settled by bilateral discussions. Both, Buyer and Seller, will make every effort to resolve the dispute if any, in a mutually acceptable manner.
- 45. ARBITRATION:** In the event of any controversy, disputes or differences arising out of or in the interpretation of any of the terms and conditions of this agreement or on breach by any of the parties shall bring the said reason to the notice of each other, and shall amicably try to settle any such issues within 30 days of such notice. In the event of the parties' failure to reach amicable settlement as mentioned herein, all unresolved controversies, disputes or arbitration in accordance with Indian arbitration and conciliation Act, 1996 and the venue of arbitration shall be New Delhi, India.
- 46. PENALTY FOR USE OF UNDUE INFLUENCE:** The Seller undertakes that he has not given, offered or promised to give, directly or indirectly, any gift, consideration, reward, commission, fees, brokerage or inducement to any person in service of the Buyer or otherwise in procuring the Contract or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of the Contract or any other contract with the Government of India for showing or forbearing to show favour or disfavour to any person in relation to the Contract or any other contract with the Government of India. Any breach of the aforesaid undertaking by the Seller or anyone employed by him or acting on his behalf (whether with or without the knowledge of the Seller) or the commission of any offers by the Seller or anyone employed by him or acting on his behalf, as defined in Chapter IX of the Indian Penal Code, 1860 or the Prevention of Corruption Act, 1986 or any other Act enacted for the prevention of corruption shall entitle the Buyer to cancel the contract and all or any other contracts with the Seller and recover from the Seller the amount of any loss arising from such cancellation. A decision of the Buyer or his nominee to the effect that a breach of the undertaking had been committed shall be final and binding on the Seller. Giving or offering of any gift, bribe or inducement or any attempt at any such act on behalf of the Seller towards any officer/ employee of the Buyer or to any other person in a position to influence any officer/ employee of the Buyer for showing any favour in relation to this or any other contract, shall render the Seller to such liability/ penalty as the Buyer may deem proper, including but not limited to termination of the contract, imposition of penal damages, forfeiture of the Bank Guarantee and refund of the amounts paid by the Buyer.



- 47. ACCESS TO BOOKS OF ACCOUNTS:** In case it is found to the satisfaction of the Buyer that the Bidder/ Seller has violated the provisions of use of undue influence and/ or employment of agent to obtain the Contract, the Bidder/ Seller, on a specific request of the Buyer, shall provide necessary information/ inspection to the relevant financial documents/ information/ Books of Accounts.
- 48. AGENTS / AGENCY COMMISSION:** The Seller confirms and declares to the Buyer that the Seller has not engaged any individual or firm, whether Indian or foreign whatsoever, to intercede, facilitate or in any way to recommend to the Government of India or any of its functionaries, whether officially or unofficially, to the award of the contract to the Seller; nor has any amount been paid, promised or intended to be paid to any such individual or firm in respect of any such intercession, facilitation or recommendation. The Seller agrees that if it is established at any time to the satisfaction of the Buyer that the present declaration is in any way incorrect or if at a later stage it is discovered by the Buyer that the Seller has engaged any such individual/firm, and paid or intended to pay any amount, gift, reward, fees, commission or consideration to such person, party, firm or institution, whether before or after the signing of this contract, the Seller will be liable to refund that amount to the Buyer. The Seller will also be debarred from entering into any contract with the Government of India for a minimum period of five years. The Buyer will also have a right to consider cancellation of the Contract either wholly or in part, without any entitlement or compensation to the Seller who shall in such an event be liable to refund all payments made by the Buyer in terms of the Contract along with interest at the rate of 2% per annum above (i) Prime Lending Rate of State Bank of India for Indian bidders, and (ii) London Inter Bank Offered Rate (LIBOR) for the foreign bidders. The applicable rates on the date of opening of tender shall be considered for this. The Buyer will also have the right to recover any such amount from any contracts in vogue with the Government of India.

OR

The Seller confirms and declares in the Techno-Commercial bid that they have engaged an Agent, individual or firm, for promotion of their product. In such case, following details are to be submitted in the Techno-Commercial bid:

- (a) Name of the Agent
 - (b) Agency Agreement between the seller and the Agent giving details of their contractual obligation
 - (c) PAN Number, name and address of bankers in India and abroad in respect of Indian Agent
 - (d) The nature of services to be rendered by the Agent and
 - (e) Percentage of Commission payable to the Agent
- 49. WITHHOLDING OF PAYMENT:** In the event of the Seller's failure to submit the Bonds, Guarantees and Documents, supply the stores/goods and conduct trials, installation of equipment, training, etc. as specified in the Contract, the Buyer may, at his discretion, withhold any payment until the completion of the Contract.
- 50. FORCE MAJEURE CLAUSE:** Should any Force Majeure circumstances arise, each of the contracting party shall be excused for the non-fulfilment or for the delayed fulfilment of any of its contractual obligations, if the affected party within 30 (Thirty) days of its



occurrence informs in a written form the other party. Force Majeure shall mean fires, floods, natural disasters or other acts, that are unanticipated or unforeseeable, and not brought about at the instance of, the party claiming to be affected by such event, or which, if anticipated or foreseeable, could not be avoided or provided for, and which has caused the non-performance or delay in performance, such as war, turmoil, strikes, sabotage, explosions, quarantine restriction beyond the control of either party. A party claiming Force Majeure shall exercise reasonable diligence to seek to overcome the Force Majeure event and to mitigate the effects thereof on the performance of its obligations under this contract.

51. LIQUIDATED DAMAGES: Will be at the rate of 0.5% per week of delay and part thereof subject to maximum of 10% of order value on failure to complete the delivery within the need date.

52. TERMINATION OF CONTRACT: The Buyer shall have the right to terminate the Contract in part or in full in any of the following cases:

(a) The store/service is not received/rendered as per the contracted schedule(s) and the same has not been extended by the Buyer.

OR

The delivery of the store/service is delayed for causes not attributable to Force Majeure for more than 02_ months after the scheduled date of delivery and the delivery period has not been extended by the Buyer.

(b) The delivery of store/service is delayed due to causes of Force Majeure by more than 06 months provided Force Majeure clause is included in the contract and the delivery period has not been extended by the Buyer.

(c) The Seller is declared bankrupt or becomes insolvent.

(d) The Buyer has noticed that the Seller has violated the provisions of Use of Undue Influence and/or Employment of Agent above to obtain the Contract.

(e) As per decision of the Arbitration Tribunal.

53. NOTICES/ CORRESPONDENCES: Any notice/correspondence required or permitted by the Contract shall be written in English language and may be delivered personally or may be sent by FAX/email or registered pre-paid mail/ airmail, addressed to the last known address of the party to whom it is sent.

54. TRANSFER AND SUB-LETTING: The Seller has no right to give, bargain, sell, assign or sublet or otherwise dispose of the Contract or any part thereof, as well as to give or to let a third party take benefit or advantage of the Contract or any part thereof without written consent of the Buyer.

55. COMPETENCE OF PERSONNEL: Bidder to ensure the following:

(a) Necessary Competence of personnel, who involving in the execution of work



- (b) Their Contribution to product / service conformity & importance towards ethical behaviour.
 - (c) Competence to detect or prevent the counterfeit parts, monitoring and reporting of the same during execution of contract.
- 56. CURRENT MANUFACTURE:** The equipment supplied will be of latest manufacture and will confirm to current production standards including the specified material and its equivalent.
- 57. COUNTERFEIT PARTS:**
- (a) Seller shall evolve necessary verification and test methodologies to detect the counterfeit Parts.
 - (b) Seller to ensure to prevention of counterfeit parts / products including from their sub-vendors, if any.
 - (c) Seller to ensure that only non-counterfeit parts / products shall be delivered to Buyer.
 - (d) Further to prevent inadvertent use of counterfeit parts, Seller shall only procure directly from the OEM (Original Equipment Manufacturer) or their authorized distribution chain unless approved by Buyer in writing.
 - (e) Seller also to ensure the necessary traceability of parts / components belonging to OEM and the same shall be provided to Buyer to eliminate the delivery of counterfeit parts.
 - (f) Seller to obtain the approval of Buyer in writing to source the inputs from Non-Franchised Distributors and also to ensure parts that were procured are legitimate, authentic, non-counterfeit parts, if applicable.
 - (g) In case of detection of counterfeit parts / products upon inspection, same will not be accepted by Buyer and returned to Seller as they are and will be handled as per the policies of Buyer.
- 58. SECRECY:** Any Information of classified nature obtained, acquired during the manufacture, test and trails is not to be passed on to any Third party by you or your subcontractor(s). This clause shall survive on termination or completion of this order.
- 59. USE OF PATENTS AND OTHER INDUSTRIAL PROPERTY RIGHTS:** The prices stated in the Contract shall be deemed to include all amounts payable for the use of patents, copyrights, registered charges, trademarks and payments for any other Industrial Property Rights. The Seller shall indemnify the Buyer against all claims from a third party at any time on account of the infringement of any or all the rights mentioned in the previous paragraphs, whether such claims arise in respect of manufacture or use. The Seller shall be responsible for the completion of the supplies including spares, tools, technical literature and training aggregates irrespective of the fact of infringement of the supplies or any or all the rights mentioned above.



60. TAXES AND DUTIES:

- (a) Bidders are required to indicate statutory taxes and duties correctly as per the price bid format and no column of taxes and duties has to be left blank. Rate (%) of taxes as applicable are to be filled up with '0' (Zero), 'positive numerical values' or 'Not applicable' in the price bid as asked for in the RFP. If any column of taxes and duties as reflected in RFP is not applicable and intentionally left blank, the reason for the same has to be clearly indicated in the remarks column.
- (b) Only GST will be paid extra by the Buyer. The Bidders are required to indicate the unit & total costs of the items/services with and without GST, GST % with HSN/SAC separately as per the format enclosed. GST claimed by the Seller shall be released by the Buyer only after it appears in the Buyer's GST Input Credit Register of GSTIN Online Portal.

61. DENIAL CLAUSE: Denial clause informs Seller that the Buyer reserves the right to admit additional payment due to upward revision of statutory levies beyond the original delivery schedule in case Seller fails to deliver the goods as per schedule. Variations in the rates of statutory levies within the original delivery schedule will be allowed if taxes are explicitly mentioned in the contract/supply order and delivery has not been made till the revision of the statutory levies. Buyer reserves the right not to reimburse the enhancement of cost due to increase in statutory levies beyond the original delivery period of the supply order/contract even if such extension is granted without imposition of LD.

62. UNDERTAKING FROM THE BIDDERS: Bidder/firm/company/vendor will submit an undertaking that in the past they have never been banned/debarred for doing business dealings with Ministry of Defence/Govt. of India/any other Govt. organization and that there is no enquiry going on by CBI/ED/any other Govt. agency against them.

63. DOCUMENTS TO BE FURNISHED FOR CLAIMING PAYMENT:

- (a) **INDIGENOUS SELLERS:** The payment of bills will be made on submission of the following documents by the Seller to the Buyer:
- (i) Ink-signed copy of Invoice.
 - (ii) Bank Guarantee for Advance, if applicable.
 - (iii) Performance cum Warranty Bank Guarantee, if applicable
 - (iv) Details for electronic payment viz. Bank name, Branch name and address, Account Number, IFS Code, MICR Number (if these details are not already incorporated in the Contract).
 - (v) Copy of the Contract and amendments thereon, if any.
 - (vi) The BIDDER must provide the Certificate of Acceptance by the Buyer and other documents which will be decided during the course of execution of Contract.

(b) **FOREIGN SELLERS** : Not applicable

64. FRANKING CLAUSE:

- (a) **IN CASE OF ACCEPTANCE OF STORE(S):** The fact that the goods have been inspected after the delivery period and passed by the Inspecting Officer will not have the effect of keeping the contract alive. The goods are being passed without prejudice to the rights of the Buyer under the terms and conditions of the Contract.



(b) IN CASE OF REJECTION OF STORE(S): The fact that the goods have been inspected after the delivery period and rejected by the Inspecting Officer will not bind the Buyer in any manner. The goods are being rejected without prejudice to the rights of the Buyer under the terms and conditions of the contract.

65. CLAIMS:

(a) The quantity claims for deficiency of quantity and/ or the quality claims for defects or deficiencies in quality noticed during the inspection shall be presented within 45 days of completion of inspection.

(b) The Seller shall collect the defective or rejected goods from the location nominated by the Buyer and deliver the repaired or replaced goods at the same location, within mutually agreed period, under Seller's arrangement without any financial implication on the Buyer.

66. LIABILITY CLAUSE:

(a) Any damage caused to the property or suffered by the personnel of Buyer during the execution of Contract shall remain the liability of the Buyer. Such liability shall be fixed on Seller in case of grossly negligent act or omission on the part of Seller.

(b) This provision is limited to the relations between the Parties. It is without prejudice to the rights and actions to which the victims of damage, or any Social Security Organizations could prevail themselves legally.

(c) Either party would provide reasonable assistance to resolve the claim of other Party to mitigate loss or damage.

(d) Neither, the Seller shall be liable to the Buyer, nor shall the Buyer be liable to the Seller for any immaterial, punitive, indirect, special, incidental, or consequential loss or damage. This will hold good irrespective of whether such liability is based or claimed to be based on any breach of a Party's obligation under the Contract, or any negligent act or omission of a Party, its employees, servants, appointed representatives, sub-contractor or professional consultants, or such liability arises otherwise out of or in connection with the Contract.

(e) The Buyer shall not be liable for any compensation in any manner to the Seller for whatsoever reason.

(f) The Seller shall be liable to the Buyer for any compensation in any manner for whatsoever reasons for a sum not exceeding value of the Contract.

67. FALL CLAUSE: The prices charged for the stores supplied under the agreement by the Seller shall in no event exceed the lowest price at which the Seller sells the items of identical description to any other person/organization during the period till performance of all supply orders placed during the currency of the agreement is completed. If, at any time, during the said period, the Seller reduces the sale price of such stores or sells stores to any other person/organization at a price lower than the price chargeable under the agreement, he shall forthwith notify such reduction or sale to the authority which has concluded the RC/PA; and the price payable under the agreement for the stores supplied after the date of coming into force of such reduction or sale shall stand correspondingly reduced.



- 68. INCOTERMS FOR DELIVERY AND TRANSPORTATION (FOR FOREIGN BIDDERS ONLY):NOT APPLICABLE .**
- 69. NON-DISCLOSURE:** The Bidding documents, including this RFP and all attached documents provided by Buyer, are and shall remain or become the property of Buyer. These are transmitted to the Bidders solely for the purpose of preparation and the submission of a proposal in accordance herewith. Bidders are to treat all information as strictly confidential and shall not use it for any purpose other than for preparation and submission of their proposal. The provisions of this Para shall also apply mutatis mutandis to Bids and all other documents submitted by the Bidders, and Buyer will not return to the Bidders any proposal, document or any information provided along therewith (except unopened Commercial Bid as relevant). Information relating to the examination, clarification, evaluation and recommendation for the Bidders shall not be disclosed to any person who is not officially concerned with the process, or concerning the Bidding Process. Buyer will treat all information, submitted as part of the Bid, in confidence and will require all those who have access to such material to treat the same in confidence. Buyer may not divulge any such information unless it is directed to do so by any statutory entity that has the power under law to require its disclosure or is to enforce or assert any right or privilege of the statutory entity and/ or Buyer or as may be required by law or in connection with any legal process.
- 70. ACCESS TO CLASSIFIED DOCUMENTS/ SYSTEMS:** The Seller will be allowed to access pertinent classified details/documentation in the interest of execution of task. Association of the Seller will be desirable for effective rectification of design defects, if any, during trials of systems/ sub-systems, being developed as part of the contract. In all such cases, the Seller and his employees, connected with the assigned task, will be subject to the provisions contained in the Indian Official Secrets Act and required to render certificate to that effect.
- 71. ACQUIRING MANUFACTURING DRAWINGS AND ASSOCIATED HARDWARE:** The manufacturing drawings & other documents prepared during the development phase shall be the property of the Buyer and will be handed over to Buyer whenever required. Further, these will also not be used by the Seller for any purpose other than stated in the contract, without the written consent of Buyer. All dies/ tools/die sets/ jigs/ fixtures/ moulds fabricated under the contract which are charged separately will be returned to Buyer unless specified otherwise in the contract.
- 72. RETURN OF DOCUMENTS:** Documents, specifications, drawings, CD in encrypted format issued to Seller or prepared by them are "RESTRICTED" in nature and property of Buyer. In the interest of National Security these will be returned by the Bidder in as issued condition without any duplication and / or photocopying along with the Techno-Commercial Bids. Any loss or damage to these documents shall be recovered from the Bidders and in addition, the Buyer shall have the right of take up legal proceeding against the Bidder under appropriate laws prevailing in India.
- 73. CONFIDENTIALITY OF INFORMATION:** No party shall disclose any information to any 'Third Party' concerning the matters under this RFP generally. In particular, any information identified as 'Proprietary' in nature by the disclosing party shall be kept strictly confidential by the receiving party and shall not be disclosed to any third party without the prior written consent of the original disclosing party. This clause shall apply to the sub-contractors, consultants, advisors or the employees engaged by a party with equal force.
- 74. UNDERTAKING BY BIDDERS:** The Bidder will submit an undertaking that they are currently not banned/ debarred / suspended from doing business dealings with Government of India / any other government organization and that there is no investigation going on



by MoD against them. In case of ever having been banned / debarred / suspended from doing business dealings with MoD/any other government organization, in the past, the Bidder will furnish details of such ban / debarment along with copy of government letter under which this ban / debarment / suspension was lifted / revoked. The Bidder shall also declare that their sub-contractor(s)/Seller(s)/technology partner(s) are not Suspended or Debarred by Ministry of Defence. In case the sub-contractor(s)/Seller(s)/ technology partner(s) of the Bidder are Suspended or Debarred by Ministry of Defence, the Bidder shall indicate the same with justification for participation of such sub-contractor(s)/ Seller(s)/ technology partner(s) in the procurement case. Subsequent to submission of bids if any sub-contractor(s)/Seller(s)/ technology partner(s) of the Bidder is Suspended or Debarred by Ministry of Defence, the Bidder shall intimate the Ministry of Defence regarding Suspension or Debarment of its sub-contractor(s)/ Seller(s)/ technology partner(s) within two weeks of such order being made public.

- 75. GOVERNMENT REGULATIONS:** It may be confirmed that there are no Government restrictions or limitations in the country of the Bidder or countries from which subcomponents are being procured and/or for the export of any part of the deliverables being supplied.
- 76. PATENT RIGHTS:** The Bidder should confirm that there are no infringements of any Patent Rights in accordance with the laws prevailing in their respective countries.
- 77. RECORD OF QUALITY RELATED DOCUMENTS:** To be maintained for a minimum period of 15 yrs.
- 78. AUDIT OF STORES:** All products and records are subjected to audit by Brahmos Aerospace at any juncture during production at Seller's premises or after receipt at BrahMos Aerospace, Hyderabad.
- 79. ORDER ACKNOWLEDGEMENT:** The Seller shall acknowledge the receipt of the Supply Order, as and when placed by the Buyer, within 7 days of receipt. In case the acknowledgement is not received within 7 days, the Supply Order will be deemed to have been accepted by the Seller.



PART-VI: FORMAT FOR PRICE BID

(The terms & conditions will be amended or additional terms & conditions, if required, will be included in the RFP as decided by the competent authority)

Sl. No.	Items	Qty.	Unit Cost	Total Basic Cost	Rate of GST	Total Cost (incl. GST)	HSN CODE
1	28VDC COIL,600A,28V DC CONTACTOR	1					
2	ENCLOSURE HEATER, 50W	1					
3	VARIABLE THERMOSTAT 10A CONTACT	1					
4	VARIABLE HYGROSTAT, 5A CONTACT	1					
5	THREE STUB SERIES (BOX COUPLER FOR 1553)	1					
6	78 OHMS TWINAX TERMINATOR	1					
7	BCA1000 SERIES AC BATTERY CHARGER	1					
8	XBM BATTERY MONITOR WITH ACCESSORIES	1					
9	SMART LCD DISPLAY	1					
10	BRIDGE RECTIFIERS	2					
11	ETHERNET SWITCH	1					
12	21.3 INCH, UXGA RUGGED DISPLAY PANEL	1					
13	BACKLITE TRACKBALL WITH USB INTERFACE	1					
14	KEYBOARD WITH USB INTERFACE	1					
15	6U VME 64X, SBC, i7 (QUAD CORE)	1					
16	6U VME 4 CHANNEL MIL 1553B COMMUNICATION BOARD	1					
17	FUSE 1A (Ceramic)	40					
18	FUSE 5A (Ceramic)	1					
19	10 A SINGLE PHASE 240/415V MCB	1					
20	POWERPC VME SBC-C106A	2					



PART-VII: COMPLIANCE STATEMENT

The Bidder is required to submit detailed Compliance Statement containing all Terms & Conditions as enumerated at Part II, Part III, Part IV, Part V, Part VI and Part VII of this RFP and give confirmation of their acceptance of all Terms & Conditions. The deviations, if any, may be clearly indicated

COMPLIANCE STATEMENT			
Sl. No.	Clause	RFP Requirement	Comments by Bidder
	Part-I	GENERAL INFORMATION AND INSTRUCTIONS	
	Sl. No. of Clause as per RFP	Terms & Conditions as per RFP	Complied (Yes / No) If No, give details
	Part-II	SCOPE OF WORK	
	Sl. No. of Clause as per RFP	Terms & Conditions as per RFP	Complied (Yes / No) If No, give details
	PART-III	EVALUATION CRITERIA OF BIDS	
	Sl. No. of Clause as per RFP	Terms & Conditions as per RFP	Complied (Yes / No) If No, give details
	Part-IV	SPECIAL TERMS & CONDITIONS	
	Sl. No. of Clause as per RFP	Terms & Conditions as per RFP	Complied (Yes / No) If No, give details
	Part-V	STANDARD TERMS & CONDITIONS	
	Sl. No. of Clause as per RFP	Terms & Conditions as per RFP	Complied (Yes / No) If No, give details
	PART-VI	PRICE BID FORMAT	
	Sl. No. of Clause as per RFP	Terms & Conditions as per RFP	Complied (Yes / No) If No, give details

- **The Bidder shall submit a Clause-by-Clause Compliance Statement as per the above format. There should be no discrepancy between the details mentioned in the Techno-Commercial Bid and the Compliance Statement.**
- **In case of any such discrepancies, the terms & conditions mentioned in the RFP and their compliances as mentioned in either of the two documents shall prevail.**



**ENCLOSURE I TO
PART-II: SCOPE OF WORK**

LIST OF DELIVERABLES

SL. NO	PART NO	DESCRIPTION	MAKE	MODEL/PART NO.
1.		28VDC COIL,600A,28V DC CONTACTOR	INTEL DESIGN	KM600AB
2.		ENCLOSURE HEATER, 50W	RAATRONICS	D81710J0
3.		VARIABLE THERMOSTAT 10A CONTACT	RITTAL	3110.000 SK-3110.000
4.		VARIABLE HYGROSTAT, 5A CONTACT	RITTAL	3118
5.		THREE STUB SERIES (BOX COUPLER FOR 1553)	EXCALIBUR	ESI-310
6.		78 OHMS TWINAX TERMINATOR	TROMPETER	TNG1-1-78
7.		BCA1000 SERIES AC BATTERY CHARGER	ANALYTIC SYSTEMS	BCA1000-220-24
8.		XBM BATTERY MONITOR WITH ACCESSORIES	TBS ELECTRONICS	5055030 / 5055200 / 5055450
9.		SMART LCD DISPLAY	FUTURA AUTOMATION PVT. LTD	AMFD-150TS
10.		BRIDGE RECTIFIERS	SEMIKRON	SKD 25/08
11.		ETHERNET SWITCH	HIRSCHMANN	MAR1140-4C4C4C4C9999 EL9HPHHXX.X
12.		21.3 INCH, UXGA RUGGED DISPLAY PANEL	SCIOTEQ (ESTERLINE (FORMER BARCO))	K9346905
13.		BACKLITE TRACKBALL WITH USB INTERFACE	PHOENIX OR EQUIVALENT	FBI 10-6
14.		KEYBOARD WITH USB INTERFACE	CORTRON	537-0144
15.		6U VME 64X, SBC, i7 (QUAD CORE)	AITECH	15C163S-AB01-00
16.		6U VME 4 CHANNEL MIL 1553B	ABACO SYSTEMS	RQVME2-1553-4SDQ2



SL. NO	PART NO	DESCRIPTION	MAKE	MODEL/PART NO.
		COMMUNICATION BOARD		
17.		FUSE 1A	ELCOMAC	EI250VF5A
18.		FUSE 5A	EXCEL ELECTROTECHNIK PVT. LTD	FC-01-05000
19.		10 A SINGLE PHASE 240/415V MCB	HAGER	NCN110N
20.		POWERPC VME SBC-C106A	AITECH SYSTEMS. LTD	15C106-A600-06 (OLD PART NO.) 15C106-A600-06A (PART NO. REVISED AS PER OEM ECN4675)

Mechanical Bought Out Items

SL. NO	PART NO	DESCRIPTION	MATERIAL
01		HEXAGON SOCKET HEAD CAP SCREW M10 X 30 LG, A4-70	SS , IS:2269
02		SPRING LOCK WASHER, B10, IS:3063, A4 SS	SS , IS:3063
03		MACHINED WASHER, 25, IS:2016, A4	SS , IS:2016,
04		SPRING LOCK WASHER, B24, IS:3063, A4	SS , IS:3063
05		HEXAGON HEAD SCREW, M24 X 90 LG	INCONEL 718 IS:1364-2
06		HEXAGON HEAD SCREW, M24 X 55 LG	INCONEL 718 IS 1364-2

The details of Items are enclosed in Annexure-I to this RFP



ACCEPTANCE OF TERMS & CONDITIONS OF TENDER

(To be given on Company Letter Head)

To,
AGM (Commercial)
M/s BrahMos Aerospace Pvt Ltd,
16 Cariappa Marg, Kirby Place,
Delhi Cantt, New Delhi – 110010

ACCEPTANCE OF TERMS & CONDITIONS OF TENDER

Tender Reference No. _____

Name of Tender: _____

Dear Sir,

1. I / We have obtained the tender document(s) for the above mentioned 'Tender/Work' from your office namely: -

_____ as per your advertisement / RFP, given above.

2. I / We hereby certify that I / we read entire terms and conditions of the tender documents from Page No. ___ to ___ (including all documents like annexure(s), schedule(s), etc.), which form part of the contract agreement and I / we shall abide hereby the terms / conditions / clauses contained therein.

3. The corrigendum(s) issued from time to time by your department / organizations too have also been taken into consideration, while submitting this acceptance letter.

4. I / We hereby unconditionally accept the tender conditions of above mentioned tender document(s) / corrigendum(s) in its totality / entirety.

5. The Tech Bid and its enclosures as submitted in physical form as mentioned in part-I of RFP.

6. In case any provisions of this tender are found violated, your department / organization shall be at liberty to reject this tender / bid absolutely and we shall not have any claim / right against dept in satisfaction of this condition.

Yours Faithfully,

(Signature of the Bidder, with Official Seal)



ELECTRONIC PAYMENT SYSTEM MANDATE FORM

SI No	Description	Details
1	Name of the Firm & Address	
2	Email ID	
3	PAN No.	
4	Name of the Bank	
5	Name of Branch & Address	
6	Branch IFSC Code	
7	MICR Code	
8	Type of Account	
9	Bank Account No.	
10	Type of EPS	

I, hereby declare that the particulars given above are correct and complete. If the transaction is delayed or not effected at all for reasons of incomplete or incorrect information, I would not hold the institution responsible.

(Signature of the Bidder, with Official Seal)

Date:

Certified that the particulars furnished above are correct as per our records.

Bank Stamp:

Date:

(Signature of Authorized Official from the Bank)



NON BLACK LISTING CERTIFICATE

(To be given on Company Letter Head)

1. I, _____ son of shri _____ age about _____ by profession proprietor/ partner of M/s _____ having registered office at _____ do hereby solemnly affirms and declare as under: -

(a) Undertakes to the effect that the firm/I represent is not blacklisted by any Government Organization.

(b) I am not Proprietor/ Partners/ Director of any other firm or business organization with whom Government has banned/ suspended business dealing.

(c) I do not have any concern/ subsidiaries with any business organization or agency blacklisted by Government Organization.

Company Seal

(Authorised Signatory of Company)

Place:

Dated:

Signature of Bidder & Stamp



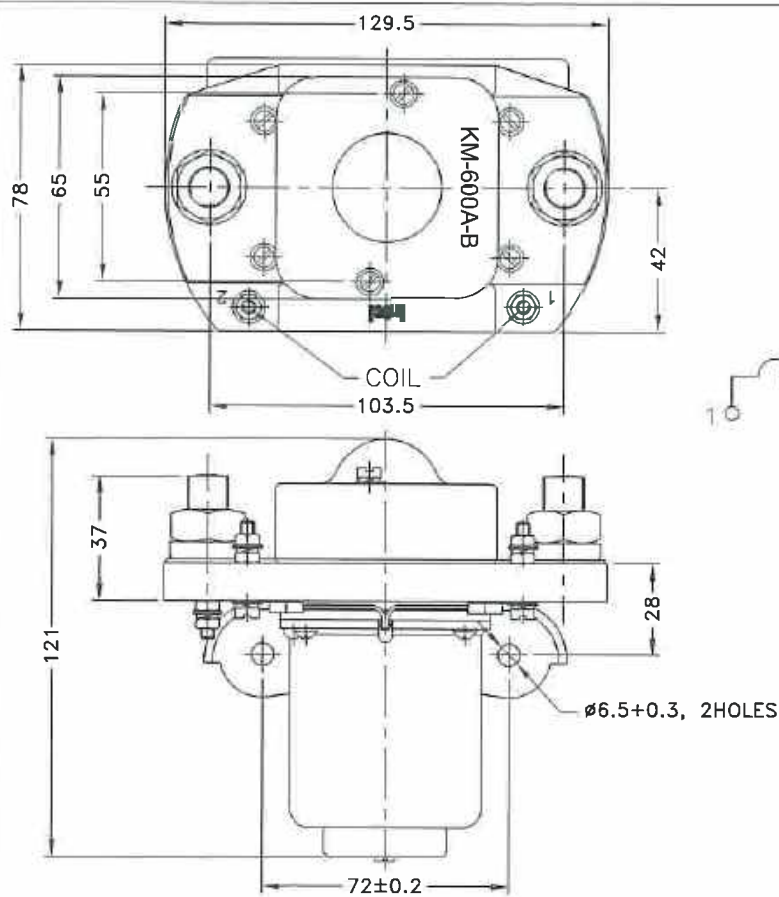
Part Details: 600 A, 28V Contactor, with 28 V DC Coil

SR. No. 1

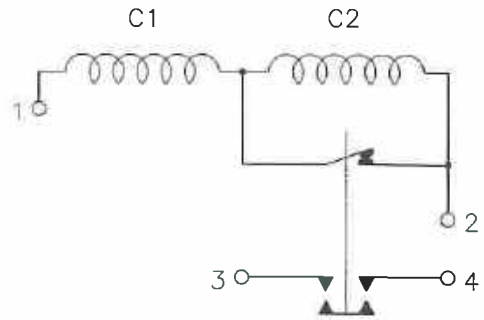
- Temp Grade** : - 60 to + 50 deg C
- Description** : KM 600 A - B
- 20A to 600A Load current
 - 24V to 30V range







SCHEMATIC DIAGRAM



ELECTRICAL SPECIFICATIONS :-

1. VOLTAGE : 27V DC
2. LOAD CURRENT : 20 to 600Amp
3. CURRENT CONSUMPTION : 0.65A. max.
OF WINDING AT 27V
4. MODE OF OPERATION : CONTINUOUS
5. WORKING VOLTAGE LEVEL : +24V to +30V DC
6. SWITCH ON VOLTAGE : ≤ 18V DC at 20°C to 55°C
7. SWITCH OFF VOLTAGE : ≤ 6.5V DC at 20°C to 55°C
8. VOLTAGE DROP : ≤ 150mV at +20±5°C
ACROSS CONTACTS
9. SWITCHING ON TIME : < 50msec

SUPPLIER :-

M/S. INTEL DESIGN SYSTEMS (I) PVT LTD
FACTORY & H.O, 47A, LONAVALA
IND. ESTATE.

ENVIRONMENTAL SPECIFICATIONS :-

1. OPERATING TEMPERATURE : +50°C to -60°C
2. RELATIVE HUMIDITY : 95% & t = +40°C ±2°C
3. VIBRATION : 10 to 200 Hz.
at linear acceleration of upto 8g
4. BUMP : 60 to 100 IMPACTS/min. at 4g PULSE
DURATION 5m to 15 mSEC.
5. ALTITUDE : 20,000M ABOVE SEALEVEL

SUPPLIER'S REF :- KM 600

				DGN /R & D AUTHY	Intel DESIGN SYSTEMS	
				TOL TO JSS 50003	DRN :	CHD :
				MATL :	TRD :	COMP :
				FINISH :	APPD :	
					PASSED :	
				SEALED :		ISSUE
				CAT NO :		
1		UPDATED	28/04/02	DRG NO :		87/OD
ISSUE	ZONE	BRIEF RECORD	APPD			
SCALE:NTS		TITLE :				
Dt.: 28/04/02		CONTACTOR (600A)				





SF 110-2

ENCLOSURE HEATER, 50 W

Connection. Terminal, screw type.

Make: RAATRONICS

Model / Part No.: D81710J0

Specifications

- (a) Dimension: 64 X 185 X 45 mm
- (b) Rating: 50 W at 20 °C
- (c) Rated operating voltage: 240 - 110 V (AC / DC)
- (d) Mounting on 35 mm DIN



Fig. 1 - Enclosure Heater, 50 W





ENCLOSURE INTERNAL THERMOSTAT WITH TEMPERATURE SELECTION FOR +5 TO +60 DEG C

Especially suitable for controlling fan-and-filter units, heaters and heat exchangers, this thermostat can also be used as a signal generator for monitoring the enclosure internal temperature.

Make: RITTAL

Model / Part No.: 3110

Specifications

- (a) Bi-metal sensor as a temperature sensitive element with thermal feedback;
- (b) Contact population: Single-pole change-over contact as a quick-break contact;
- (c) Permissible contact load:
 - (i) Category 5 - 3 (heating) AC 10 (4) A, (Inductive load at $\cos\Phi = 0.6$);
 - (ii) DC = 30 W;
 - (iii) Category 5 - 4 (cooling);
 - (iv) AC 5 (4) A, (Inductive load at $\cos\Phi = 0.6$);
 - (v) DC = 30 W.
- (d) Setting range: +5 to +60 °C;
- (e) Weight approx.: 105 grams;
- (f) Dimensions: 71 x 71 x 33.5 mm;
- (g) Switching difference approx. 1 K \pm 0.8 K. A broad voltage spectrum i.e. just one model covers 24 to 230 V AC (Model No. SK3110.000);
- (h) Time-saving connection technique using a terminal strip with a screw connection from the outside;
- (j) Flexible mounting on a vertical or horizontal 35 mm support rail to EN 50 022, and snap fastening in the TS/ES enclosure section using the supplied adaptor;







Enclosure internal thermostat

Especially suitable for controlling fan-and-filter units, heaters and heat exchangers, this thermostat can also be used as a signal generator for monitoring the enclosure internal temperature.

Technical specifications:

- Bi-metal sensor as a temperature-sensitive element with thermal feedback
- Contact population: Single-pole change-over contact as a quick-break contact
- Permissible contact load:
Category 5 – 3 (heating)
AC 10 (4)⁽¹⁾ A,
DC = 30 W
Category 5 – 4 (cooling)
AC 5 (4)⁽¹⁾ A,
DC = 30 W
(⁽¹⁾) = Inductive load at $\cos \varphi = 0.6$
- Setting range +5°C to +60°C
- Weight approx. 105 grams
- Dimensions 71 x 71 x 33.5 mm
- Switching difference approx. 1 K ± 0.8 K.

Rated operating voltage	Model No. SK
230/115/60/48/24 V (AC)	3110.000
60/48/24 V (DC)	



- A broad voltage spectrum i.e. just one model covers 24 to 230 V.
- Time-saving connection technique using a terminal strip with a screw connection from the outside.
- Flexible mounting on a vertical or horizontal 35 mm support rail to EN 50 022, and snap fastening in the TS/ES enclosure section using the supplied adaptor.



Hygrostat

The hygrostat switches on the heater and/or fan when a preset relative humidity in the enclosure is exceeded.

In this way, the relative humidity is raised above the dew point, and condensation on assemblies or electronic components is avoided.

Technical specifications:

- Contact population: Single-pole change-over contact as a quick-break contact
- Permissible contact load:
AC ~ 5 (0.2)⁽¹⁾ A
DC = max. 20 W
(⁽¹⁾) = Inductive load at $\cos \varphi = 0.6$
- Setting range 50 – 100 % relative humidity
- Weight approx. 100 g
- Dimensions 71 x 71 x 33.5 mm
- Switching difference approx. 4 %

Rated operating voltage	Model No. SK
24 – 230 V (AC/DC)	3118.000

- A broad voltage spectrum i.e. just one model covers 24 to 230 V.
- Time-saving connection technique using a terminal strip with a screw connection from the outside.
- Flexible mounting on a vertical or horizontal 35 mm support rail to EN 50 022, and snap fastening in the TS/ES enclosure section using the supplied adaptor.

B
47

Accessories for system climate control



Bottom-mounted adaptor

for enclosure internal thermostat SK 3110.000 and hygrostat SK 3118.000

Bottom-mounted adaptor with mounting option for screwed cable glands, for targeted cable infeed from appropriate equipment such as SK fan-and-filter units and enclosure heaters. In conjunction with screwed cable glands, it is also suitable for use as strain relief.

Packs of	Model No. SK
1	3110.200







Enclosure internal thermostat

Especially suitable for controlling fan-and-filter units, heaters and heat exchangers, this thermostat can also be used as a signal generator for monitoring the enclosure internal temperature.

Technical specifications:

- Bi-metal sensor as a temperature-sensitive element with thermal feedback.
- Contact population: Single-pole change-over contact as a quick-break contact.
- Permissible contact load:
Category 5 – 3 (heating)
AC 10 (4)⁽¹⁾ A,
DC = 30 W
Category 5 – 4 (cooling)
AC 5 (4)⁽¹⁾ A,
DC = 30 W
(¹) = Inductive load at $\cos \varphi = 0.6$
- Setting range +5°C to +60°C
- Weight approx. 105 grams
- Dimensions 71 x 71 x 33.5 mm
- Switching difference approx. 1 K ± 0.8 K.

Rated operating voltage	Model No. SK
230/115/60/48/24 V (AC)	3110.000
60/48/24 V (DC)	



- A broad voltage spectrum i.e. just one model covers 24 to 230 V.
- Time-saving connection technique using a terminal strip with a screw connection from the outside.
- Flexible mounting on a vertical or horizontal 35 mm support rail to EN 50 022, and snap fastening in the TS/ES enclosure section using the supplied adaptor.



Hygrostat

The hygrostat switches on the heater and/or fan when a preset relative humidity in the enclosure is exceeded.

In this way, the relative humidity is raised above the dew point, and condensation on assemblies or electronic components is avoided.

Technical specifications:

- Contact population: Single-pole change-over contact as a quick-break contact.
- Permissible contact load:
AC ~ 5 (0.2)⁽¹⁾ A
DC = max. 20 W
(¹) = Inductive load at $\cos \varphi = 0.6$
- Setting range 50 – 100 % relative humidity
- Weight approx. 100 g
- Dimensions 71 x 71 x 33.5 mm
- Switching difference approx. 4 %

Rated operating voltage	Model No. SK
24 – 230 V (AC/DC)	3118.000

- A broad voltage spectrum i.e. just one model covers 24 to 230 V.
- Time-saving connection technique using a terminal strip with a screw connection from the outside.
- Flexible mounting on a vertical or horizontal 35 mm support rail to EN 50 022, and snap fastening in the TS/ES enclosure section using the supplied adaptor.

B
4.7

Accessories for system climate control



Bottom-mounted adaptor

for enclosure internal thermostat SK 3110.000 and hygrostat SK 3118.000

Bottom-mounted adaptor with mounting option for screwed cable glands, for targeted cable infeed from appropriate equipment such as SK fan-and-filter units and enclosure heaters. In conjunction with screwed cable glands, it is also suitable for use as strain relief.

Packs of	Model No. SK
1	3110.200





HYGROSTAT WITH SETTING OF 50-100% HUMIDITY



Fig. 1 - Hygrostat with setting of 50-100% humidity

Make: RITTAL

Model / Part No.: 3118

Specifications

- (a) Contact population: Single-pole change-over contact as a quick-break contact;
- (b) Permissible contact load:
 - (i) AC ~ 5 (0.2) 1 A (Inductive load at $\cos\Phi = 0.6$);
 - (ii) DC = max. 20 W.
- (c) Setting range: 50 - 100 % relative humidity;
- (d) Weight approx.: 100 g;
- (e) Dimensions: 71 X 71 X 33.5 mm;
- (f) Switching difference approx.: 4 %;
- (g) A broad voltage spectrum i.e. just one mode covers 24 to 230 V AC (Model No. SK3118.000);
- (h) Time-saving connection technique using a terminal strip with a screw connection from the outside;
- (j) Flexible mounting on a vertical or horizontal 35 mm support rail to EN 50 022, and snap fastening in the TS/ES enclosure section using the supplied adaptor.

Enclosure Internal hygrostat with RH selection from 50% to 100%.





SPECIFICATIONS for ESI-310/320/330/340

THREE STUB BOX COUPLER

MECHANICAL OUTLINE

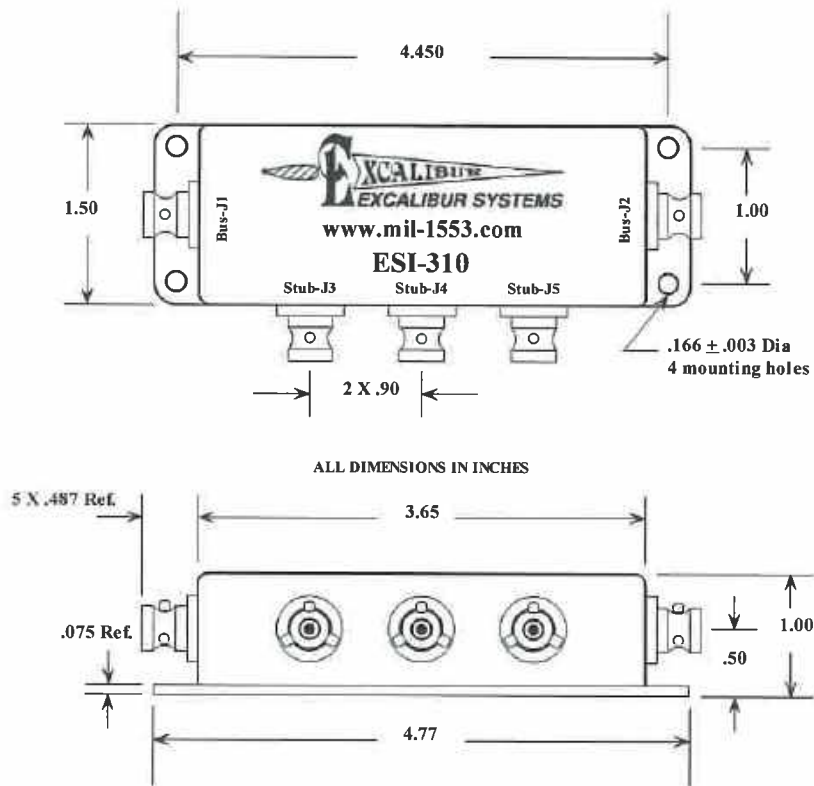
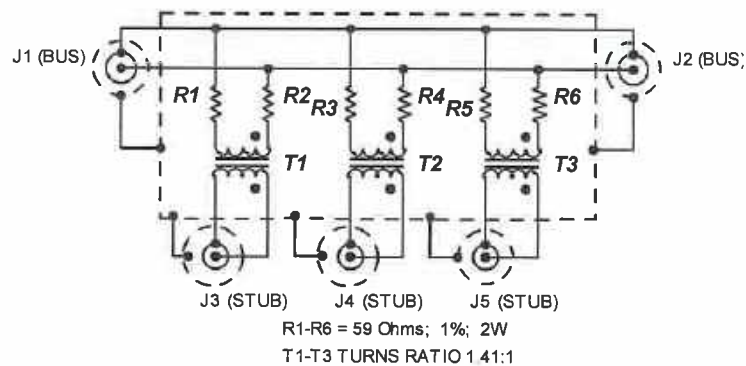


figure 1



3 STUB SCHEMATIC DIAGRAM

figure 2





SPECIFICATIONS for ESI-310/320/330/340

- 1.0 **REQUIREMENTS:**
 - 1.1 DOCUMENT DESCRIBES THE REQUIREMENTS FOR THREE STUB BUS COUPLERS FOR MIL-STD-1553 APPLICATIONS

- 2.0 **MECHANICAL SPECIFICATIONS:**
 - 2.1 DESIGN AND CONSTRUCTION – THE COUPLER SHALL WITHSTAND THE STATIC HANDLING, INSTALLATION, AND OPERATIONAL SERVICE AS SPECIFIED HEREIN. THE COUPLER SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF MIL-STD-454 FOR PROCESS, PARTS AND MATERIALS, DESIGN CONSTRUCTION AND WORKMANSHIP. THE ENCLOSURE SHALL BE A METAL ENCLOSURE

- 3.0 **ELECTRICAL SPECIFICATIONS:**
 - 3.1 FREQUENCY RANGE: 75 kHz – 1.0 MHz
 - 3.2 COMMON MODE REJECTION: -45.0 dB MIN. @ 1.0MHz.
 - 3.3 DROOP: 20% MAX. (250kHz)
 - 3.4 OVERSHOOT & RINGING: +/- 1.0V PEAK
 - 3.5 TRANSFORMER RATIO: 1:1.41 +/- 3%
 - 3.6 POWER RATING: 2-WATT MIN. FOR ISOLATION RESISTORS
 - 3.7 DIELECTRIC STRENGTH: 500 Vrms BETWEEN CABLE SHIELD AND BUS AND STUB CONDUCTORS AND BETWEEN BUS AND STUB CONDUCTORS.
 - 3.8 INSULATION RESISTANCE: GREATER THAN 1000 MEGOHMS AT 250 VDC BETWEEN CONDUCTORS AND SHIELD.

- 4.0 **ENVIRONMENTAL:**
 - 4.1 OPERATING TEMPERATURE RANGE: -55 deg. C to +125 deg. C

- 5.0 **MARKINGS:**
 - 5.1 ITEMS SHALL BE LEGIBLY AND PERMANENTLY MARKED WITH THE MANUFACTURER'S NAME OR TRADEMARK, PART NUMBER, TERMINAL IDENTIFICATION, AND DATE CODE.

- 6.0 **MECHANICAL SPECIFICATIONS:**
 - 6.1 CONNECTORS:
 - BJ770 (TROMPETER OR EQUIV.) J1 THRU J5
 - MATING CONNECTOR FOR REFERENCE: PL75 (TROMPETER OR EQUIV.)
 - 6.2 MATERIAL:
 - 6.2.1 ENCLOSURE: ALUMINUM .050 THK.
 - 6.2.2 MOUNTING PLATE: STAINLESS STEEL .075 THK.
 - 6.2.3 BLUE ENAMEL (POWDER COATED)

COUPLER CONFIGURATIONS THAT MEET THE SAME ELECTRICAL AND MECHANICAL SPECIFICATIONS BUT HAVE DIFFERENT INTERCONNECTS

Ordering Information

PART NUMBER	CONNECTOR	MATING CONNECTOR
ESI-310	BJ770 (MINATURE)	PL75
ESI-320	BJ377 (MINATURE THREADED)	PL375
ESI-330	BJ157 (SUB-MINATURE)	PL155
ESI-340	BJ3157 (SUB-MINATURE THREADED)	PL3155

Table 1



Description:

78 ohms TWINAX TERMINATOR WITHOUT CHAIN, TO
CAP BJ79-9.

Material:

Hi-quality brass with bright nickel-plated, non tarnish finish

CAT NO	MANUFACTURE	Description	ORDERING CODE
XL 02022	Trompeter	78 Ohm Terminator	TNG1-1-78





100





ANALYTIC SYSTEMS

Power Conversion Solutions

#207 12448 82nd Ave.
Surrey, BC V3W 3E9 CANADA

+1 (604) 543-7378 • phone
1-800-668-3884 • toll free
+1 (604) 543-7354 • fax

www.analyticsystems.com



(Shown with Optional Digital Meter)

Benefits

- Ultra-Quiet
- Power sensitive electronics without interference
- Rugged & Reliable
- Ensure years of safe and trouble free operation
- Fast & Accurate Charging

Applications

- Marine & other rugged environments
- Automotive / RV
- Electric Utilities and Substations
- Base Station Power (Radio & Telecommunications)
- OEM Applications
- Field Work / Construction Sites
- Solar Power Systems
- Emergency Power Backup (UPS)
- Security Systems
- Charge any 12, 24, 32, or 48 Volt Battery System

AC Battery Chargers

BCA1000 Series Battery Charger

Description

The BCA1000 battery charger provides up to 1000 watts to charge a 12, 24, 32, or 48 Volt battery system (1 or 2 banks) from a 110 or 220VAC source. The batteries must share a common ground.

This all-new single board design incorporates state of the art switchmode technology for unmatched efficiency and ultra-quiet operation. Multiple stages of filtering reduce radiated or conducted noise to very low levels. Extra features include adjustable output voltage, audible and visual indicators for low input voltage, low output voltage, over temperature and an equalize charging cycle. Safety features include both charger and battery over-temperature shutdown, current limiting, short circuit protection with automatic recovery, input undervoltage shutdown, reverse battery hook-up protection, a dry contact alarm relay output and output overvoltage crowbar.

Optional features include a Digital Volt/Ammeter, 3-Bank Charging, a Remote Control Panel, and/or a second Battery Temperature Sensor. We are confident that you will get many years of reliable service from this AC Battery Charger.

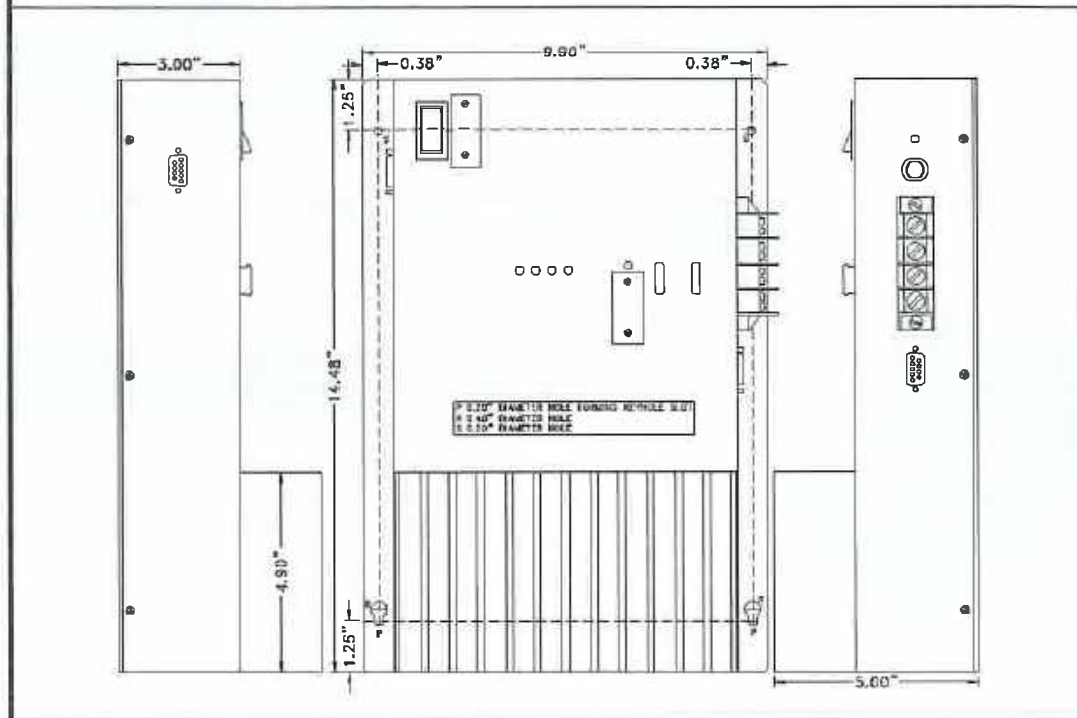
Features

- Ideal as Global Marine Distress Safety System (GMDSS) power supply when equipped with optional voltmeter and ammeter.
- Adjustable output voltage for charging standard or deep cycle lead-acid, VRLA or Gel cell type battery
- Temperature compensated charging
- High tolerance for shock and vibration
- Ultra-quiet low EMI operation
- Can be left permanently connected
- Can function as a power supply
- Dry contact output fail relay
- User selectable 2 or 3 stage charging profile
- 3 Bank Option Available
- Audible & visual indicators for output overload, low input voltage, low output voltage & over-temperature
- Over-temperature shutdown
- Short circuit protection
- Output over-voltage crowbar
- Inrush Current Limiting with solid state bypass
- Thermostatically controlled fan
- 3 year parts and labour warranty



BCA1000 Series Battery Charger

Mechanical Diagram



Specifications

Electrical (Input)

Nominal Vac (Ip)	110	220
Actual (Vac)	105-125	210-250
Input Amps (max)	13.8	6.9
Input Fuse (MDA)	20A	10A
Input Frequency	45-65 Hz	
Noise on Input	< 50 mV	

Environmental Specifications

Operating Temp. Range	-25° to +40°C @ maximum output Derate Linearly 2.5% per °C from 40°C (Optional -40°C extra wide temp. operation avail.)
Humidity	0 - 95°C Relative Humidity (non-condensing) with optional conformal coating
Audible Noise	NONE Ødb @ 3 ft (34.5 dB when fan operating)
Typical Service Life	> 10 yrs. (87,600 hrs)
Isolation	Input-Case & Input-Output 1500VDC Output-Case 500VDC

Electrical (Output)

Output Nominal (op)	12	24	32	48
Output Volts (DC)	13.6 ± 0.05	27.2 ± 0.05	36.3 ± 0.05	54.4 ± 0.05
Absorption Voltage (Vdc)	14.4	28.8	38.4	57.6
Charging Amps	60	40	30	20
Absorption to Float (15%)	9 Amps	6 Amps	4.5 Amps	3.0 Amps
Output Adjustment (Vdc)	± 0.5V			
Output Fuses (ATC)	40 x 2	40 x 2	40 x 2	30 x 2
Battery Banks	1 or 2 (3 Bank Option Available)			
Output Crowbar	16.0 ± 0.5V	32.0 ± 1.0V	42.7 ± 1.3V	63.9 ± 2.0V
Battery Size (Amp Hrs.)	240 - 360	160 - 240	120 - 180	80 - 120
Output Ripple & Noise	< 50 mV			
Regulation (Line & Load)	< +/- 0.5%			
Temperature Comp.	-30 mV/°C	-60 mV/°C	-80 mV/°C	-120 mV/°C
Duty Cycle	Continuous 100% for 24 hours per day			
Efficiency	> 75% @ Maximum Output			
Stages	2 or 3 (user selectable)			

Mechanical Specifications

Length	14.5 in / 36.8 cm
Width	9.9 in / 25.1 cm
Height	5.5 in / 14.0 cm
Clearance	1 inch (2.5 cm) all around
Material	Marine Grade Aluminium
Finish	Black Anodize / Powder Epoxy Coat
Fastenings	All 18-8 Stainless Steel
Weight	12.0 lb / 5.5 kg
Connections	Four contact output terminals
Warranty	3 years
Safety	Approval to CSA/UL Standards Pending

Available From:



ANALYTIC SYSTEMS
Quality since 1976

#207 12448 82nd Ave
Surrey, BC V3W 3E9 CANADA
+1 (604) 543-7378 • phone
1-800-668-3884 • toll free
+1-604-543-7354 • fax
www.analyticsystems.com

© 2002 Analytic Systems Ware Ltd. (1993)
Specifications Subject to Change Without Notice

Description: BCA1000SERIES AC BATTERY CHARGER
Operating Temperature Range: -25 °C to +55 ° C
Battery Size: 160-240Ah.





LinkPRO / LinkLITE Battery Monitors

xantrex



Battery Status At A Glance

Defining the amount of energy available in a battery is a complex task since battery age, discharge current and temperature all influence the actual battery capacity. High performance measuring circuits, along with complex software algorithms, are used to exactly determine the remaining battery capacity. A new shunt selection feature enables the LinkPRO and LinkLITE to measure currents up to 10,000 and 1,000 amps respectively.

The LinkPRO and LinkLITE selectively displays voltage, charge and discharge current, consumed amp-hours, remaining battery capacity and the LinkPRO also displays the time remaining of your battery bank. Using a clear backlit LCD Display and an intuitive user interface, all parameters can be recalled with just a button press. A second battery input is also provided to monitor voltage on a second battery bank.

The LinkPRO and LinkLITE are equipped with an internal programmable alarm relay, to run a generator when needed or to turn off devices when the battery voltage exceeds programmable boundaries.

Performance Features

- ▶ Read your battery bank like a fuel gauge
- ▶ Provides critical information about the status of your battery bank
- ▶ Displays voltage, current, consumed amp-hours and remaining battery capacity
- ▶ Secondary battery bank voltage monitoring
- ▶ Auto sensing battery voltage inputs
- ▶ Large backlit LCD Display
- ▶ Quick nut mounting construction
- ▶ Programmable alarm relay
- ▶ Shunt selection capability enables flexible system integration
- ▶ Splash proof frontpanel
- ▶ 500 Amp shunt included
- ▶ CE and e-mark certified

LinkPRO Additional Performance Features

- ▶ Displays time remaining
- ▶ Communication/expansion port
- ▶ Stores a wide range of history events in internal memory
- ▶ Advanced programmable alarm relay
- ▶ Battery temperature sensor input

LinkPRO
LinkLITE

Xantrex Technology Inc.

Headquarters
8999 Nelson Way
Burnaby, British Columbia
Canada V5A 4B5
800 670 0707 Toll Free
604 420 1591 Fax

541 Roske Drive, Suite A
Elkhart, Indiana
USA 46516
800 446 6180 Toll Free
574 294 5989 Fax

www.xantrex.com



LinkPRO / LinkLITE Battery Monitors

Electrical Specifications

Models	LinkPRO	LinkLITE
Supply voltage range	9 to 35 Vdc	9 to 35 Vdc
Supply current ¹		
- @ Vin = 12 Vdc	9 mA	9 mA
- @ Vin = 24 Vdc	7 mA	7 mA
Input voltage range		
- Main battery	0 to 35 Vdc	0 to 35 Vdc
- Auxiliary battery	2 to 35 Vdc	2 to 35 Vdc
Input current range ²	-9999 to +9999A	-999 to +999A
Battery capacity range	20 to 9990A	20 to 999A
Readout resolution		
- Voltage (0 to 35V)	± 0.01V	± 0.1V
- Current	0 to 199A (± 0.1A)	0 to 99A (± 0.1A)
- Current	200 to 9999A (± 1A)	100 to 999A (± 1A)
- Amphours	0 to 199Ah (± 0.1Ah)	0 to 99Ah (± 0.1Ah)
- Amphours	200 to 9999Ah (± 1Ah)	100 to 999Ah (± 1Ah)
- State-of-charge	± 0.1%	± 1%
- Time-to-go (0 to 99hrs)	± 1 minute	n/a
- Time-to-go (100 to 240hrs)	± 1 hour	n/a
- Temperature (-20 - +50°C) ²	± 0.5°C	n/a
Voltage measurement accuracy	± 0.3%	± 0.3%
Current measurement accuracy	± 0.4%	± 0.4%

General Specifications

Models	LinkPRO	LinkLITE
Operating temperature ³	-20 to 50°C	-20 to 50°C
Battery monitor dimensions		
- Front panel	Ø 2.54" (64mm)	Ø 2.54" (64mm)
- Body diameter	Ø 2.05" (52mm)	Ø 2.05" (52mm)
- Total depth	Ø 3.11" (79mm)	Ø 3.11" (79mm)
Shunt dimensions		
- Footprint	1.77 x 3.43" (45 x 87mm)	1.77 x 3.43" (45 x 87mm)
- Height	0.67" (17mm) base / 1.38" (35mm) terminal bolts	0.67" (17mm) base / 1.38" (35mm) terminal bolts
Weight		
- Battery monitor weight	0.21 lb (95 g)	0.21 lb (95 g)
- Shunt weight	0.32 lb (145 g)	0.32 lb (145 g)
Warranty	One year	One year
Part Numbers	84-2031-00	84-2030-00

Accessories

Temperature sensor - 32ft (10m)	854-2022-01	n/a
Communication kit	854-2019-01	n/a
Connection kit - 50ft (15m)	854-2021-01	854-2021-01

Regulatory & Environmental Compliance

EMC Directive 2004/108/EC (EN61000-6-2 and -6-3). Automotive EMC Directive 95/54/EC. RoHS Directive 2002/95/EC

¹ Measured with backlight and alarm relay turned off.² Only available when optional temperature sensor is connected.³ Depends on selected shunt. With standard delivered 500A/50mV shunt (350A continuous), the range is limited from -600 to +600A.

Note: Specifications subject to change without notice.



15" TOUCH LCD DISPLAY WITH SINGLE BOARD COMPUTER BASED ON ARM A9

Make: FUTURA AUTOMATION PVT. LTD

Model / Part No.: AMFD-150TS

The type of data and control signals are digital and transmitted via. LVDS interface per ttp. 65 MHz. clock cycle This LCD display has a touch screen facility.



Fig. 1 - 15" Touch LCD Display

Features

- (a) Single board computer based on ARM A9 (TI-AM4378) at 1 GHz;
- (b) 2 GB RAM;
- (c) 16 GB eMMC (Flash storage);
- (d) 2x ethernet ports;
- (e) 1 x RS232;
- (f) 1 x RS232 (Debug);
- (g) 2 x USB ports;
- (h) Built-in 15" XGA touch LCD panel.



Connector Pin Details

The connector pin details of the 15" Touch LCD Display is given in the **Table 1** below.

Table 1 - 15" Touch LCD Display Pin Details

Pin No.	Signal Name	Pin No.	Signal Name
2x USB PORTS		1x DC POWER IN	
1	Vcc	1	+Ve (DC Supply +Ve)
2	D-	2	-Ve (DC Supply -Ve)
3	D+	3	Earth
4	Ground	-	-
2x ETHERNET PORTS		1x RS232	
1	Transmit Data +	1	DCD (Data Carrier Detect)
2	Transmit Data -	2	RXD (Receive Data)
3	Receive Data +	3	TXD (Transmit Data)
4	Not Used	4	DTR (Data Terminal Ready)
5	Not Used	5	GND (Ground)
6	Receive Data -	6	DSR (Data Set Ready)
7	Not Used	7	RTS (Request to Send)
8	Not Used	8	CTS (Clear to Send)
-	-	9	RI



Specifications

General specifications. The general specifications of the 15" Touch LCD Display is given in the **Table 2** below.

Table 2 - General Specifications of 15" Touch LCD Display

Sl. No.	Parameter	Specifications
1	Resolution	1024 x 768
2	Display active area	304.12 mm(H) x 228.096 mm(V)
3	Pixel pitch	0.297mm x 0.297mm
4	Brightness	450 cd/m ²
5	Contrast ratio	700:1
6	Viewing angle	L/R: ± 70 Top: 60 Down: 60
7	Screen type	Built-in resistive touchscreen with EMI mesh
8	Power input	28 V DC (18 ~ 36 volts)

Configuration

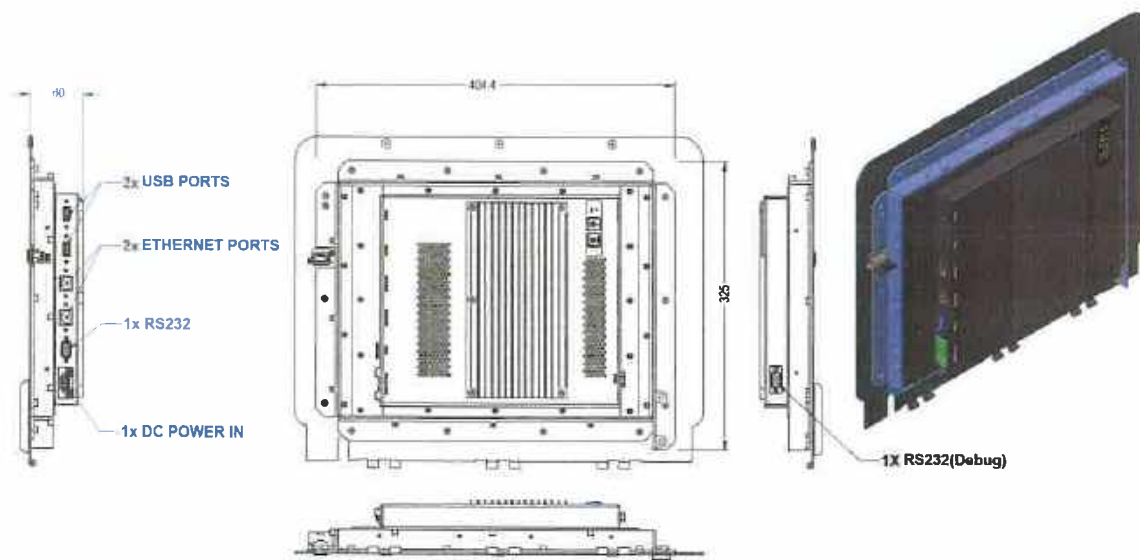


Fig. 2 - Configuration of 15" Touch LCD Display



Dimensions

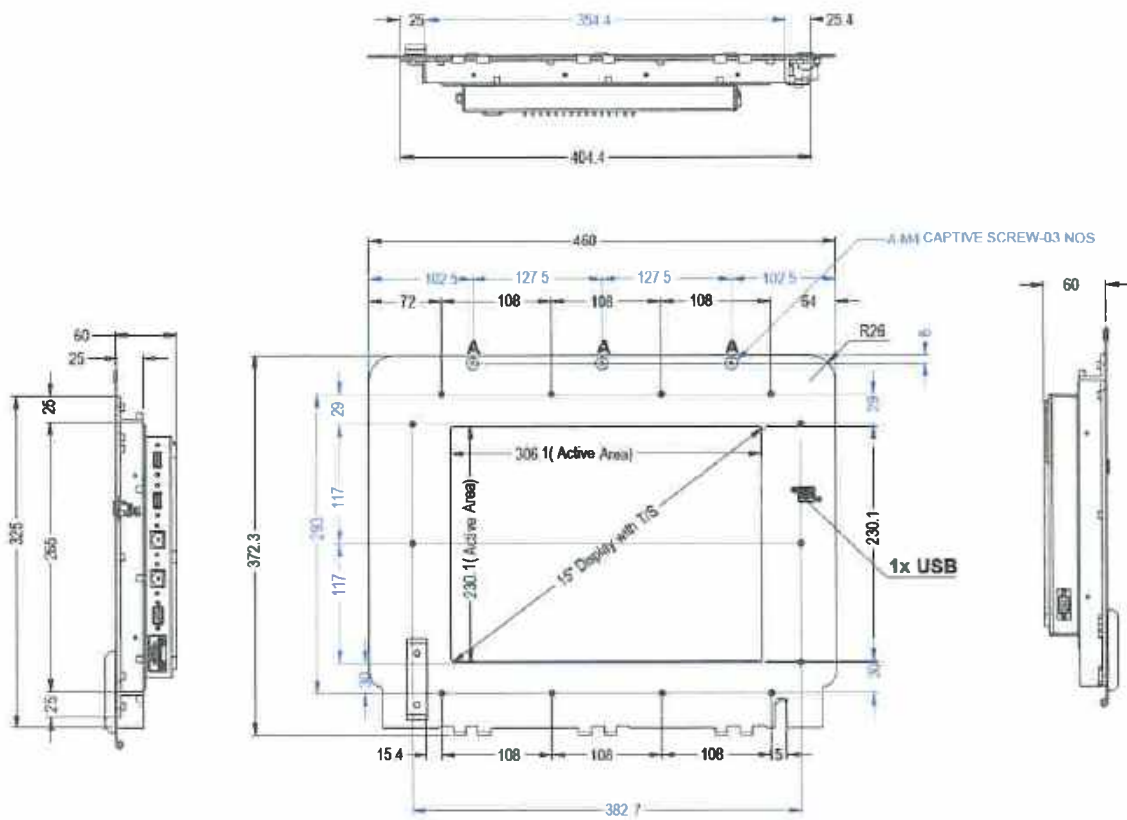


Fig. 3 - Dimensions of 15" Touch LCD Display



Connection details of 15" Multifunction Display

2x USB PORTS

Pin #	Signal Name:
1	Vcc
2	D-
3	D+
4	Ground

2x ETHERNET PORTS

Pin #	Signal Name
1	Transmit Data +
2	Transmit Data -
3	Receive Data +
4	not used
5	not used
6	Receive Data -
7	not used
8	not used



1x RS232

Pin #	Signal	Signal Name
1	DCD	Data Carrier Detect
2	RXD	Receive Data
3	TXD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator

1x DC POWER IN

Pin #	Signal	Signal Name
1	+Ve	DC Supply +Ve
2	-Ve	DC Supply -Ve
3	Earth	Earth




BRIDGE RECTIFIERS

Make: SEMIKRON

Model / Part No.: SKD 25/08

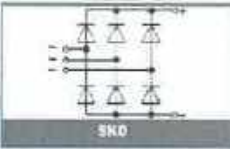
1.1 The data sheet of the power bridge rectifier used in the system i.e. SKD25 is given below.

SKD 25



Power Bridge Rectifiers

SKD 25



Features

- Square plastic case with isolated metal base plate and fast-on connectors
- Blocking voltage to 1600 V
- High surge current
- Easy chassis mounting
- UL recognized, file no. E 63 532

Typical Applications

- Three phase rectifier for power supplies
- Input rectifiers for variable frequency drives
- Rectifier for DC motor field supplies
- Battery charger rectifiers
- Recommended snubber network: RC: 50 Ω, 0.1 μF (P_R = 1 W)

1) Freely suspended or mounted on an insulator

2) Mounted on a painted metal sheet of min. 250 x 250 x 1 mm

V_{RSM}, V_{RRM} V	V_{VRMS} V	$I_D = 20 \text{ A } (T_c = 73^\circ\text{C})$ Types	C_{max} μF	R_{min} Ω
200		SKD 25/02		0,15
400		SKD 25/04		0,3
800		SKD 25/08		0,7
1200		SKD 25/12		1
1400		SKD 25/14		1,2
1600		SKD 25/16		1,5

Symbol	Conditions	Values	Units
I_D	$T_a = 45^\circ\text{C}$, isolated ¹⁾	3,5	A
	$T_a = 45^\circ\text{C}$, chassis ²⁾	12	A
I_{DCL}	$T_a = 45^\circ\text{C}$, isolated ¹⁾	3,5	A
	$T_a = 45^\circ\text{C}$, chassis ²⁾	12	A
	$T_a = ^\circ\text{C}$,		A
I_{FSM}	$T_{vj} = 25^\circ\text{C}$, 10 ms	370	A
t_H	$T_{vj} = 150^\circ\text{C}$, 10 ms	320	A
	$T_{vj} = 25^\circ\text{C}$, 8,3 ... 10 ms	680	A ² s
V_F	$T_{vj} = 25^\circ\text{C}$, $I_F = 150 \text{ A}$	max. 2,2	V
	$T_{vj} = 150^\circ\text{C}$	max. 0,85	V
r_T	$T_{vj} = 150^\circ\text{C}$	max. 12	mΩ
I_{RD}	$T_{vj} = 25^\circ\text{C}$, $V_{RD} = V_{RRM}$	300	μA
	$T_{vj} = ^\circ\text{C}$, $V_{RD} = V_{RRM} \geq V$		μA
I_{RD}	$T_{vj} = 150^\circ\text{C}$, $V_{RD} = V_{RRM}$	5	mA
	$T_{vj} = ^\circ\text{C}$, $V_{RD} = V_{RRM} \geq V$		mA
t_{rr}	$T_{vj} = 25^\circ\text{C}$	10	μs
f_G		2000	Hz
$R_{th(j-a)}$	isolated ¹⁾	15	K/W
	chassis ²⁾	4,7	K/W
$R_{th(j-c)}$	total	1,75	K/W
$R_{th(c-a)}$	total	0,15	K/W
T_{vj}		- 40 ... + 150	°C
T_{stg}		- 55 ... + 150	°C
V_{isol}	a. c. 50 ... 60 Hz; r.m.s.; 1 s / 1 min.	3000 / 2500	V~
M_a	to heatsink	2 ± 15 %	Nm
M_l			Nm
a			m/s ²
w		26	g
F_u		20	A
Case		G 11b	



Dimensions in mm

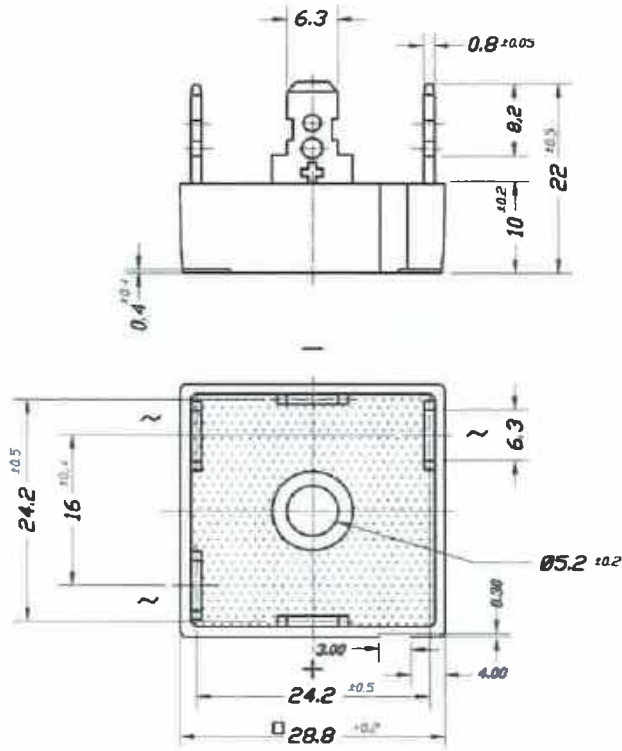


Fig 3L Power dissipation vs. output current

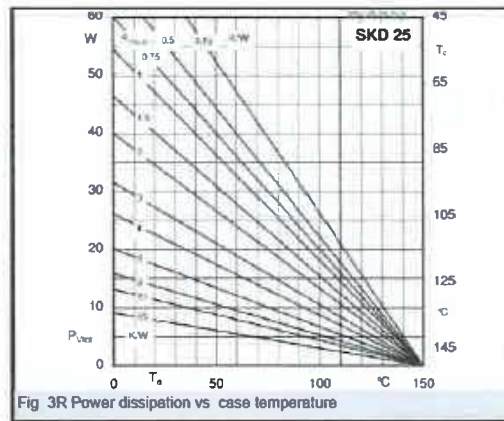


Fig 3R Power dissipation vs case temperature

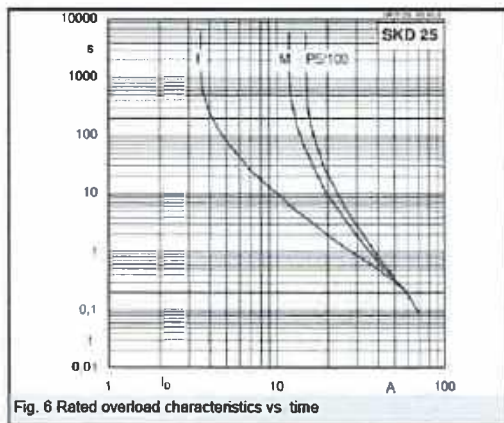


Fig 6 Rated overload characteristics vs time

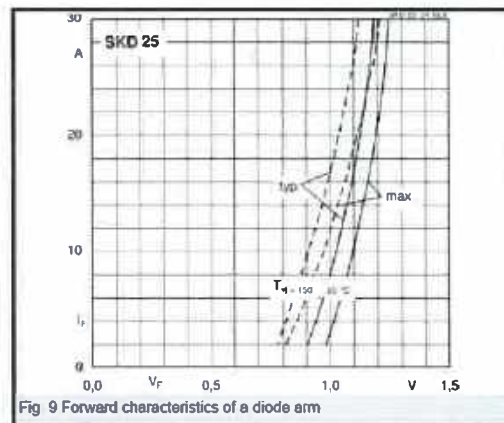


Fig 9 Forward characteristics of a diode arm






HIRSCHMANN

A BELDEN BRAND

Product information MACH1000, Full Gigabit Ethernet switch 16 ports - MAR1040-4C4C4C4C9999TL9HPHH08.0.

Industrial Ethernet/Ruggedized Switches:Fast/Gigabit Ethernet Control Cabinet Switches:Full Gigabit Ethernet Control Cabinet Switches:with Firmware Release 8:MACH1000, Full Gigabit Ethernet switch 16 ports

<http://www.e-catalog.beldensolutions.com/link/57078-24455-49846-49997-82828-373311-373318/en/MAR1040-4C4C4C4C9999TL9HPHH08.0.uslate>

Name	MACH1000, Full Gigabit Ethernet switch 16 ports
	
Delivery informations	Ethernet/Fast Ethernet/Gigabit Ethernet switch, managed, Industrial Switch 19" rack mount, fanless design
Availability	available
Product description	
Description	Ethernet/Fast Ethernet/Gigabit Ethernet switch, managed, Industrial Switch 19" rack mount, fanless design
Part type and quantity	16 x combo ports (10/100/1000BASE TX RJ45 plus related FE/GE-SFP slot)
Type	MAR1040-4C4C4C4C9999TL9HPHH08.0.
Order No.	MAR1040-4C4C4C4C9999TL9HPHH08.0.
More interfaces	
Power supply/signaling contact	power supply 1: power supply, 2 pin plug-in terminal block, signal contact, 2 pin plug-in terminal block;
V24 interface	1 x RJ11 socket
USB interface	1 x USB to connect the AutoConfiguration Adapter ACA21-USB
Network size - length of cable	
Twisted pair (TP)	0 m ... 100 m
Multimode fiber (MM) 50/125 µm	cf. Gigabit and Fast Ethernet SFP modules
Multimode fiber (MM) 62.5/125 µm	cf. Gigabit and Fast Ethernet SFP modules
Single mode fiber (SM) 9/125 µm	cf. Gigabit and Fast Ethernet SFP modules
Single mode fiber (LH) 9/125 µm (long haul transceiver)	cf. Gigabit and Fast Ethernet SFP modules
Network size - cascading	
Line - / star topology	any
Ring structure (HIPER-Ring) quantity switches	up to 10 ms (10 switches), up to 30 ms (50 switches), up to 40 ms (100 switches), up to 60 ms (200 switches)
Power requirements	
Operating voltage	power supply 1: 24/36/48 V DC
Current consumption at 24 V DC	power supply 1: 1060 mA max., if all ports are equipped with SFP;
Current consumption at 230 V AC	power supply 1: n/a
Power output in Btu (IT) h	90 max (150 PoE option)
Software	
Management	Serial interface, web-interface, SNMP V1/V2, HiVision file transfer SW HTTP/FTP, LLDP-MED
Diagnostics	LEDs, log-file, syslog, relay contact, RMON, port mirroring 1:1 and n:1, egress/ingress traffic configurable, topology discovery 802.1AB, cable tester (TX), address conflict detection, network error detection, SFP diagnostic [temperature, optical input and output power (µW and dBm)], Trap for configuration saving and changing, duplex mismatch detection, disable learning, Port Monitor
Configuration	Command line interface (CLI), TELNET, BootP, DHCP, DHCP option 82, HiDiscovery, easy device exchange with auto-configuration adapter ACA21-USB (automatic software and/or configuration upload), automatic script load from ACA21, integrated DHCP server per port, DHCP relay, automatic invalid configuration undo, Offline Configuration, SFP Whitelist, ARC automatic ring configuration (MRP), automatic port shutdown (link flapping), configuration signature (water marking), overload detection
Security	Port Security (IP and MAC) with multiple addresses (MAC 60 per port), SNMP V3, SSHv2, Authentication (IEEE802.1x), 802.1x/Mini Gigant Authentication, Guest VLAN and Unauthenticated VLAN, Port based Radius VLAN assignment, MAC notification
Redundancy functions	HIPER-Ring, Fast HIPER-Ring, MRP, MSTR, RSTP - IEEE802.1D-2004, MRP and RSTP in parallel, link aggregation, multiple rings
Filter	QoS 8 classes, prioritization (IEEE 802.1D/p), VLAN (IEEE 802.1Q), Voice VLAN, shared VLAN learning, G-in-Q double VLAN tagging, multicast IGMP v1/v2/v3 (sniffing/querier), multicast detection unknown multicast, broadcast-, unicast-, multicast limiter, fast aging, GMRP IEEE 802.1D, Jumbo Frame Support





HIRSCHMANN

A BELDEN BRAND

Industrial Ethernet Ruggedized Switches: Fast Gigabit Ethernet Control Cabinet Switches: Full Gigabit Ethernet Control Cabinet Switches: with Firmware Release 8: MACH1000, Full Gigabit Ethernet switch 16 ports

<http://www.e-catalog.beldensolutions.com/lnk/57078-24455-49846-49997-82828-373311-373318/en/MAR1040-4C4C4C9999TL9PHH0&0.0/uislate>

Industrial Profiles	EtherNet/IP and PROFINET (2,2 PDEV, GSDML Stand-alone generator, automatic device exchange) profiles included, configuration and diagnostic via automation software tools like e.g. STEP7, or Control Logix IEC61850 protocol (MMS Server, Switch Model)
Time synchronization	PTP IEEE 1588 v1/v2 Boundary and Transparent Clock hardware time stamping with accuracies of 30ns, IEEE 1588 Power Profile (C37.238-2011), SNTP server, realtime clock with energy buffer
Flow control	Flow Control 802.3x, Port Priority 802.1D/p, Priority (TOS/DIFFSERV), Prio (MAC/IP), Prio Mapping (TOS Layer2), Traffic Shaping (Unicast, Multicast, Broadcast) Ingress / Egress
Ambient conditions	
Operating temperature	-40 °C ... 70 °C
Note	IEC 60068-2-2 Dry Heat Test +85°C 16 Hours
Storage/transport temperature	-40 °C ... 85 °C
Relative humidity (non-condensing)	5 % ... 95 %
MTBF	13.6 years (MIL-HDBK-217F)
Protective paint on PCB	No
Mechanical construction	
Mounting	19" control cabinet
Weight	5600 g
Protection class	IP30
Mechanical stability	
IEC 60068-2-27 shock	15 g, 11 ms duration, 18 shocks
IEC 60068-2-6 vibration	1 mm, 2 Hz-13.2 Hz, 90 min.; 0.7g, 13.2 Hz-100 Hz, 90 min.; 3.5 mm, 3 Hz-9 Hz, 10 cycles, 1 octave/min.; 1 g, 9 Hz-150 Hz, 10 cycles, 1 octave/min.
EMC interference immunity	
EN 61000-4-2 electrostatic discharge (ESD)	8 kV contact discharge, 15 kV air discharge
EN 61000-4-3 electromagnetic field	35 V/m (90-2700 MHz); 1 kHz, 80% AM
EN 61000-4-4 fast transients (burst)	4 kV power line, 4 kV data line
EN 61000-4-5 surge voltage	power line: 2 kV (line/earth), 1 kV (line/line), 1 kV data line, IEEE1613: power line 5 kV (line/earth)
EN 61000-4-16 mains frequency voltage	30 V, 50 Hz continuous; 300 V, 50 Hz 1 s
EMC emitted immunity	
FCC CFR47 Part 15	FCC 47 CFR Part 15 Class A
EM 55022	EN 55022 Class A
Approvals	
Safety of industrial control equipment	cUL 508
Hazardous locations	ISA 12.12.01 Class 1 Div. 2
Shipbuilding	Germanischer Lloyd
Railway norm	EN 50121-4, EN50155 (pending), NEMA TS
Substation	IEC 61850-3, IEEE 1613
Transportation	EN 50121-4, EN50155 (pending), NEMA TS
Scope of delivery and accessories	
Scope of delivery	device, operating manual

For more information please contact:
Hirschmann Automation and Control GmbH
 Stuttgarter Strasse 45-51
 72654 Neckartenzlingen
 Germany
 Phone: +49 7127/14-1809
 E-Mail: inet-sales@belden.com





Technical Data

Product Description	
Description	All-Gigabit, 19" rack-mount, managed Layer 2, fanless switch (professional firmware), with optional PoE and rear ports
Port type and quantity	16 Gigabit Ethernet RJ45/SFP Combo Ports (optionally rear-facing) TX Ports support 10/100/1000 BASE TX SFP slots support 100 Mbps or 1000 Mbps (Gigabit) SFPs
Additional Interfaces	
V.24 interface	1 x RJ11 socket
USB interface	1 x USB to connect auto-configuration adapter ACA 21-USB EEC
Network range – cascadability	
Line/Star topology	Any
Ring structure (HIPER ring)	100 (<0.3 sec reconfiguration time)
Fault recovery time	< 10 ms / < 40 ms / < 60 ms
Power Supply	
Operating voltage	24/36/48 VDC (18 – 60 V) or 120/250 VDC (77 – 320 V) and 110/230 VAC (90 – 265 V)
Software	
Management	Serial interface, web interface, SNMP v1/v2, HiVision, file transfer via HTTP/TFTP
Diagnostics	LEDs, log file, syslog, relay contact, RMON, port mirroring, Topology Discovery 802.1AB, cable tester (TX), address conflict detection, network error detection, SFP diagnostics (temperature, optical input/output power)
Configuration	Command line interface (CLI), TELNET, BootP, DHCP, DHCP Option 82, HiDiscovery, auto-configuration adapter (ACA 21-USB), integrated DHCP server, automatic invalid configuration undo
Security	Port security (IP and MAC), SNMP v3, SSH, VLAN, authentication (802.1x)
Redundancy	Fast HIPER ring, multiple rings, MRP, RSTP 802.1w, redundant network/ring coupling, link aggregation
Filter	QoS 7 classes, port priority (IEEE 802.1D/p), VLAN (IEEE 802.1Q), multicast (IGMP snooping/querier), unknown multicast detection, broadcast/unicast/multicast limiter, fast aging, GMRP IEEE 802.1D, flow control 802.3x
Synchronization	SNTP Server, PTP/IEEE 1588, v1/v2 hardware timestamp with accuracy of 30 ns
Ambient conditions	
Operating temperature range	0°C to +60°C or -40°C to +70°C IEC 60068-2-2 Dry Heat Test +85°C, 16 HoursEC)
Storage/Transportation temperature range	-40°C to +85°C)
PCB conformal coating	Optional
Relative humidity (non-condensing)	10% to 95% (non-condensing)
Approvals	
Safety for industrial control equipment	cUL 508 (pending)
Hazardous locations	cUL 1604 Class 1 Div 2 (pending)
Germanischer Lloyd	GL (pending)
Substation	IEEE61850-3, IEEE1613
Transport	NEMA TS2, EN50121-4, EN50155 (pending)





Ordering Information

1. Design	
MAR1040	Full GE-Switch
MAR1042	Full GE-Switch, PoE
MAR1140	Full GE-Switch, backside ports
MAR1142	Full GE-Switch, backside ports, PoE
2. Gigabit Ports	
4C4C4C4C9999	16 Ports GE combo ports
3. Temperature range	
S	0°C to +60°C
T	-40°C to +70°C
E	-40°C to +70°C with conformal coating
4. Power supply 1	
L	24/36/48 V/DC
M	110/250 VDC / 110/230 VAC
5. Power supply 2	
9	Empty
L	24/36/48 V/DC
M	110/250 VDC / 110/230 VAC
6. Approvals	
H	cUL508, cUL/1604 class 1 Div 2, GL, IEC 61850, IEEE1613, NEMA TS
7. Software	
P	Layer 2 Professional
R	Layer 3 (future release)

Example

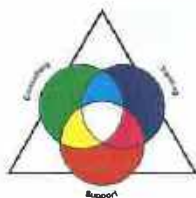
MAR1042	4C4C4C9999	E	L	M	H	P		
		1.	2.	3.	4.	5.	6.	7.

Always the Right Solution

Belden is the world's leading supplier of signal transmission solutions including cable, connectivity and active components for mission-critical applications ranging from industrial automation to data centers, broadcast studios, and aerospace. Belden offers an extensive portfolio of signal transmission solutions for information, control and field levels, which the company produces and markets under its proprietary Belden®, Hirschmann™ and Lumberg Automation™ brands.

We welcome the opportunity to speak with you about our extensive industry portfolio and Belden's worldwide service. Further information and technical data are available online at www.hirschmann-usa.com

You can also contact our sales team directly at **1-717-217-2299**.



Belden® Competence Center

Get the complete economic business solution for your network. In addition to our proven product portfolio, Belden offers you a comprehensive range of multi-supplier network services. Whether it is consulting, training or support – the Belden® Competence Center provides a single source of services customized to your needs.

Regardless of the technology you are using, our experts will support you from network design to the optimization of system performance throughout the operational process. State-of-the-art manufacturing expertise, a global service network and fast access to external specialist ensure that you receive the best assistance possible. Bundle your individual service package, today!



ETHERNET SWITCH, MANAGED, 1U, 19 INCH RACK MOUNTABLE, 24/36/48 V DC, 16 COMBO (10/100/1000BASE TX RJ45 /SFP Slot) PORTS

1.1 ES units contain managed fiber switches. datasheet of the switch used in ES is mentioned below.

Make: HIRSCHMANN

Model / Part No.: MAR1140-4C4C4C4C9999 EL9HPHHXX.X

1.1.1 Configuration Guide of Ethernet Switch (MAR1140)

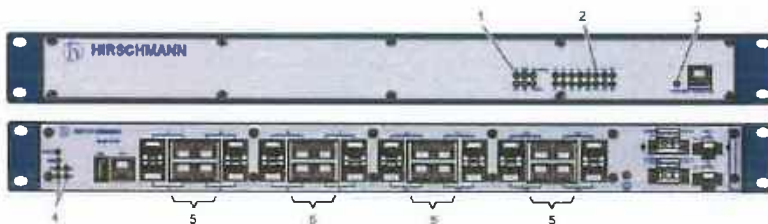
The configuration guide displays the following options and descriptions:

- 1. Product:** MAR1140
- 2. ports:** 4C4C4C4C9999 (16x 10/100/1000 Mbit/s ports Combo Ports, SFP slots - dual speed)
- 3. Temp. range:** Master: 0°C - 60°C, Extended: -40°C - 85°C, including Carbonized Coating
- 4. Voltage range power supply 1:** L: 24/36/48 V DC - power plug, M: 110/250 V DC - 110/230 V AC - power plug
- 5. Voltage range power supply 2:** L: 24/36/48 V DC - power plug, M: 110/250 V DC - 110/230 V AC - power plug, 9: empty
- 6. Approvals:** UL508, UL1804 Class I Div2, CL, IEC 61850-3, IEEE 1613, EN60121-4, NEMA 1S
- 7. Software version:** Layer 2 - Professional, Layer 3
- 8. Configuration:** Hirschmann
- 9. OEM type:** Hirschmann
- 10. Software release:** Newest software

Additional notes at the bottom:

- Power supply MACH1042 (with PoE)
- Port 1 (230 V AC supports chassis operating voltage)
- Port 2 (230 V AC supports exclusive 4 ports PoE)
- No operating voltage redundancy -

1.1.1.2 Features



Display elements for MAR1140 and MAR1142

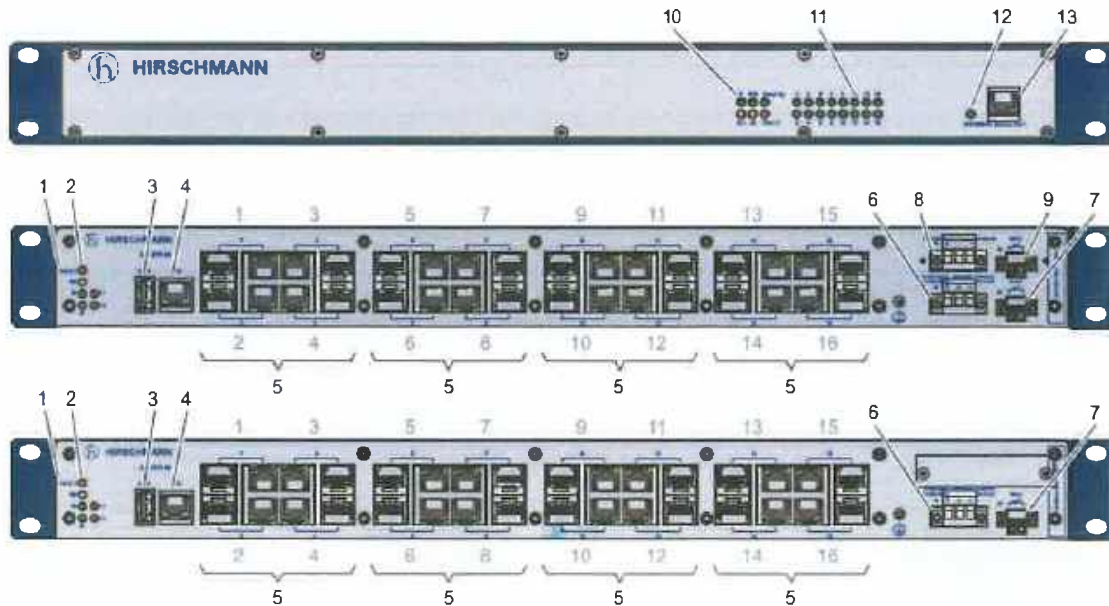
Front of device:

- 1 - Device status display elements
- 2 - Port status display elements for 16 Gigabit Ethernet ports
- 3 - Diagnosis port with display element

Back of device:

- 4 - Device status display elements
- 5 - Port status display elements





Back of device:

- 1 - MAR1140 device
- 2 - LED display elements
- 3 - USB interface
- 4 - V.24 connection for external management
- 5 - Gigabit Ethernet combo ports: 100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/1000 Mbit/s twisted pair, RJ45 connections
- 6 - P1: Connection for the voltage supply
- 7 - Relay 1: signal contact
- For device variants with 2 power supply units:
- 8 - P2: Connection for redundant voltage supply
- 9 - Relay 2: signal contact

Front of device:

- 10 - LED device status display elements
- 11 - LED port status display elements
- 12 - LED service port display element
- 13 - Service port

1.1.1.3 Specifications

Dimensions W x D x H	MAR1...	448 x 44 x 345 mm (without brackets)
Weight	MAR1040 ..., MAR1140...	max. 4.2 kg
	MAR1040 ..., MAR1140 ... Devices with redundant power unit	max. 4.4 kg
	MAR1042 ..., MAR1142... Devices with PoE power unit	max. 4.6 kg
Power supply	Nominal voltage range AC	100 V-240 V, 50 Hz-60 Hz
Power unit type "M"	Voltage range AC incl. maximum tolerances	90 V-265 V, 47 Hz-63 Hz
	Nominal voltage range DC	110 V-250 V
	Voltage range DC incl. maximum tolerances	77 V-300 V
	Connection type	3-pin terminal block
	Power failure bridging	> 20 ms at 230 V AC



Power supply Power unit type "L"	Nominal voltage range DC	24 V-48 V
	Voltage range DC incl. maximum tolerances	18 V-60 V
	Connection type	3-pin terminal block
	Power failure bridging	> 10 ms at 20.4 V DC
Properties of the back-up fuse to be installed for the voltage supply	Power units "L"	Nominal rating: 6.3 A Characteristic: slow blow
	Power units "M"	Nominal rating: 2.5 A Characteristic: slow blow
	Nominal value for AC	$I_{max} = 2 \text{ A}$ at $U_{max} = 230 \text{ V}$
	Nominal value for DC	$I_{max} = 2 \text{ A}$ at $U_{max} = 30 \text{ V}$ $I_{max} = 0.2 \text{ A}$ at $U_{max} = 125 \text{ V}$ $I_{max} = 0.1 \text{ A}$ at $U_{max} = 250 \text{ V}$
Signal contact (ordinary locations)	Connection type	2-pin terminal block
	Entity parameters	$V_{max} = 30 \text{ V}$ $I_{max} = 90 \text{ mA}$ $C_i = 50 \text{ pF}$ $L_i = 2 \text{ } \mu\text{H}$ For details refer to the figure on
Signal contact (Hazardous Locations Class 1, Division 2)	Connection type	2-pin terminal block
	Storage temperature (ambient air)	Standard: -40 °C to +70 °C Extended: -40 °C to +85 °C
Environment	Humidity	5% to 95% (non-condensing)
	Air pressure	Up to 2000 m (795 hPa), higher altitudes on request
	Standard (surrounding air)	0 °C to +60 °C ^a
Operating temperature	Extended (surrounding air)	-40 °C to +70 °C ^a
	Pollution degree	2
Protection classes	Laser protection	Class 1 according to EN 60825-1 (2007)
	Protection class	IP 30

1.1.2 Additionally SFP gigabit multimode fiber optic transceiver module (M-SFP-SX/LC EEC) is also used in the Ethernet Switches (ES). Datasheet of the module is given below.

M-SFP-SX/LC EEC



Model

M-SFP-SX/LC EEC



	SFP Fiberoptic Gigabit Ethernet Transceiver: extended temperature range
Delivery information	
Availability	available
Product description	
Description	SFP Fiberoptic Gigabit Ethernet Transceiver: extended temperature range
Part type and quantity	1 x 1000BASE-LX with LC connector
Type	M SFP-SGLC-EEC
Order No.	943 936-001
Network size - length of cable	
Multimode fiber (MM) 90/125 µm	0 - 550 m 0 - 7,5 dB link budget at 850 nm A = 3 dB/km, 3 dB reserve, B = 400 MHz x km
Multimode fiber (MM) 62.5/125 µm	0 - 275 m 0 - 7,5 dB link budget at 850 nm A = 3,2 dB/km, 3 dB reserve, B = 200 MHz x km
Power requirements	
Operating voltage	power supply via the switch
Power consumption	1 W
Service	
Diagnostics	optical input and output power, transmitter temperature
Ambient conditions	
Operating temperature	-40 °C to +85 °C
Storage/transport temperature	-40 °C to +85 °C
Relative humidity (non-condensing)	10% to 95%
Mechanical construction	
Dimensions (W x H x D)	20 mm x 18 mm x 50 mm
Mounting	SFP slot
Weight	80 g
Protection class	IP 20
Mechanical stability	
IEC 60068-2-27 shock	15 g, 11 ms duration, 18 shocks
IEC 60068-2-6 vibration	1 mm, 2 Hz - 13.2 Hz, 90 min.; 0.7g, 13.2 Hz - 100 Hz, 90 min.; 3.5 mm, 3 Hz - 8 Hz, 10 cycles, 1 octave/min.; 1g, 9 Hz - 150 Hz, 10 cycles, 1 octave/min.
EMC interference immunity	
EN 61000-4-2 electrostatic discharge (ESD)	6 kV contact discharge, 8 kV air discharge
EN 61000-4-3 electromagnetic field	10 V/m (30 - 1000 MHz)
EN 61000-4-4 fast transients (burst)	2 kV power line, 1 kV data line
EN 61000-4-5 surge voltage	power line: 2 kV (line-earth), 1 kV (line-line), 1 kV data line
EN 61000-4-6 conducted immunity	3 V (10 MHz - 150 kHz), 10 V (150 kHz - 80 MHz)
EMC emitted immunity	
FCC CFR47 Part 15	FCC CFR47 Part 15 Class A
EN 55022	EN 55022 Class A
Approvals	
Safety of information technology equipment	UL 91650-1
Shipbuilding	Germanischer Lloyd, ABS, BV, DNV, LR, RINA



1.1 **21.3 INCH, UXGA RUGGED DISPLAY PANEL**

Make: SCIOTEQ (ESTERLINE (FORMER BARCO))

Model / Part No.: K9346905

TL-354

21.3" Thin Lightweight display (1600 x 1200)

The TL-354 can serve as a drop-in replacement for customers needing displays with a 4:3 aspect ratio and 1600 x 1200 screen resolution. It is the perfect solution for legacy systems currently equipped with a 20.1" UXGA display.

The TL-354 features a first-class 21.3" Active Matrix Liquid Crystal Display offering excellent performance in terms of brightness, dimming, crispness, contrast, and viewing angle. Equipped with an LED backlight, the TL-354 offers a long lifetime and reduces power consumption.



Product specifications		TL-354	
Panel size		21,3"	
Resolution		1600 x 1200 (UXGA)	
Brightness		Typical 300 cd/m ² (87 fL), LED backlight	
Contrast ratio		Typical 1500:1	
		Standard	Rugged option
Vibration	SHIPS	MIL-STD-167-1 Type 1	MIL-STD-167-1 Type 1
	AIRBORN	2g MIL-E-5400T Fig.2, curve IIa (sheet 2 of 3)	5g MIL-E-5400T Fig.2, curve IIIa (sheet 2 of 3)
	RANDOM		MIL-STD-810F, Meth 514.5 Proc I, comp. wheeled vehicle (C2 & C3)
Shock		MIL-STD-810F Meth 516.5 30g - 12,5ms	MIL-STD-810F Meth 516.5 30g - 12,5ms MIL-S-901D Lightweight Grade A
Operational temperature		- Low temp: -10°C (immediate usable image at power up, image fully compliant with specs after 30 minutes) - Low temp: 0°C - High temp: 50°C	- Low temp: -40°C - High temp: +55°C
Storage temperature		- Low temp: -40°C - High temp: +70°C	- Low temp: -40°C - High temp: +70°C
Relative humidity		max. 95% @ 40°C	max. 95% @ 40°C
Drip proof		MIL-STD-810F Meth 506.4 proc III	MIL-STD-810F Meth 506.4 proc III
Altitude low pressure		40.000ft (187 mbar)	40.000ft (187 mbar)
Rapid decompression			MIL-STD-810F, Meth 500.4 Proc III, 8.000ft to 40.000ft in 15s
EMI / EMC		MIL-STD-461F - NAVY Applications	MIL-STD-461F - NAVY Applications / Navy fixed and Airforce Applications
FCC		FCC-A	FCC-A
Ingress protection		IPx5 on display front IPx5 on unit level with optional circular MIL connectors	
Signal inputs		2 x DVI-D, VGA, HD-SDI, RS-232 or RS-422, USB, Ethernet	
Power		28 VDC or 115-220VAC, per MIL-STD-704E and MIL-STD1275D guidelines	
Power consumption		45 W typical (without heating)	
Weight		± 10kg	
Options		LCD flicker compensation Touch screen Circular MIL connector interface	



ELECTRO-OPTICAL SPECIFICATIONS

Image specifications

Overview

Panel	Active Matrix LCD (AM-LCD) Incorporating amorphous silicon TFT
Active screen size (diagonal)	21.3"
Active screen size (H x V)	432 mm x 324 mm (17.01" x 12.76")
Aspect ratio (H:V)	4:3
Color depth	8bit 16 million colors – 256 gray scales
Viewing angle (typical @ cr ≥10)	Horizontal: ±89° Vertical: ±89°
Front filter (glass)	<ul style="list-style-type: none"> • Rugged Optical Stack • Chemically Strengthened Glass • HE (High Efficient) AR (Anti Reflective) coating • ITO coating (EMI-EMC filter) • Optional touchscreen: <ul style="list-style-type: none"> - Multi-touch technology (up to 10 simultaneous touch points) - Automatic gesture recognition - Ultra-rugged touch panel - Projected Capacitive coupling (PCAP)
Light output (on axis) @ 25°C	<ul style="list-style-type: none"> • Maximum: typical 300 cd/m² (87.56 fL) • Minimum: typical 0.5 cd/m² (0.15 fL) • Dimming ratio: minimum 600:1
Contrast ratio (dark environment)	typical 1300:1
Resolution	<ul style="list-style-type: none"> • UXGA (1600 x 1200) • 1 pixel is composed of 3 sub pixels R, G and B (RGB Vertical Stripe configuration) • pixel dimensions: 0.27 mm x 0.27 mm
Reflection	<ul style="list-style-type: none"> • Screen specular reflection less than 4% (units with touchscreen) • Screen specular reflection less than 1.5% (units without touchscreen)
Color temperature	<p>Typical 7100K in the center and perpendicular to the screen</p> <p>Typical CIE coordinates are:</p> <ul style="list-style-type: none"> • Red (x,y): (0.655 ±0.03, 0.330 ±0.03) • Green (x,y): (0.305 ±0.03, 0.625 ±0.03) • Blue (x,y): (0.150 ±0.03, 0.075 ±0.03) • White (x,y): (0.300 ±0.03, 0.340 ±0.03)
Response time (25°C ambient, normal viewing angle 0°)	<ul style="list-style-type: none"> • Rise time (black to white) <ul style="list-style-type: none"> - Typical: 11ms - Maximum: 20ms • Fall time (white to black) <ul style="list-style-type: none"> - Typical: 9ms - Maximum: 20ms



Power supply specifications

DC power

Applicable standards	MIL-STD-1275D
Nominal voltage	28 Vdc
Voltage range	18 Vdc - 33 Vdc
Cranking voltage	18 Vdc
Power consumption	Typ. 40 W Max. 130 W with heater option
Grounding	Protective earth = mechanical ground = chassis ground The secondary electrical ground is connected to the chassis ground The two primary input voltage leads are floating (this is: not connected to the chassis ground) Isolation resistance min. 1 megaohm
Isolation	Isolation resistance between power lines and earth connection: min. 2 Mega Ohm
Safety	Europe CE : EN60950-1

AC power

Applicable standards	MIL-STD-704E guidelines
Nominal voltage/ Rated voltage	100-240 Vac
Voltage range	90 Vac - 264 Vac
Frequency range	50-60 Hz \pm 5%
Power consumption	Typ. 40 W Max. 120 W with heater option
Grounding	Protective earth = mechanical ground = chassis ground The secondary electrical ground is connected to the chassis ground The two primary input voltage leads are floating (this is: not connected to the chassis ground)
Isolation	Isolation voltage between power lines and earth connection: min. 1000 V
Safety	Europe CE : EN60950-1 touch current: max. 3.5mA r.m.s. The device should be earthed correctly. When using extension cords, make sure that they contain a grounded connection. Ignoring this warning may lead to personal injury or death. See also safety paragraph in the user manual.

Touchscreen option

Touchscreen option

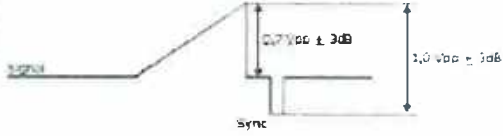
Touchscreen

Touch technology:	PCAP (Projected Capacitive)
Touch method:	Finger or conductive stylus
Touch activation force:	No pressure required
Touch durability:	Unlimited
# touches	Max. 10 simultaneous touches with finger Typ. 6 simultaneous touches with gloves (depending type of gloves)
Communication methods:	1. via USB interface (HID device class) (USB 1.1 or later) 2. via RS port (Barco protocol)
Accuracy	Max. \pm 1.5%
Pencil hardness	Min 8H
Surface hitting	typ. 1 million times



Input signal specifications









Signal input

DVI	Signal input	Digital input according to DVI 1.0 interface standard Digital channel is driven by TMDS (Transmission Minimized Differential Signaling)
	Timing limitations	<ul style="list-style-type: none"> Maximum input resolution: 1920 x 1080 @ 60 Hz Video pixel clock: max. 165 MHz Non- and interlaced RGB Minimum horizontal blanking: 60 pixels Typical vertical frequency: 60 Hz Minimum vertical blanking: 5 lines Maximum horizontal frequency: 105 kHz
	Signal timing database	The digital input supports DDC protocol (Display Data Channel)
HD-SDI	SD video	SD-SDI serial digital video input signals: SMPTE 259M-C
	HD video	HD-SDI serial digital video input signals: SMPTE 292M and SMPTE 424M
RGB	Input signal timings	<ul style="list-style-type: none"> One RGB non-differential input according to: <ul style="list-style-type: none"> Signal: 0.7 Vpp ± 3 dB Sync: 1.0 Vpp ± 3 dB for Sync On Green, TTL-compatible for External Composite Sync and External Separate Sync Input impedance: terminated internally at 75Ω  <p>The standard input has a resolution of 1920 x 1080 pixels (full HD)</p>
	Timing limitations	<ul style="list-style-type: none"> Maximum Input resolution: 1920 x 1080 @ 60 Hz Maximum pixel clock: 170 MHz Minimum pixel clock: 10 MHz Non- and interlaced RGB Minimum vertical blanking: 5 lines Minimum horizontal blanking: 60 pixels Maximum horizontal frequency: 100 kHz
	Sync limitations	<ul style="list-style-type: none"> The unit accepts <ul style="list-style-type: none"> External sync, H&V separate (SS) (5-wire) External combined sync (CS) (4-wire) Composite sync on green (SoG) (3-wire) <p>Sync polarity independent: accepts positive and negative sync tips</p>
	Signal timing database	<ul style="list-style-type: none"> The timing database stores set-up parameters for specific input timings. Timing specifications are defined by different parameters (geometry, color values, timing values and brightness). The analog input supports DDC protocol (Display Data Channel).



Human Machine Interface

Control keys and indicators

Control Keys and Indicators	Front controls are integrated in the bezel and used for adjusting the display settings displayed through the On-Screen Display (OSD) 
	Optional functionality
	Optional functionality
	Cycles through the different inputs. Refer to user manual for detailed functional description
	If the up and down buttons are pushed, brightness will be adjusted. Up and down buttons are used to navigate through the menu when the OSD is active
	The select button activates the OSD, and enables the user to select different settings.
	The quit button allows you to go back one level in the OSD menu structure.
	The standby button controls power down of the panel and backlight. The main purpose of the standby button is to reduce the power consumption to a minimum.
<ul style="list-style-type: none"> <input type="checkbox"/> POWER <input type="checkbox"/> OVERTEMP <input type="checkbox"/> FAULT 	<p>Power: green indicator</p> <p>Overtemp: red indicator</p> <p>Fault: red indicator</p>



Touchscreen communication

USB interface

Drivers:	No hardware specific driver required: works with Windows or Linux native HID driver				
USB reported touch resolution:	2048 x 2048				
Reporting speed:	Maximum 25ms				
Operating systems:	Windows	The touchscreen interface operates as a HID Human interface Device without the need of installing a specific driver.			
		Version	touch support		
		Windows 7	multi touch		
		Windows Vista, XP	single touch		
	Linux	The touchscreen interface operates without the need of installing a specific driver.			
		Kernel version	CPU type	touch support	note
		2.6.36 or higher (RHEL (1) 6 and 7)	X86 32/64 bits ARM/MIPS	multi touch	available for non-X-window system support multi-controller & multi-monitor support right-click
		2.6.35 or lower (RHEL (1) 6 and 7)	X86 32/64 bits ARM/MIPS	single touch	
2.6.23 or lower (RHEL(1) 5)		X86 32/64 bits	single touch	X-window system needed support multi-controller & multi-monitor support right-click	
Calibration:	No calibration needed				

RS interface

Note:	Note that communication via RS does not work when USB is connected. Disconnect USB if communication via RS is required.
Communication protocol:	<p>Barco protocol:</p> <ul style="list-style-type: none"> • Polling Driven (host > unit): the touchscreen position can be read using the RTS command, replying with X, Y coordinates. • Event Driven (unit > host): unit sends the touchscreen coordinates to the host on its own initiative whenever the touch screen coordinates change (Dual Master Mode) <p>Remote commands can be found on the user manual CD.</p>
Calibration:	No calibration needed

Dual touchscreen

Dual touchscreen support

Dual Head	<p>Dual head configuration supported with horizontal or vertical positioning of the 2 displays. Touchscreens can be configured and linked to the displays.</p> <p>For configuration details, refer to the user manual.</p>
-----------	--



Electro-optical features

Features

Automatic Gain Control (AGC)	<p>"AGC" is an automated Color Calibration adjustment in order to compensate unbalanced signals between the RGB lines and to optimize the A/D converters for digitized video. This will ensure maximum gray scales and provide improved color purity</p> <ul style="list-style-type: none"> AGC is performed during the initial installation to match display with generator and cabling. Perform again if cabling and / or generator is changed. <p>The display image must contain at least one full black pixel and one full white pixel to work properly when AGC is performed.</p>
Automatic Phase Adjustment (APA)	<p>"APA" locks the LCD sampling clock (Sample Delay) to the drifting pixel clock of a video data generator. This feature will run continuously to ensure crisp images at all times (suppressing pixel noise).</p>

LCD Flicker Compensation (LFC) (option)

The LCD Flicker Compensation performs real-time digital image processing to enhance image quality

The LFC performance of the unit is as follows:

- The LFC algorithm (Cdn. Pat No 2327429, EP Pat No 0951007, US Pat No 6359663) reduces - to an undetectable level - the flicker that is visible on the LCD's when dense, high contrast random data is constantly being updated

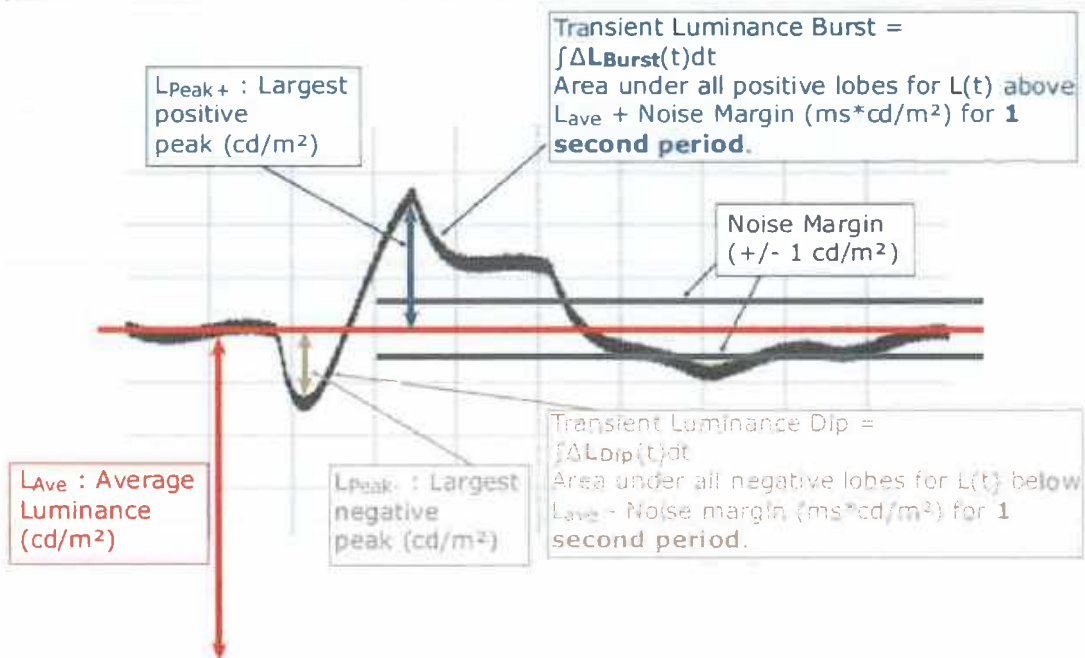
Parameter	Required Values*
Relative Positive transient peak (L_{Peak+}/L_{Ave})	< = 17 %
Relative Negative transient peak (L_{Peak-}/L_{Ave})	< = 17 %
Weighted Positive Transient ($\int \Delta L_{Burst}(t)dt / L_{Ave}$) Luminance Burst for any 1 second period	< = 16 ms
Weighted Negative Transient ($\int \Delta L_{Dip}(t)dt / L_{Ave}$) Luminance Dip for any 1 second period	< = 16 ms

*All four conditions must be met.



Flicker compensation specification is applicable between 0°C and 50°C.

During fast ambient temperature changes, LFC performance can degrade. Full performance is reached after maximum 20 minutes stabilization at constant temperature.



Mechanical drawings

Dimension drawings

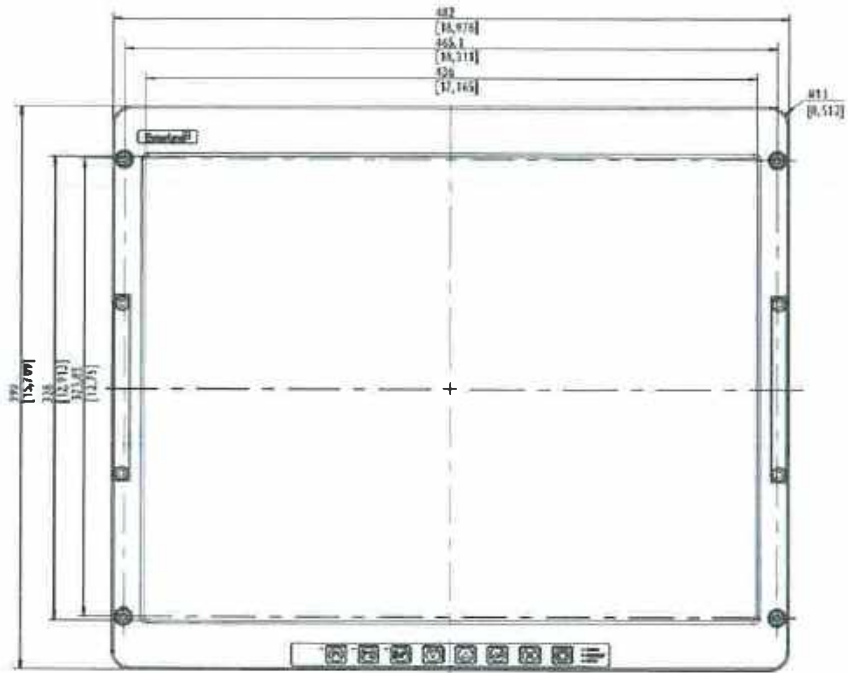


Image 4-1
Front view

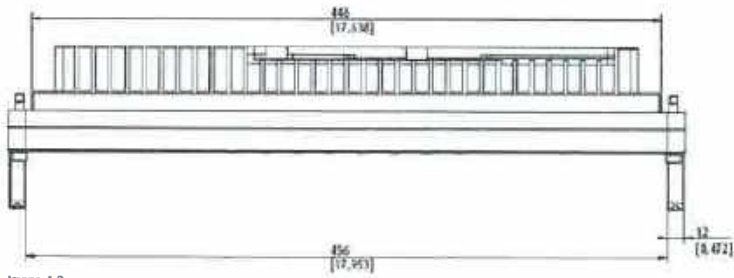
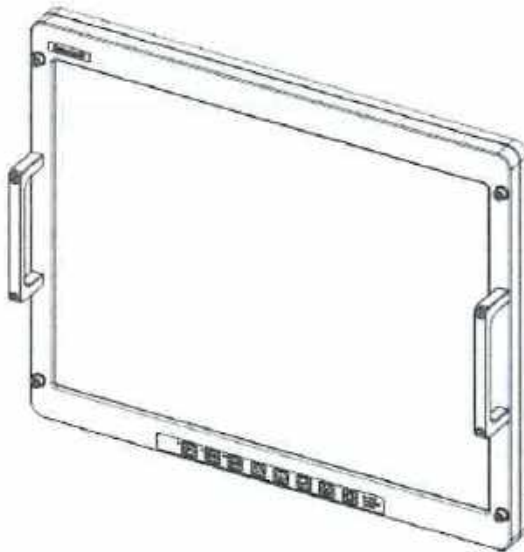


Image 4-2
Top view



Climate/Natural environment

COTS statement:



The unit is a COTS product that has been designed and qualified for following environmental specifications. Different customer requirements can be evaluated on special request.

Climate/Natural environment specifications

Specification	Standard	Rugged option
Operating Temperature	MIL-STD-810F Meth 501.4 , Proc II Meth. 502.4 , Proc II <ul style="list-style-type: none"> High temp.: +50°C (122°F) Low temp.: 0°C (32°F) Low temp* : -10°C (14°F) 	MIL-STD-810F Meth 501.4 , Proc II Meth. 502.4 , Proc II <ul style="list-style-type: none"> High temp.: +55°C (131°F) Low temp.: -40°C (-40°F)
Non-operating Temperature	MIL-STD-810F Meth 501.4 , Proc I Meth. 502.4 , Proc I <ul style="list-style-type: none"> High temp.: +70°C (158°F) Low temp.: -40°C (-40°F) 	
Relative Humidity Operating and Non-operating	MIL-STD-810F Meth 507.4	
Altitude/Low pressure Operating and Non-operating	MIL-STD-810F Meth 500.4, Proc II Meth 500.4, Proc I <ul style="list-style-type: none"> 40000 ft (187 mbar) 	
Rain	MIL-STD-810F Meth 506.4, Proc III <ul style="list-style-type: none"> Drip proof, waterproof for inclinations up to 45° 	
Water tightness	IEC-529 <ul style="list-style-type: none"> Industrial connectors: IPX5 at the front, IPX3 at the back Circular MIL connectors: IPX5 at the front, IPX5 at the back 	
Rapid decompression Operating and Non-operating		MIL-STD-810F Meth 500.4, Proc III <ul style="list-style-type: none"> 8000 ft (752 mbar) to 40000 ft (187mbar) in 15s
Fungus (by analysis)	MIL-STD-810F Meth. 508.5 <ul style="list-style-type: none"> Fungus inert materials are selected as much as possible. 	
Salt Fog (by analysis)	MIL-STD-810F Meth. 509.4 <ul style="list-style-type: none"> The resistance to Salt fog is considered on unit level to an exposure for a 48 hour period at a concentration of 5% 	
Sand and Dust (by analysis)	MIL-STD-810F Meth. 510.4, Proc I <ul style="list-style-type: none"> The resistance to sand and dust is considered on unit level. 	

* The display shall be starting up from a low temperature of -10°C with a usable image. The display shall be within performance spec after 30 minutes.



Electromagnetic environment

Electromagnetic environment specifications

All measurements are done with double shielded signal cables and non-shielded power cable.

Reference	Test Description	Performance Level	Compliant
FCC			
FCC 47 CFR Part 15	Conducted Emission	Class A ITE	Yes
FCC 47 CFR Part 15	Radiated Emission	Class A ITE	Yes
EN 55022			
EN 55022:2010	Conducted Emission	Class A ITE	Yes
EN 55022:2010	Radiated Emission	Class A ITE	Yes
EN 55024			
EN 61000-4-2	Electrostatic Discharge 4kV contact (Level 2) 8kV air (Level 3)	Performance criterion B	Yes
EN 61000-4-3	Continuous radio frequency disturbances Enclosure: 3 V/m with 80% AM modulation	Performance criterion A	Yes
EN 61000-4-4	Electrical fast transients / Burst Signal ports: 0.5 kVpeak 5/50 ns 5kHz. Input power port: 1 kVpeak 5/50 ns 5kHz.	Performance criterion B	Yes
EN 61000-4-5	Surges Input power port: 1 kV line to line, 2kV line to earth(1,2/50µs)	Performance criterion B	Yes
EN 61000-4-6	Continuous conducted disturbances The signal ports shall comply to a level of 3 V/m with 80% AM modulation. The input power port shall comply to a level of 3 V/m with 80% AM modulation.	Performance criterion A	Yes
EN 61000-4-11	Voltage Interruptions AC power input: - voltage interruption dips >95% reduction 0,5 period - voltage interruption dips >30% reduction 25 periods - voltage interruptions >95% 250 periods	Performance criterion B for dips >95% Performance criterion C for other interrupts	Yes



MIL-STD-461F (DC version)			
CE 101	Conducted Emissions	Surface ships and submarine applications: DC, fig CE 101-1. Navy ASW Aircraft and army aircraft applications: - curve 2, fig. CE 101-4. Tested on power leads, range 30Hz to 10kHz.	Yes
CE 102	Conducted Emissions	All applications: 28V nominal, fig CE 102-1 Tested on power leads, range 10kHz to 10MHz	Yes
CS 101	Conducted Susceptibility	All applications: - Curve 2s, fig. CS 101-1. Tested on power leads, range 30Hz to 150kHz, 28V nominal.	Yes
CS 114	Conducted Susceptibility, bulk cable injection	Curve 4, fig. CS 114-1. Range 10kHz to 200 MHz	Yes
CS 115	Conducted Susceptibility, bulk cable injection, impulse excitation	All applications: fig CS 115-1	Yes
CS 116	Conducted Susceptibility, damped sinusoidal transients	Army and Navy: I _{max} =10A, fig. CS 116-2. Tested on cables and power leads, range 10kHz to 100 MHz	Yes
RE 101	Radiated Emissions, magnetic field	Army applications: fig. RE 101-1. Navy applications: fig. RE 101-2. Range 30Hz to 100kHz.	Yes
RE 102	Radiated Emissions, electric field	Surface ship applications, below deck, fig RE 102-1. Submarine applications, Internal to Pressure Hull, fig. RE 102-2. Aircraft and space system applications, Fixed Wing Internal >25 meters Nose to Tail, fig. RE 102-3 Ground applications, Navy Fixed & Air Force, fig. RE 102-4. Range 10kHz to 18GHz.	Yes
RS 101	Radiated Susceptibility, magnetic field	Army applications: fig. RS 101-2 Navy applications: fig. RS 101-1 Range 30Hz to 100kHz.	Yes
RS 103	Radiated Susceptibility, electric field	50V/m. Range 2 MHz to 18 GHz.	Yes
MIL-STD-461F (AC version)			
CE 101	Conducted Emissions	Surface ships and submarine applications: 60 Hz, fig. CE 101-2. Navy ASW Aircraft and army aircraft applications: - curve 1, fig. CE 101-4. Tested on power leads, range 30Hz to 10kHz.	Yes
CE 102	Conducted Emissions	All applications: 115V nominal, 220V nominal, fig. CE 102-1 Tested on power leads, range 10kHz to 10MHz.	Yes
CS 101	Conducted Susceptibility	All applications: - Curve 1, fig. CS 101-1. Tested on power leads, range 100Hz to 150kHz, 240V nominal	Yes



Reference	Test Description	Performance Level	Compliant
CS 114	Conducted Susceptibility, bulk cable injection	Curve 4, fig. CS 114-1. Range 10kHz to 200 MHz.	Yes
CS 115	Conducted Susceptibility, bulk cable injection, impulse excitation	All applications: fig. CS 115-1.	Yes
CS 116	Conducted Susceptibility, damped sinusoidal transients	Army and Navy: $I_{max}=10A$, fig. CS 116-2. Tested on cables and power leads, range 10kHz to 100 MHz.	Yes
RE 101	Radiated Emissions, magnetic field	Army applications: fig. RE 101-1. Navy applications: fig. RE 101-2. Range 30Hz to 100kHz.	Yes
RE 102	Radiated Emissions, electric field	Surface ship applications, below deck, fig. RE 102-1. Submarine applications, Internal to Pressure Hull, fig. RE 102-2. Aircraft and space system applications, Fixed Wing Internal >25 meters Nose to Tail, fig. RE 102-3. Ground applications, Navy Fixed & Air Force, fig. RE 102-4. Range 10kHz to 18GHz.	Yes
RS 101	Radiated Susceptibility, magnetic field	Army applications: fig. RS 101-2 Navy applications: fig. RS 101-1. Range 30Hz to 100kHz.	Yes
RS 103	Radiated Susceptibility, electric field	50V/m. Range 2 MHz to 18 GHz	Yes

Connector location (Industrial)

Industrial connectors

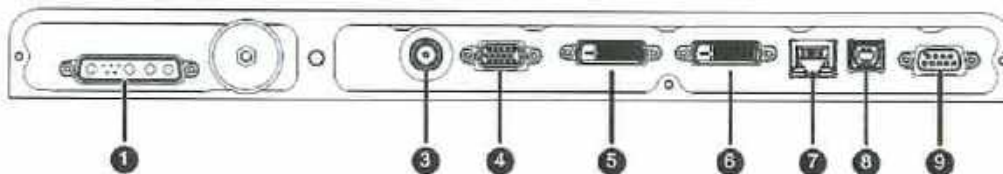


Image 3-1
Connector location Industrial DC

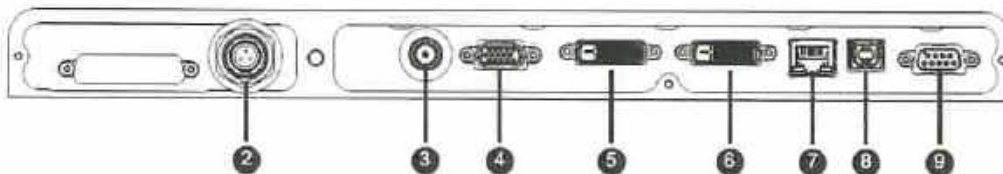


Image 3-2
Connector location Industrial AC

- | | |
|-----------------------------------|-----------------------------------|
| 1 J1 Power connector (DC version) | 2 J2 Power connector (AC version) |
| 3 J3 HD-SDI connector | 4 J4 Analog input connector |
| 5 J5 DVI2 input connector | 6 J6 DVI1 input connector |
| 7 J7 Ethernet connector | 8 J8 USB connector |
| 9 J9 Control connector | |





TL-354

21.3" Thin Lightweight display (1600 x 1200)



The TL-354 is a new 21.3" thin and light-weight rugged display combining unmatched thinness with exceptionally low weight.

A perfect fit for legacy systems

ScioTeq's TL-354 offers a new generation upgrade solution for the TL-351 in terms of LCD resolution, ruggedization, and display functionality.

The TL-354 can serve as a drop-in replacement for customers needing displays with a 4:3 aspect ratio and 1600 x 1200 screen resolution. It is the perfect solution for legacy systems currently equipped with a 20.1" UXGA display.

The TL-354 features a first-class 21.3" Active Matrix Liquid Crystal Display offering excellent performance in terms of brightness, dimming, crispness, contrast, and viewing angle. Equipped with an LED backlight, the TL-354 offers a long lifetime and reduces power consumption.

ScioTeq's TL displays are designed for application in the most extreme environments, making them suited for naval combat, army, UAV and airborne use.





Product specification			
Panel size		21,3"	
Resolution		1600 x 1200 (UXGA)	
Brightness		Typical 300 cd/m ² (87 fL), LED backlight	
Contrast ratio		Typical 1500:1	
		Standard	Rugged option
Vibration	SHIPS	MIL-STD-167-1 Type 1	MIL-STD-167-1 Type 1
	AIRBORN	2g MIL-E-5400T Fig 2, curve IIa (sheet 2 of 3)	5g MIL-E-5400T Fig 2, curve IIIa (sheet 2 of 3)
	RANDOM		MIL-STD-810F, Meth 514.5 Proc I, comp. wheeled vehicle (C2 & C3)
Shock		MIL-STD-810F Meth 516.5 30g - 12,5ms	MIL-STD-810F Meth 516.5 30g - 12,5ms
Operational temperature		Low temp: -10°C (immediate usable image at power up, image fully compliant with specs after 30 minutes) Low temp: 0°C High temp: 50°C	Low temp: -40°C High temp: +55°C
Storage temperature		Low temp: -40°C High temp: +70°C	Low temp: -40°C High temp: +70°C
Relative humidity		max. 95% @ 40°C	max. 95% @ 40°C
Drip proof		MIL-STD-810F Meth 506.4 proc III	MIL-STD-810F Meth 506.4 proc III
Altitude low pressure		40.000ft (187 mbar)	40.000ft (187 mbar)
Rapid decompression			MIL-STD-810F, Meth 500.4 Proc III, 8.000ft to 40.000ft in 15s
EMI / EMC		MIL-STD-461F - NAVY Applications	MIL-STD-461F - NAVY Applications / Navy fixed and Airforce Applications
FCC		FCC-A	FCC-A
Ingress protection		IPx5 on display front IPx5 on unit level with optional circular MIL connectors	
Signal inputs		2 x DVI-D, VGA, HD-SDI, RS-232 or RS-422, USB, Ethernet	
Power		28 VDC or 115-220VAC, per MIL-STD-704E and MIL-STD1275D guidelines	
Power consumption		45 W typical (without heating)	
Weight		± 10kg	
Options		LCD flicker compensation Touch screen Circular MIL connector interface	

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED

The information and data given are typical for the equipment described. However any individual item is subject to change without any notice.

SCI_TL_354_SpecSheet_190529

WWW.SCIOTEO.COM



1.1 BACKLITE TRACKBALL WITH USB INTERFACE

1.1.1 Specifications

Make: PHOENIX OR EQUIVALENT

Model / Part No.: FBI 10-6

1.1.1.1 The specifications of backlit trackball with USB interface (**Fig. 1**) are as follows:



Fig. 1 - Backlit Trackball with USB Interface



Cortron PN: 570-0110

10/28/2015 02

Description: Model: Model T20D: 2 inch D

Performance/Class: Rugged

* See appropriate Model and Class literature for additional information

Pointing Device

Model T20D4: 2 inch DuraTrackball with 4 ergonomic buttons. Standard default layout is three buttons closest to user, with 4th button providing drag lock functionality, unless specified below.



10/28/2015 02
10/28/2015 02

Pointing Device

Style: Model T20D: 2 inch DuraTrackball has 4 ergonomic buttons. Standard default layout is three buttons closest to user, with 4th button providing drag lock functionality.

Pointing Device Interface: USB

PD Protocol: USB

Backlit Ball: Yes Ball Color: Green

Backlit Buttons: Yes Buttons Color: Green

Brightness Control: Brightness controlled locally when integral with keyboard or remotely by keyboard

Product Details

Performance/Class:

Product is RUGGED by design, not ruggedized after manufacturing. All rugged grade products have metal enclosure systems for excellent durability and EMI shielding, and use stainless steel hardware.

Mechanical:

Enclosure Style: Panel Mount; Underside: This product is designed to mount to flat underside surface of customer console or mounting platform via flange or threaded inserts located on top surface of product. See Cortron mechanical drawing for mounting specifics and gasket sealing options. Cortron panel mount products typically do not have painted bottom cases.

* Mechanical Drawing: EMK083

Mounting Fasteners: N/A

Color: No Paint, Undercoat plating only. Unless specified otherwise default for aluminum is MIL-DTL-5541,

Feet:

Front Feet: No front feet supplied

Back Feet: No rear feet supplied

Connector Style: D-Sub Bulkhead style connector:::

PLEASE NOTE: Unless specified on quotation and originally part of product design, all products with bulkhead connectors do not include cable accessory. If cable is needed for your project, we suggest you purchase separate cable item, contact Cortron with your requirements, we build custom high quality cables. See Connector Pin Out Data listed below for electrical pin designations, do not assume connector is configured to pre-existing layouts.

I/O Connector: 9 Pin (Male), shell size 1, D-Sub Bulkhead Connector (AMP PN 205204-4 or equal) with Jack Posts (female screw locks).

Suggested connector mates or equal; Tyco Electronics (TE) previously AMP. AMP part numbers are still in use and are active.

AMP PN 1658654-1 (9 D female receptacle, EMI shield kit, black plastic straight back shell with AMP



CORTRON

Product Spec Sheet

thumb screws), Avoid use of AMP kit thumb screws since they have tendency to break under normal conditions, we suggest use of Cortron stainless steel upgrade thumb screws PN HW10210801, quantity 2 per connector.

Or

PN 747523-1 (9 female receptacle, with EMI shield kit, NO back shell, NO thumb screws).

Or

PN 205203-3 (9 female receptacle, no slots or dents to support use of EMI shield, NO back shell or NO thumb screws, this connector typically used with third party back shells)

Crimp Contacts:
PN 66504-3 (reel machine)
PN 1658537-4 (hand tool)

Electrical:

* Connector Pinout Data: PD10185804-02

Power: +5VDC @ 0250 mA MAX

Accessories: No

Process:

PCB Workmanship Class: 2

PCB Workmanship Spec: IPC-A-610

Quality System: ISO9000

Conformal Coating: None.

Burn-In/ESS: Extended power-on / elevated temperature / vibration burn-in (ESS) is NOT provided.

Warranty: Limited Lifetime Warranty and Long term support agreement, see warranty sheet

Export # ECCN: EAR99

HTS Schedule B: 8471.60.9050 Standalone Pointing Devices

Weight: Estimated product weight (not packaged) with accessories when applicable (lbs): 1.3

Estimated product weight (packaged) with Cortron standard packaging
(does not include multi-unit or master / pallet packaging (lbs): 2.3

Estimated multi-unit master box weight adder: up to 3 lbs

PRODUCT LABELING:

Standard Cortron product labeling includes Cortron name, Cortron Cage Code, "Made in USA", Cortron PN and Revision, Serial Number, Date of Manufacturing, and Power Information. It is the customer's responsibility to provide Cortron with any and all additional data that may be required on the product.

Product Notes

TBD

* These items indicate that there is a drawing or data to support product configuration.

Notes:

1. Above product information subject to change without notice unless otherwise under written agreement.
2. Performance levels stated above are based on actual test results from many product tests using common Cortron standard design practices, components and modules.
3. Specifications noted above are assumed to be latest revisions. Cortron test data may be originated from older test specification revisions. Some tests performed by customers so Cortron may not have all test reports available.
4. Excessive spill, rain, salt fog or humidity, desire for product to survive for 10-20 years, or mitigate against RoHS tin whiskers may require optional conformal coating.
5. Performance levels may be dependent upon mounting configuration and options installed.
6. Optional performance levels must be requested by customer, standard Cortron products may not have extra performance capability installed, and may be configuration dependent.
7. All options and features may not be ready for immediate shipment depending on product version, contact Cortron for additional information.
8. Some options and features and combinations thereof may not meet all listed specifications without limitations or exceptions.



CORTRON

Product Spec Sheet

9. Unless specified otherwise, all products are complaint to DFARS 252.225-7014 Specialty Metals, Berry Amendment.
10. Prohibited materials: unless otherwise stated please assume Cortron products contain materials as listed on TM-334, available upon request. If customer requirement includes flow down of prohibited materials, please provide information for review by Cortron.
11. RoHS: Cortron is in process of migrating all standard product designs and materials to RoHS compliance. As of 2009, all plastics, standard enclosure case finishes, and standard electrical components used in Cortron products are RoHS compliant. As of 2011, unless specified otherwise, products use lead based solder on electronic assemblies. During 2012, many Cortron products will migrate to full RoHS compliance.

Please do not hesitate to contact Cortron for application assistance or if additional information is required.



Rugged Grade Pointing Device Specifications

Cortron Rugged Pointing Device Products have been designed and manufactured to meet the following commercial and military environmental specifications. Optional specifications are only installed upon request by customer.

Size: Varies depending on options selected, see Cortron detailed mechanical drawing prefixed with EMK.

Weight: Varies depending on installed options

MTBF: Trackball: 100,000-200,000 hours, typical, 25°C Ground Benign, MIL-HDBK-217, depending on installed options, see TM-336 for additional information.

Ergonomics: MIL-STD-1472, MOPP IV

Switches, Pointing Devices: 5 to 100 million cycles, dependent on device and installed options

Power, Input: Logic +5VDC @ 250mA or less depending on installed options

Power, Input (Optional): +24 to +28VDC, MIL-STD-704

Temperature: Operating: -20°C to +70°C Non-operating: -40°C to +70°C

Temperature, Extended (Optional): Operating: -40°C to +71°C Non-operating: -55°C to +85°C

Thermal Shock (Optional): Operating: -40°C to +71°C, Non-operating: -55°C to +85°C; transition less than 1 minute

Humidity: 0-95% RH, non-condensing

Humidity (Optional): 0-100% RH, condensing

Humidity / Corrosion, Operational (Optional): IEC60945: 4 cycles of 2hrs salt spray, 168hrs thermal soak +20-+40C.

Salt Fog (Optional): MIL-STD-810 (24, 48 or 96 hours)

Rain/Spill/Drip/Fire Sprinkler: MIL-STD-810/108 15° inclination or (Optional) 45° inclination

Water Jet Cleaning (Optional): 1500 PSI @ 20 inches

Sealing; Liquid/Dust Ingress Protection: NEMA 4 & IP65

Sealing; Liquid/Dust Ingress Protection (Optional): NEMA 6 & IP66, or IP67

Submersion (Optional): MIL-STD-810, 1m, Contact Cortron

Sand/Dust: MIL-STD-810

Shock: MIL-STD-810, +30g

Shock (Optional): MIL-STD-901D, Grade A Class I, Type A

Acceleration: MIL-STD-810 ranges 1.5-6.5g

Crash Safety: MIL-STD-810 ranges 4-16g

Vibration: MIL-STD-810, 20-2000Hz

+6db/Octave 20Hz -70Hz;

0.01G²/Hz 70Hz -700Hz

-6db/Octave 700-2,000Hz

Vibration (Optional): MIL-STD-810, 20-2000Hz

+6db/Octave 20Hz -70Hz;

0.04G²/Hz 70Hz -700Hz

-6db/Octave 700-2,000Hz

EMI/RFI: Designed to meet MIL-STD-461, CE, IEC60945 and FCC regulations

Nuclear Survivability / Vulnerability (S/V): Contact Cortron.

EMP / HEMP: Contact Cortron

ESD: EN61000-4-2, 6kV Contact Discharge, 8kV Air Discharge

ESD (Optional): DO-160, 18kV

Altitude: +40,000 feet

Explosive Atmosphere: MIL-STD-810, Intrinsically Safe

Decompression:

MIL-STD-810 11psia to 3psia in greater than 15 seconds

Decompression, Rapid (Optional):

MIL-STD-810 11psia to 3psia in less than 4 seconds

Decompression, Explosive (Optional):

MIL-STD-810 11psia to 3psia in less than 0.5 seconds

Compass Safety (Optional): IEC60945

Solar Radiation: MIL-STD-810

Fluids (chemical) Resistance (Optional): MIL-STD-810

NBC Decontamination (Optional): Contact Cortron

Fungus (Optional): MIL-STD-810

Bench Handling: MIL-STD-810

Safety: MIL-HDBK-454, UL1950, CE, materials UL recognized/approved, File #E179526

Workmanship: MIL-STD-454, IPC-610, Class 2

Workmanship (Optional): IPC-610 Class 3 or J-STD001 Class 2 or 3

NOTES:

1. Above specifications (Cortron TE10212601 Rev A3) subject to change without notice unless otherwise under written agreement.
2. Performance levels stated above are based on actual test results from many product tests using common Cortron standard design practices, components and modules.
3. Specifications noted above are assumed to be latest revisions. Cortron test data may be originated from older test specification revisions. Some tests performed by customers so Cortron may not have all test reports available.
4. Excessive spill, rain, salt fog or humidity, desire for product to survive for 10-20 years, or mitigate against RoHS tin whiskers may require optional conformal coating.
5. Performance levels may be dependent upon mounting configuration and options installed.
6. Optional performance levels must be requested by customer, standard Cortron products may not have extra performance capability installed, and may be configuration dependent.
7. All options and features may not be ready for immediate shipment depending on product version, contact Cortron for additional information.
8. Some options and features and combinations thereof may not meet all listed specifications without limitations or exceptions.
9. Unless specified otherwise, all products are compliant to DFARS 252.225-7014 Specialty Metals, Berry Amendment.
10. Prohibited materials: unless otherwise stated please assume Cortron products contain materials as listed on TM-334, available upon request. If customer requirement includes flow down of prohibited materials, please provide information for review by Cortron.
11. RoHS: Cortron is in process of migrating all standard product designs and materials to RoHS compliance. All plastics, standard enclosure case finishes, and standard electrical components used in Cortron products are RoHS compliant. As of 2014, unless specified otherwise, products may use lead based solder on electronic assemblies. Full RoHS compliant versions available upon request.

Please do not hesitate to contact Cortron for application assistance or if additional information is required.







Cortron PN: 570-0110

10/28/2015 02

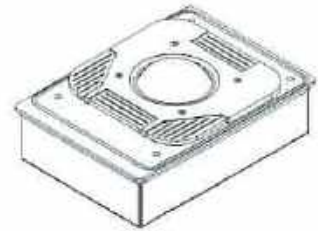
Description: Model: Model T20D: 2 inch D

Performance/Class: Rugged

* See appropriate Model and Class literature for additional information

Pointing Device

Model T20D4: 2 inch DuraTrackball with 4 ergonomic buttons. Standard default layout is three buttons closest to user, with 4th button providing drag lock functionality, unless specified below.



pic from Key-Catalog
(picture may not represent actual product)

Pointing Device

Style: Model T20D: 2 inch DuraTrackball has 4 ergonomic buttons. Standard default layout is three buttons closest to user, with 4th button providing drag lock functionality.

Pointing Device Interface: USB

PD Protocol: USB

Backlit Ball: Yes Ball Color: Green

Backlit Buttons: Yes Buttons Color: Green

Brightness Control: Brightness controlled locally when integral with keyboard or remotely by keyboard

Product Details

Performance/Class:

Product is RUGGED by design, not ruggedized after manufacturing. All rugged grade products have metal enclosure systems for excellent durability and EMI shielding, and use stainless steel hardware.

Mechanical:

Enclosure Style: Panel Mount; Underside: This product is designed to mount to flat underside surface of customer console or mounting platform via flange or threaded inserts located on top surface of product. See Cortron mechanical drawing for mounting specifics and gasket sealing options. Cortron panel mount products typically do not have painted bottom cases.

* Mechanical Drawing: EMK083

Mounting Fasteners: N/A

Color: No Paint, Undercoat plating only. Unless specified otherwise default for aluminum is MIL-DTL-5541,

Feet:

Front Feet: No front feet supplied

Back Feet: No rear feet supplied

Connector Style: D-Sub Bulkhead style connector:::

PLEASE NOTE: Unless specified on quotation and originally part of product design, all products with bulkhead connectors do not include cable accessory. If cable is needed for your project, we suggest you purchase separate cable item, contact Cortron with your requirements, we build custom high quality cables. See Connector Pin Out Data listed below for electrical pin designations, do not assume connector is configured to pre-existing layouts.

I/O Connector: 9 Pin (Male), shell size 1, D-Sub Bulkhead Connector (AMP PN 205204-4 or equal) with Jack Posts (female screw locks).

Suggested connector mates or equal; Tyco Electronics (TE) previously AMP. AMP part numbers are still in use and are active.

AMP PN 1658654-1 (9 D female receptacle, EMI shield kit, black plastic straight back shell with AMP



thumb screws), Avoid use of AMP kit thumb screws since they have tendency to break under normal conditions, we suggest use of Cortron stainless steel upgrade thumb screws PN HW10210801, quantity 2 per connector.

Or

PN 747523-1 (9 female receptacle, with EMI shield kit, NO back shell, NO thumb screws).

Or

PN 205203-3 (9 female receptacle, no slots or dents to support use of EMI shield, NO back shell or NO thumb screws, this connector typically used with third party back shells)

Crimp Contacts:
PN 66504-3 (reel machine)
PN 1658537-4 (hand tool)

Electrical:

* Connector Pinout Data: PD10185804-02

Power: +5VDC @ 0250 mA MAX

Accessories: No

Process:

PCB Workmanship Class: 2

PCB Workmanship Spec: IPC-A-610

Quality System: ISO9000

Conformal Coating: None.

Burn-In/ESS: Extended power-on / elevated temperature / vibration burn-in (ESS) is NOT provided.

Warranty: Limited Lifetime Warranty and Long term support agreement, see warranty sheet

Export # ECCN: EAR99

HTS Schedule B: 8471.60.9050 Standalone Pointing Devices

Weight: Estimated product weight (not packaged) with accessories when applicable (lbs): 1.3

Estimated product weight (packaged) with Cortron standard packaging
(does not include multi-unit or master / pallet packaging (lbs): 2.3

Estimated multi-unit master box weight adder: up to 3 lbs

PRODUCT LABELING:

Standard Cortron product labeling includes Cortron name, Cortron Cage Code, "Made in USA", Cortron PN and Revision, Serial Number, Date of Manufacturing, and Power Information. It is the customer's responsibility to provide Cortron with any and all additional data that may be required on the product.

Product Notes

TBD

* These items indicate that there is a drawing or data to support product configuration.

Notes:

1. Above product information subject to change without notice unless otherwise under written agreement.
2. Performance levels stated above are based on actual test results from many product tests using common Cortron standard design practices, components and modules.
3. Specifications noted above are assumed to be latest revisions. Cortron test data may be originated from older test specification revisions. Some tests performed by customers so Cortron may not have all test reports available.



4. Excessive spill, rain, salt fog or humidity, desire for product to survive for 10-20 years, or mitigate against RoHS tin whiskers may require optional conformal coating.
5. Performance levels may be dependent upon mounting configuration and options installed.
6. Optional performance levels must be requested by customer, standard Cortron products may not have extra performance capability installed, and may be configuration dependent.
7. All options and features may not be ready for immediate shipment depending on product version, contact Cortron for additional information.
8. Some options and features and combinations thereof may not meet all listed specifications without limitations or exceptions.
9. Unless specified otherwise, all products are complaint to DFARS 252.225-7014 Specialty Metals, Berry Amendment.
10. Prohibited materials: unless otherwise stated please assume Cortron products contain materials as listed on TM-334, available upon request. If customer requirement includes flow down of prohibited materials, please provide information for review by Cortron.
11. RoHS: Cortron is in process of migrating all standard product designs and materials to RoHS compliance. As of 2009, all plastics, standard enclosure case finishes, and standard electrical components used in Cortron products are RoHS compliant. As of 2011, unless specified otherwise, products use lead based solder on electronic assemblies. During 2012, many Cortron products will migrate to full RoHS compliance.

Please do not hesitate to contact Cortron for application assistance or if additional information is required.



CORTRON

Cortron, Inc. 59 Technology Drive, Lowell MA 01851 USA Tel# 978-975-5445 Fax# 978-975-0357 sales@cortroninc.com www.cortroninc.com

02-Nov-15 9:29:57 AM

Cortron PN: 570-0110

Page 3 of 3



1.1 KEYBOARD WITH USB INTERFACE

1.1.1 Specifications

Make: CORTRON

Model / Part No.: 537-0144



Fig. 1 - Keyboard with USB Interface

1.1.1.1 The specifications of keyboard with USB interface (Fig. 6.13) are as follows:

CORTRON

Product Spec Sheet

Cortron PN: 537-0144

11/25/2013 02

Description: Model: Model 100
Performance/Class: Rugged
* See appropriate Model and Class literature for additional information
Keyboard with full-travel plastic keys
No Pointing Device.



Keyboard / Product

Style: Model 100 Series Keyboard: 101 to 108 keys, full-size keyboard based on original industry standard IBM AT/PS2 101 style keyboard.

Interface: USB

Protocol: USB

Luminosity: Backlit product has black 'Forever' keys with translucent white legends.

Keyboard Backlit Color: Green

Keyboard Brightness Control: KBC: Key Brightness Control with Memory (after power cycling brightness will return to the previous setting)

Backlighting Power Source: No extra power source needed, power is obtained from computer peripheral port

Indicator Color: Green

Indicator Brightness Control: None.

* Key Layout (s)

KK20537027

Key Legend Type: Backlit

Model 100-C USA layout with keys for brightness control.

Keycap Retaining Clips: Keys designed for shock events less than 50Gs.

Shock Sensing: None



Product Details

Performance/Class:

Product is RUGGED by design, not ruggedized after manufacturing. All rugged grade products have metal enclosure systems for excellent durability and EMI shielding, and use stainless steel hardware.

Mechanical:

Enclosure Style: Panel Mount; Top Mount: This product is designed to mount to flat top surface of customer console or mounting platform via flange or threaded inserts located on top surface of product. See Cortron mechanical drawing for mounting specifics and gasket sealing options. For style of mounting fasteners see below. Cortron panel mount products typically do not have painted bottom cases.

★ Mechanical Drawing: EMK627

Mounting Fasteners: Captive Screw, stainless steel 6-32x0.5" flat head Phillips, Cortron Standard, always in stock

Color: Black Powder Coat Finish is extremely durable and scratch / chemical resistant

Feet:

Front Feet: No front feet supplied

Back Feet: No rear feet supplied

Connector Style: D-Sub Bulkhead style connector:::

PLEASE NOTE: Unless specified on quotation and originally part of product design, all products with bulkhead connectors do not include cable accessory. If cable is needed for your project, we suggest you purchase separate cable item, contact Cortron with your requirements, we build custom high quality cables. See Connector Pin Out Data listed below for electrical pin designations, do not assume connector is configured to pre-existing layouts.

I/O Connector: 25 Male (Male / (pin), shell size 3, Bulkhead D-Sub Jack Posts (female screw locks)
Connector (AMP PN 745036-2 or equal)

Electrical:

★ Connector Pinout Data: PD10185913

Power: +5VDC @ 0450 mA MAX

Accessories: No

Process:

PCB Workmanship Class: 2

PCB Workmanship Spec: IPC-A-610

Quality System: ISO9000

Conformal Coating: None.

Burn-In/ESS: Extended power-on / elevated temperature / vibration burn-in (ESS) is NOT provided.

Warranty: Limited Lifetime Warranty and Long term support agreement, see warranty sheet

Export # ECCN: EAR99

HTS Schedule B: 8471.60.2000 Keyboards and Keypads

Weight: Estimated product weight (not packaged) with accessories when applicable (lbs): 4.7

Estimated product weight (packaged) with Cortron standard packaging

(does not include multi-unit or master / pallet packaging (lbs): 6.4

Estimated multi-unit master box weight adder: up to 3 lbs

PRODUCT LABELING:

Standard Cortron product labeling includes Cortron name, Cortron Cage Code, "Made in USA", Cortron PN and Revision, Serial Number, Date of Manufacturing, and Power Information. It is the customer's responsibility to provide Cortron with any and all additional data that may be required on the product.

Product Notes

- 1) Product will be designed to be the same / identical as the latest updated version of 537-0061 except with USB interface.
- 2) Latest version of 537-0061 same as delivered under customer PO# IMP/74161/Mathews. We are not sure how our part numbers are used by customer, therefore we do not know if product configuration management is centralized.
- 3) We highly recommend the new 537-0144 (USB) should not use cables designed for 537-0061 (PS2). The new USB version should use USB rated cables. We recommend power lines used in the USB cable be at least 22 gauge. Very common low cost USB cables use power lines that are too thin which may cause system conflicts due to voltage drops.
- 4) Similar to other Larson & Toubro projects, unless directed otherwise, as requested by customer, Cortron will not put customer part number on product label.

★ These items indicate that there is a drawing or data to support product configuration.

Notes:

1. Above product information subject to change without notice unless otherwise under written agreement.
2. Performance levels stated above are based on actual test results from many product tests using common Cortron standard design practices, components and modules.



CORTRON

Product Spec Sheet

3. Specifications noted above are assumed to be latest revisions. Cortron test data may be originated from older test specification revisions. Some tests performed by customers so Cortron may not have all test reports available.
4. Excessive spill, rain, salt fog or humidity, desire for product to survive for 10-20 years, or mitigate against RoHS tin whiskers may require optional conformal coating.
5. Performance levels may be dependent upon mounting configuration and options installed.
6. Optional performance levels must be requested by customer, standard Cortron products may not have extra performance capability installed, and may be configuration dependent.
7. All options and features may not be ready for immediate shipment depending on product version, contact Cortron for additional information.
8. Some options and features and combinations thereof may not meet all listed specifications without limitations or exceptions.
9. Unless specified otherwise, all products are complaint to DFARS 252.225-7014 Specialty Metals, Berry Amendment.
10. Prohibited materials: unless otherwise stated please assume Cortron products contain materials as listed on TM-334, available upon request. If customer requirement includes flow down of prohibited materials, please provide information for review by Cortron.
11. RoHS: Cortron is in process of migrating all standard product designs and materials to RoHS compliance. As of 2009, all plastics, standard enclosure case finishes, and standard electrical components used in Cortron products are RoHS compliant. As of 2011, unless specified otherwise, products use lead based solder on electronic assemblies. During 2012, many Cortron products will migrate to full RoHS compliance.

Please do not hesitate to contact Cortron for application assistance or if additional information is required.





Rugged Grade Keyboard Specifications

Cortron Rugged Keyboard Products have been designed and manufactured to meet the following commercial and military environmental specifications. Optional specifications are only installed upon request by customer.

Size: Varies depending on options selected, see Cortron detailed mechanical drawing prefixed with EMK.

Weight: Varies depending on installed options

MTBF: Keyboard:

200,000-300,000 hours, typical, 25°C Ground Benign, MIL-HDBK-217, depending on installed options, see TM-389 for additional information.

MTBF: Trackball:

100,000-200,000 hours, typical, 25°C Ground Benign, MIL-HDBK-217, depending on installed options, see TM-336 for additional information.

Ergonomics: MIL-STD-1472, MOPP IV

Switches, Keyboards: Full-Travel, 100 million cycles

Switches, Pointing Devices: 5 to 100 million cycles, dependent on device and installed options

Switch Spacing: 0.75" OC (on center), typical

Power, Input: Logic +5VDC @ 250mA or less depending on installed options

Power, Input, Low Power Backlighting (Optional): Unless specified by customer, combined keyboard logic and backlighting not to exceed + 5VDC @ 450mA Max., powered from keyboard and/or trackball ports. Max current can be tailored per customer specification.

Power, Input (Optional): +24 to +28VDC, MIL-STD-704

Temperature:

Operating: -20°C to +70°C Non-operating: -40°C to +70°C

Temperature, Extended (Optional):

Operating: -40°C to +71°C Non-operating: -55°C to +85°C

Thermal Shock (Optional): Operating: -40°C to +71°C,

Non-operating: -55°C to +85°C; transition less than 1 minute

Humidity: 0-95% RH, non-condensing

Humidity (Optional): 0-100% RH, condensing

Humidity / Corrosion, Operational (Optional): IEC60945:

4 cycles of 2hrs salt spray, 168hrs thermal soak +20-+40C.

Salt Fog (Optional): MIL-STD-810 (24, 48 or 96 hours)

Rain/Spill/Drip/Fire Sprinkler: MIL-STD-810/108 15° inclination or (Optional) 45° inclination

Water Jet Cleaning (Optional): 1500 PSI @ 20 inches

Sealing; Liquid/Dust Ingress Protection: NEMA 4 & IP65

Sealing; Liquid/Dust Ingress Protection (Optional): NEMA 6 & IP66, or IP67

Submersion (Optional): MIL-STD-810, 1m, Contact Cortron

Sand/Dust: MIL-STD-810

Shock: MIL-STD-810, +30g

Shock (Optional): MIL-STD-901D, Grade A Class I, Type A

Acceleration: MIL-STD-810 ranges 1.5-6.5g

Crash Safety: MIL-STD-810 ranges 4-16g

Vibration: MIL-STD-810, 20-2000Hz

+6db/Octave 20Hz -70Hz;

0.01G²/Hz 70Hz -700Hz

-6db/Octave 700-2,000Hz

Vibration (Optional): MIL-STD-810, 20-2000Hz

+6db/Octave 20Hz -70Hz;

0.04G²/Hz 70Hz -700Hz

-6db/Octave 700-2,000Hz

EMI/RFI: Designed to meet MIL-STD-461, CE, IEC60945 and FCC regulations

Nuclear Survivability / Vulnerability (S/V):

Contact Cortron.

EMP / HEMP: Contact Cortron

ESD: EN61000-4-2, 6kV Contact Discharge, 8kV Air Discharge

ESD (Optional): DO-160, 18kV

TEMPEST (Optional): Contact Cortron; Level I or II, Red-Black

Altitude: +40,000 feet

Explosive Atmosphere: MIL-STD-810, Intrinsically Safe

Decompression:

MIL-STD-810 11psia to 3psia in greater than 15 seconds

Decompression, Rapid (Optional):

MIL-STD-810 11psia to 3psia in less than 4 seconds

Decompression, Explosive (Optional):

MIL-STD-810 11psia to 3psia in less than 0.5 seconds

Compass Safety (Optional): IEC60945

Solar Radiation: MIL-STD-810

Fluids (chemical) Resistance (Optional): MIL-STD-810

NBC Decontamination (Optional): Contact Cortron

Fungus (Optional): MIL-STD-810

Bench Handling: MIL-STD-810

Safety: MIL-HDBK-454, UL1950, CE, materials UL recognized/approved, File #E179526

Workmanship: MIL-STD-454, IPC-610, Class 2

Workmanship (Optional):

IPC-610 Class 3 or J-STD001 Class 2 or 3

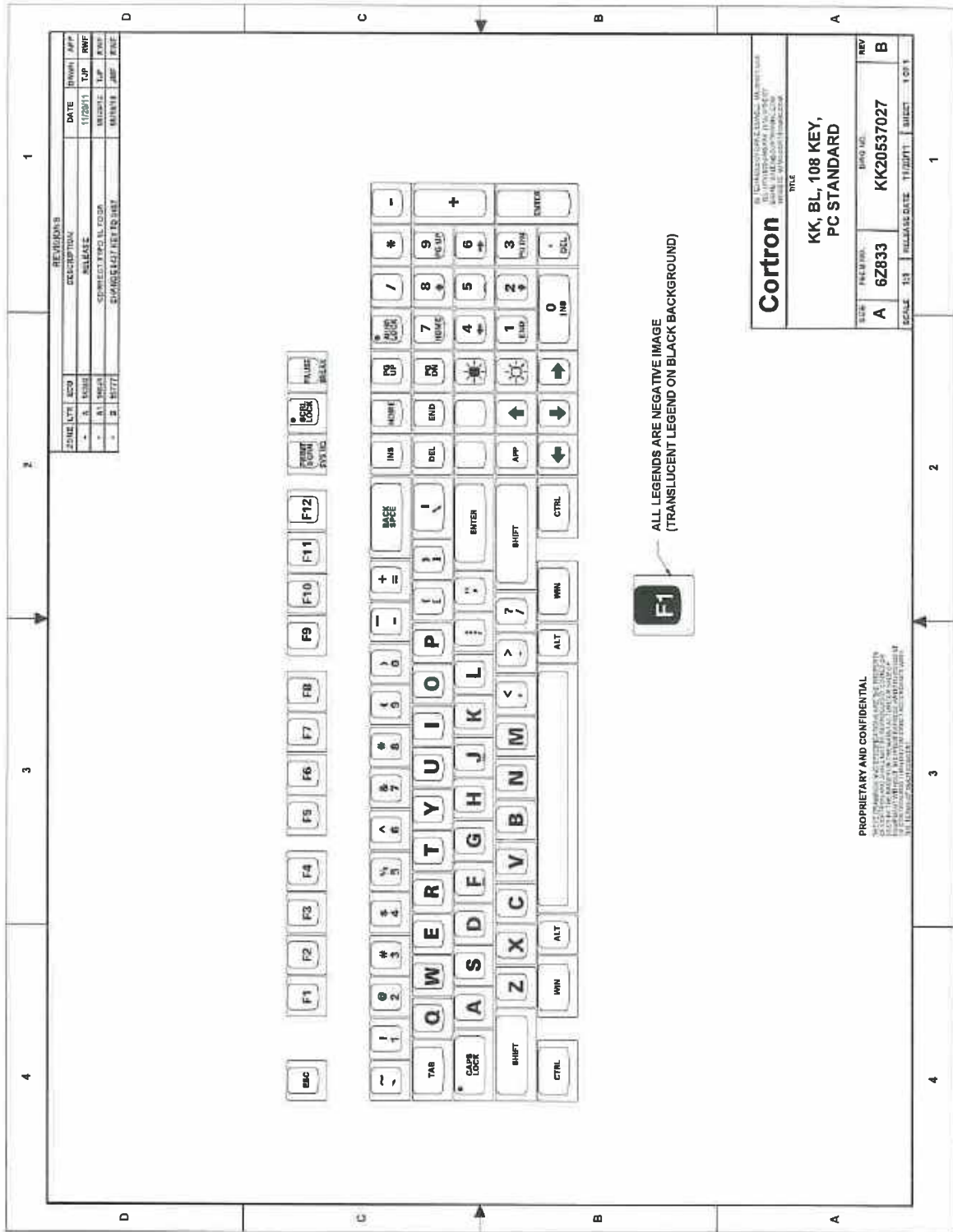
NOTES:

1. Above specifications (Cortron TE10212601 Rev A3) subject to change without notice unless otherwise under written agreement.
2. Performance levels stated above are based on actual test results from many product tests using common Cortron standard design practices, components and modules.
3. Specifications noted above are assumed to be latest revisions. Cortron test data may be originated from older test specification revisions. Some tests performed by customers so Cortron may not have all test reports available.
4. Excessive spill, rain, salt fog or humidity, desire for product to survive for 10-20 years, or mitigate against RoHS tin whiskers may require optional conformal coating.
5. Performance levels may be dependent upon mounting configuration and options installed.
6. Optional performance levels must be requested by customer, standard Cortron products may not have extra performance capability installed, and may be configuration dependent.
7. All options and features may not be ready for immediate shipment depending on product version, contact Cortron for additional information.
8. Some options and features and combinations thereof may not meet all listed specifications without limitations or exceptions.
9. Unless specified otherwise, all products are compliant to DFARS 252.225-7014 Specialty Metals, Berry Amendment.
10. Prohibited materials: unless otherwise stated please assume Cortron products contain materials as listed on TM-334, available upon request. If customer requirement includes flow down of prohibited materials, please provide information for review by Cortron.
11. RoHS: Cortron is in process of migrating all standard product designs and materials to RoHS compliance. All plastics, standard enclosure case finishes, and standard electrical components used in Cortron products are RoHS compliant. As of 2014, unless specified otherwise, products may use lead based solder on electronic assemblies. Full RoHS compliant versions available upon request.

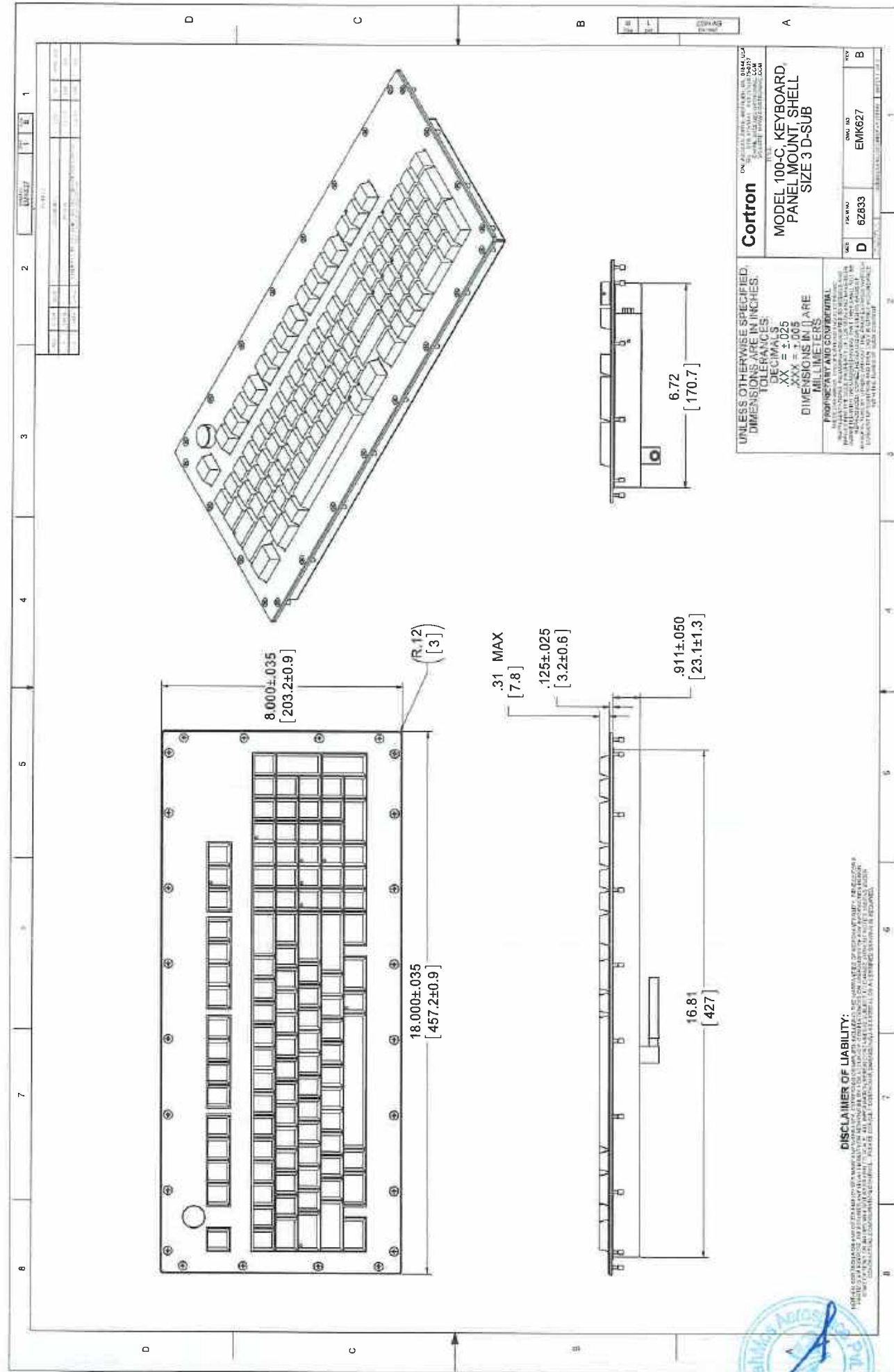
Please do not hesitate to contact Cortron for application assistance or if additional information is required.











REV	DATE	BY	CHKD	DESCRIPTION
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Cortron ON 2000 100-C KEYBOARD PANEL MOUNT SHELL SIZE 3 D-SUB

MODEL 100-C, KEYBOARD PANEL MOUNT SHELL SIZE 3 D-SUB

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES. TOLERANCES DECIMALS .XX = ±.025 .XXX = ±.000 DIMENSIONS IN PARENTHESIS ARE MILLIMETER EQUIVALENTS

PROPRIETARY AND UNPUBLISHED INFORMATION

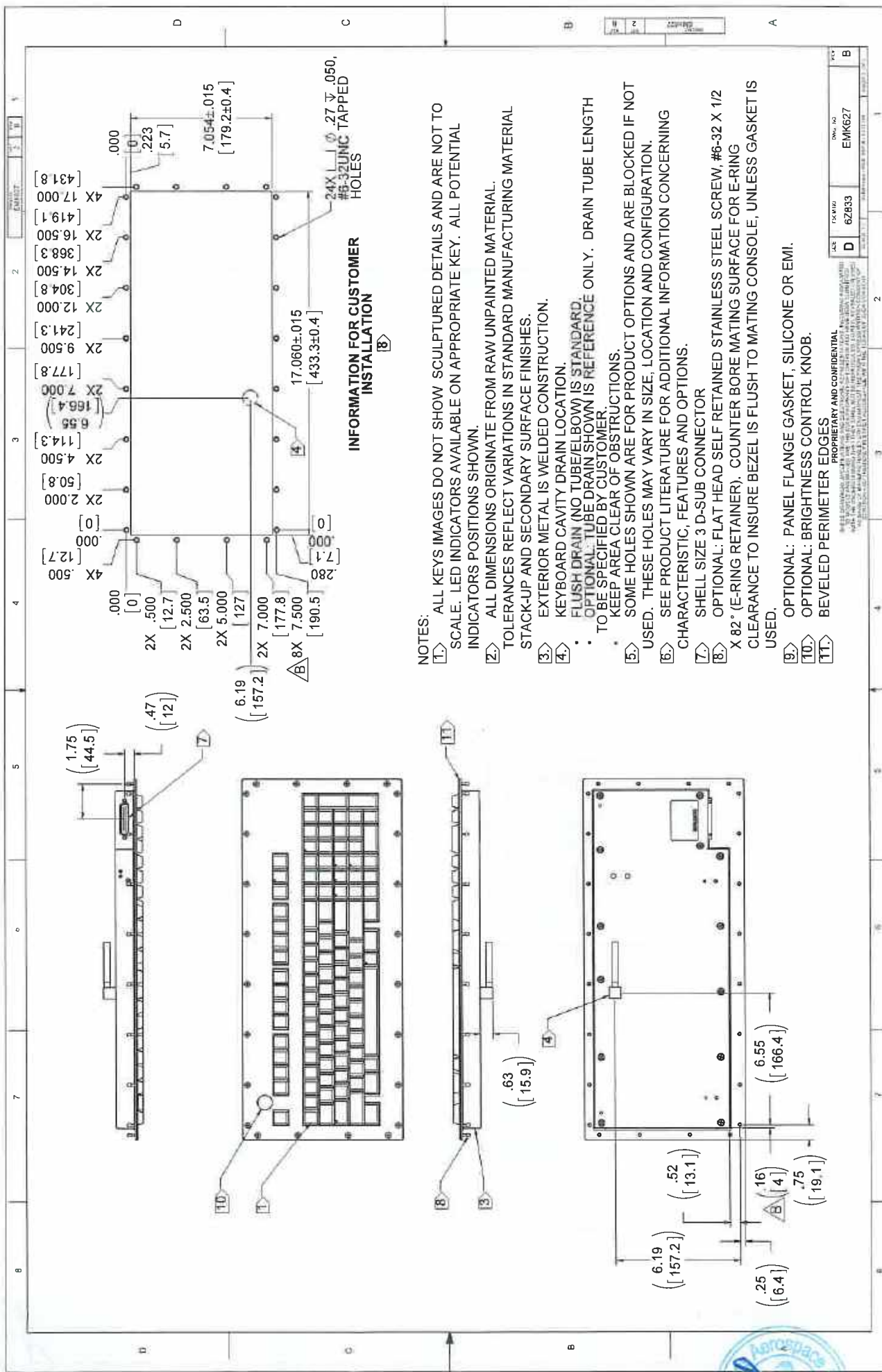
THIS DRAWING IS THE PROPERTY OF CORTRON, INC. AND IS NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF CORTRON, INC.

REV	DATE	BY	CHKD
B			
D	6/28/83	EMK627	



DISCLAIMER OF LIABILITY:

THESE DIMENSIONS ARE FOR INFORMATION ONLY. THE USER SHALL BE RESPONSIBLE FOR VERIFYING THE DIMENSIONS OF THE PARTS AND ASSEMBLIES. CORTRON, INC. SHALL NOT BE LIABLE FOR ANY DAMAGE OR LOSS OF PROFITS, INCLUDING CONSEQUENTIAL DAMAGES, ARISING FROM THE USE OF THIS DRAWING. THE USER SHALL BE RESPONSIBLE FOR OBTAINING NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AUTHORITIES.



INFORMATION FOR CUSTOMER INSTALLATION

- NOTES:
- 1> ALL KEYS IMAGES DO NOT SHOW. SCULPTURED DETAILS AND ARE NOT TO SCALE. LED INDICATORS AVAILABLE ON APPROPRIATE KEY. ALL POTENTIAL INDICATORS POSITIONS SHOWN.
 - 2> ALL DIMENSIONS ORIGINATE FROM RAW UNPAINTED MATERIAL. TOLERANCES REFLECT VARIATIONS IN STANDARD MANUFACTURING MATERIAL STACK-UP AND SECONDARY SURFACE FINISHES.
 - 3> EXTERIOR METAL IS WELDED CONSTRUCTION.
 - 4> KEYBOARD CAVITY DRAIN LOCATION.
 - FLUSH DRAIN (NO TUBE/ELBOW) IS STANDARD.
 - OPTIONAL: TUBE DRAIN SHOWN IS REFERENCE ONLY. DRAIN TUBE LENGTH TO BE SPECIFIED BY CUSTOMER.
 - KEEP AREA CLEAR OF OBSTRUCTIONS.
 - 5> SOME HOLES SHOWN ARE FOR PRODUCT OPTIONS AND ARE BLOCKED IF NOT USED. THESE HOLES MAY VARY IN SIZE, LOCATION AND CONFIGURATION.
 - 6> SEE PRODUCT LITERATURE FOR ADDITIONAL INFORMATION CONCERNING CHARACTERISTIC, FEATURES AND OPTIONS.
 - 7> SHELL SIZE 3 D-SUB CONNECTOR
 - 8> OPTIONAL: FLAT HEAD SELF RETAINED STAINLESS STEEL SCREW, #6-32 X 1/2 X 82° (E-RING RETAINER). COUNTER BORE MATING SURFACE FOR E-RING CLEARANCE TO INSURE BEZEL IS FLUSH TO MATING CONSOLE, UNLESS GASKET IS USED.
 - 9> OPTIONAL: PANEL FLANGE GASKET, SILICONE OR EMI.
 - 10> OPTIONAL: BRIGHTNESS CONTROL KNOB.
 - 11> BEVELED PERIMETER EDGES

REV	DATE	DESCRIPTION
B		
D	6/28/83	EMK627



Cortron PN: 537-0144

11/25/2013 02

Description: Model: Model 100
Performance/Class: Rugged
* See appropriate Model and Class literature for additional information
Keyboard with full-travel plastic keys
No Pointing Device.



pic from Pm B des
(picture may not represent actual product)

Keyboard / Product

Style: Model 100 Series Keyboard: 101 to 108 keys, full-size keyboard based on original industry standard IBM AT/PS2 101 style keyboard.
Interface: USB
Protocol: USB
Luminosity: Backlit product has black 'Forever' keys with translucent white legends.
Keyboard Backlit Color: Green
Keyboard Brightness Control: KBC: Key Brightness Control with Memory (after power cycling brightness will return to the previous setting)
Backlighting Power Source: No extra power source needed, power is obtained from computer peripheral port
Indicator Color: Green
Indicator Brightness Control: None.
* Key Layout (s)
KK20537027 Key Legend Type: Backlit
Model 100-C USA layout with keys for brightness control.
Keycap Retaining Clips: Keys designed for shock events less than 50Gs.
Shock Sensing: None

Product Details

Performance/Class:

Product is RUGGED by design, not ruggedized after manufacturing. All rugged grade products have metal enclosure systems for excellent durability and EMI shielding, and use stainless steel hardware.

Mechanical:

Enclosure Style: Panel Mount; Top Mount: This product is designed to mount to flat top surface of customer console or mounting platform via flange or threaded inserts located on top surface of product. See Cortron mechanical drawing for mounting specifics and gasket sealing options. For style of mounting fasteners see below. Cortron panel mount products typically do not have painted bottom cases.
* Mechanical Drawing: EMK627
Mounting Fasteners: Captive Screw, stainless steel 6-32x0.5" flat head Phillips, Cortron Standard, always in stock
Color: Black Powder Coat Finish is extremely durable and scratch / chemical resistant
Feet:
Front Feet: No front feet supplied
Back Feet: No rear feet supplied
Connector Style: D-Sub Bulkhead style connector:::

CORTRON

Cortron, Inc 59 Technology Drive, Lowell MA 01851 USA Tel# 978-975-5445 Fax# 978-975-0357 sales@kortroninc.com www.cortroninc.com

05-Nov-15 3:52:23 PM

Cortron PN: 537-0144

Page 1 of 3



PLEASE NOTE: Unless specified on quotation and originally part of product design, all products with bulkhead connectors do not include cable accessory. If cable is needed for your project, we suggest you purchase separate cable item, contact Cortron with your requirements, we build custom high quality cables. See Connector Pin Out Data listed below for electrical pin designations, do not assume connector is configured to pre-existing layouts.

I/O Connector: 25 Male (Male / (pin), shell size 3, Bulkhead D-Sub Jack Posts (female screw locks) Connector (AMP PN 745036-2 or equal)

Electrical:

* Connector Pinout Data: PD10185913

Power: +5VDC @ 0450 mA MAX

Accessories: No

Process:

PCB Workmanship Class: 2

PCB Workmanship Spec: IPC-A-610

Quality System: ISO9000

Conformal Coating: None.

Burn-In/ESS: Extended power-on / elevated temperature / vibration burn-in (ESS) is NOT provided.

Warranty: Limited Lifetime Warranty and Long term support agreement, see warranty sheet

Export # ECCN: EAR99

HTS Schedule B: 8471.60.2000 Keyboards and Keypads

Weight: Estimated product weight (not packaged) with accessories when applicable (lbs): 4.7

Estimated product weight (packaged) with Cortron standard packaging

(does not include multi-unit or master / pallet packaging (lbs): 6.4

Estimated multi-unit master box weight adder: up to 3 lbs

PRODUCT LABELING:

Standard Cortron product labeling includes Cortron name, Cortron Cage Code, "Made in USA", Cortron PN and Revision, Serial Number, Date of Manufacturing, and Power Information. It is the customer's responsibility to provide Cortron with any and all additional data that may be required on the product.

Product Notes

- 1) Product will be designed to be the same / identical as the latest updated version of 537-0061 except with USB interface.
- 2) Latest version of 537-0061 same as delivered under customer PO# IMP/74161/Mathews. We are not sure how our part numbers are used by customer, therefore we do not know if product configuration management is centralized.
- 3) We highly recommend the new 537-0144 (USB) should not use cables designed for 537-0061 (PS2). The new USB version should use USB rated cables. We recommend power lines used in the USB cable be at least 22 gauge. Very common low cost USB cables use power lines that are too thin which may cause system conflicts due to voltage drops.
- 4) Similar to other Larson & Toubro projects, unless directed otherwise, as requested by customer, Cortron will not put customer part number on product label.

* These items indicate that there is a drawing or data to support product configuration.

Notes:

1. Above product information subject to change without notice unless otherwise under written agreement.
2. Performance levels stated above are based on actual test results from many product tests using common Cortron standard design practices, components and modules.



3. Specifications noted above are assumed to be latest revisions. Cortron test data may be originated from older test specification revisions. Some tests performed by customers so Cortron may not have all test reports available.
4. Excessive spill, rain, salt fog or humidity, desire for product to survive for 10-20 years, or mitigate against RoHS tin whiskers may require optional conformal coating.
5. Performance levels may be dependent upon mounting configuration and options installed.
6. Optional performance levels must be requested by customer, standard Cortron products may not have extra performance capability installed, and may be configuration dependent.
7. All options and features may not be ready for immediate shipment depending on product version, contact Cortron for additional information.
8. Some options and features and combinations thereof may not meet all listed specifications without limitations or exceptions.
9. Unless specified otherwise, all products are complaint to DFARS 252.225-7014 Specialty Metals, Berry Amendment.
10. Prohibited materials: unless otherwise stated please assume Cortron products contain materials as listed on TM-334, available upon request. If customer requirement includes flow down of prohibited materials, please provide information for review by Cortron.
11. RoHS: Cortron is in process of migrating all standard product designs and materials to RoHS compliance. As of 2009, all plastics, standard enclosure case finishes, and standard electrical components used in Cortron products are RoHS compliant. As of 2011, unless specified otherwise, products use lead based solder on electronic assemblies. During 2012, many Cortron products will migrate to full RoHS compliance.

Please do not hesitate to contact Cortron for application assistance or if additional information is required.

CORTRON

Cortron, Inc. 59 Technology Drive, Lowell MA 01851 USA Tel# 978-975-5445 Fax# 978-975-0357 sales@cottroninc.com www.cottroninc.com

05-Nov-15 3:52:24 PM

Cortron PN: 537-0144

Page 3 of 3

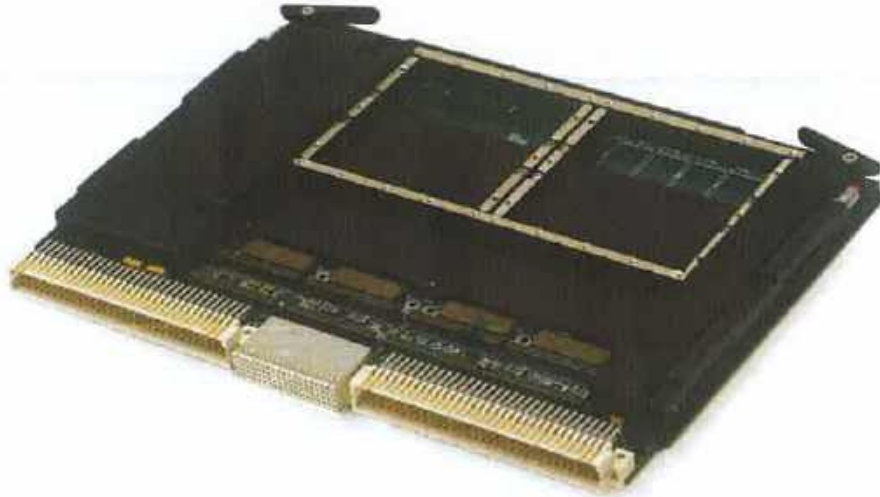






C163

4th Gen. Intel Core™ i7 6U VME SBC



- Rugged 6U VME Single-Slot SBC
- 4th Generation Intel® Core™ i7 Processor
 - Quad Core @ 2.4 GHz
 - Intel Virtualization Technology (VT-x)
 - Streaming SIMD Extensions (SSE) 4.2
 - Intel Advanced Vector Extensions (AVX) 2.0
 - Integrated HD Graphics 4600
 - 6 MB Last Level Cache (LLC) shared between CPU and Integrated Graphics
- Memory Resources
 - Up to 16 GB Dual-channel DDR3L, @ 1600 MT/s with ECC
 - Up to 128 GB SATA Flash Disk
 - Dual BIOS Flash Devices
- I/O Interfaces
 - Four Gigabit Ethernet Ports
 - Seven USB 2.0 Ports
 - Two SATA II Ports
 - Four RS-232/422/485 Serial Ports
 - 12 Discrete I/O Lines
 - Two CANbus Ports
 - One RGBHV Display Output
 - Two HDMI/DVI Display Outputs
 - High Definition Audio I/O
- VME 2eSST with Legacy VME Support
- Two PMC/XMC Slots
 - PMC Slots supporting 64-bit PCI/PCI-X buses @ up to 133 MHz
 - XMC Slots supporting PCIe x8 Gen 2.0
- System Resources
 - Three Temperature Sensors
 - Real Time Clock
 - Avionics Windowed Watchdog Timer
 - Elapsed Time Recorder (ETR)
 - Trusted Platform Module (TPM – optional)
 - Intelligent Platform Management Interface (IPMI)
- Software Support
 - Windows™
 - VxWorks®
 - Linux®
- Conduction and Air-Cooled Versions
- Vibration and Shock Resistant

Aitech Defense Systems, Inc.

A member of the Aitech Rugged Group
19756 Prairie Street, Chatsworth, CA 91311

Tel: (888) Aitech-8 (248-3248) Fax: (818) 407-1502 e-mail: sales@rugged.com web: www.rugged.com#





C163 – 4th Generation Intel® Core™ i7 6U VME SBC

Aitech's C163 is a high-performance 6U VME SBC (Single Board Computer) for embedded and harsh environment applications. The heart of the C163 is Intel's newest platform (Haswell), featuring a 4th generation Intel® Core™ i7 Quad Core processor with integrated HD Graphics 4600, coupled with a companion Lynx Point QM87 I/O Platform Controller Hub (PCH).

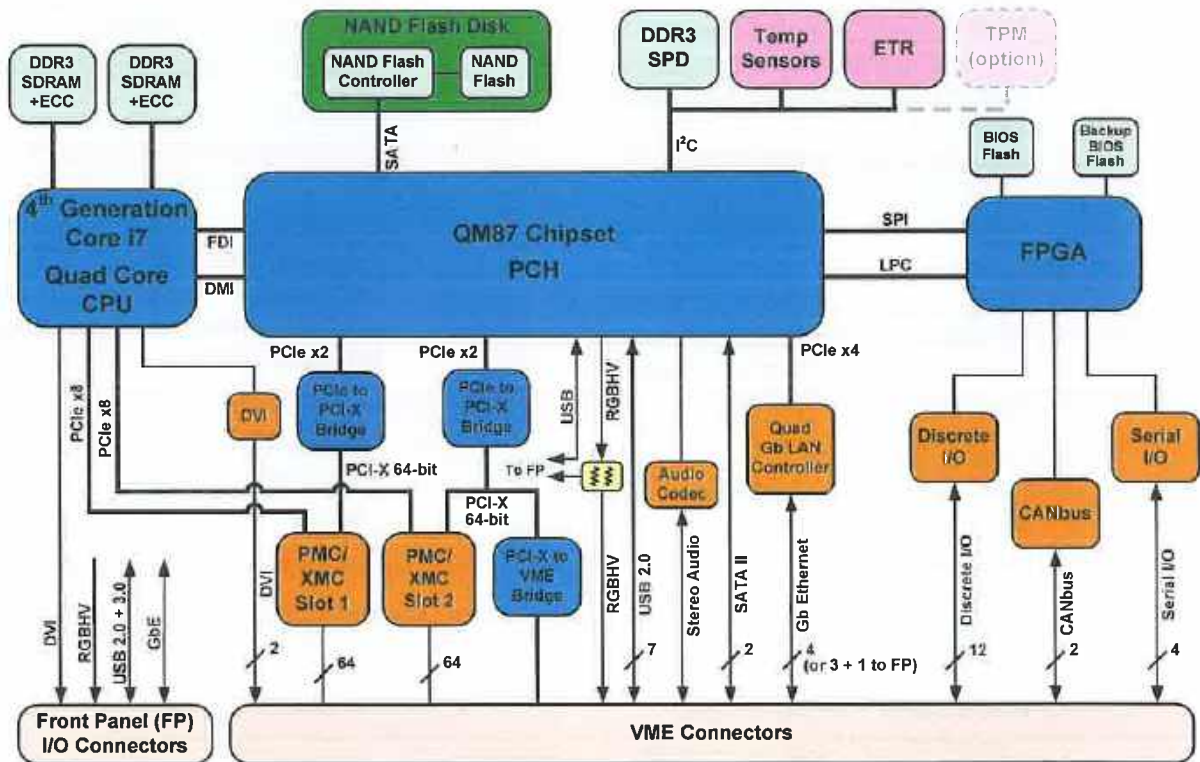
The processor's integrated 2D/3D graphics controller supports graphics and video processing and provides RGBHV (via PCH) and two HDMI/DVI outputs.

The C163 integrates large on-board memory arrays to support processor and user application needs. Memory resources include up to 16 GB of dual-channel DDR3L SDRAM with ECC protection and up to 128 GB of SATA flash disk storage for user/application-specific mass storage.

In addition to its high-performance processor architecture, the C163 provides a wide variety of I/O, including four Gigabit Ethernet ports, seven USB 2.0 ports, two SATA II ports, four UART ports, 12 general-purpose discrete I/O channels, two CANbus ports, and high-definition stereo audio I/O. To further expand its capabilities, the C163 is equipped with two industry-standard PMC/XMC slots.

The C163 is VME64x compliant, and supports VME advanced protocols such as 2eSST and 2eVME while maintaining full compliance with legacy VME operation.

C163 mechanical and electrical designs guarantee operation over the full range of rugged application environments. It is available in industry standard conduction- and air-cooled form factors.



C163 Functional Block Diagram





Functional Description

Processor and Bus Architecture

The C163 is a high-performance 6U VME SBC, based on Intel's Haswell platform and supported by extensive memory arrays.

System Architecture

The C163 is based on the Intel 4th Generation Core i7 processor (Intel's high-performance, low-power mobile CPU) and the Lynx Point Platform Controller Hub (PCH-QM87). In this two-chip solution, the quad core processor, memory controller, and integrated graphics processing are provided by the Core i7, while platform I/O interfaces are provided by the PCH.

4th Generation Intel Core i7 Processor

Fabricated using 22-nanometer process technology, the 64-bit, quad core 4th generation Intel Core i7 processor provides the host interface controller, system memory interface (DDR3L), direct media interface, and integrated graphics processing, and also supports external graphics interfaces (over a PCIe port).

The processor includes two PCIe Gen. 3.0 x8 ports, which are routed to the two XMC sites.

Lynx Point Platform Controller Hub (PCH)

The PCH integrates a number of I/O device controllers and interfaces supporting legacy and high-speed resources to allow system design flexibility. The PCH also integrates an RGBHV interface, which receives display data from the CPU's graphics controller over the Intel Flexible Display Interface (FDI).

Memory

SDRAM

Up to 16 GB of fast DDR3L SDRAM with error correction (ECC) operating at up to 1600 MT/s, configured in dual channels, provides maximum performance.

Dual Redundant Flash BIOS

The C163 is equipped with two 16 MB Flash BIOS devices. If the board fails to boot from the primary device, the boot process redirects to the alternate device.

Flash Disk

A SATA II Flash Disk of up to 128 GB provides on-board mass storage, eliminating the need for externally attached storage media.

Integrated Graphics

The C163 includes Intel's HD Graphics 4600, implemented on the processor module. The graphics core provides 20 execution units, and is capable of 2D/3D graphics processing, supporting Microsoft® DirectX® 11.1, OpenGL 4, and more.

The graphics core implements Intel's Floating Point technology, enhancing the visual quality of generated images.

The C163 provides one RGBHV and single link HDMI/DVI video outputs, all supporting resolutions up to 1600x1200 @ 60 Hz.

VME

The C163 implements Tundra's Tsi148 PCI-X to VME 2eSST Bridge for interconnection to the VME bus. The VME Bridge is located on the PCI-X bus allowing for high-speed operation and throughput.

The VME interface provides full master and slave capabilities and supports the following:

- 2eSST and 2eVME protocol support
- Legacy traditional VME protocol support
- A64/A32/A24/A16 addressing modes
- MBLT/BLT/D64/D32/D16/D8 data transfer modes
- Interrupter and handler capability on all seven VME interrupt lines
- Four mailbox and four location monitors for in-system board communication
- Full system controller functionality – arbitration, VME clock generation, VME global timeout timer (BERR)
- Flexible register set allowing manipulation of all VME options

The Tsi148 Bridge incorporates large FIFOs for optimal usage of the two buses on which it operates (PCI and VME). In addition, it includes two DMA engines supporting high data rate transfers.

I/O Interfaces

Ethernet

Four 10BaseT/100BaseTX/1000BaseT interfaces are implemented in a Quad Gigabit LAN Controller (with integrated PHY) using four of the PCH PCIe lanes.

For air-cooled boards, one of these ports is routed to a front panel connector.

USB 2.0

USB Rev. 2.0 host controllers (backward compliant with Rev. 1.0 and Rev. 1.1) integrated in the PCH provide eight USB 2.0 ports (seven routed to backplane connectors and one to a front panel connector on air-cooled boards). The controllers integrate the USB transceivers supporting high-speed, full-speed, and low-speed signaling. The C163 is capable of providing power to downstream devices.





SATA II

Two SATA II interfaces enable connection of external mass storage devices to the C163. The SATA II interface is fully compliant with the Serial ATA 2.0 and 1.0 specifications with SATA II extensions, supporting data transfer rates of up to 300 MB/s.

Serial I/O

The C163 provides four UART serial ports supporting full RS-232/422/485 physical interfaces. Serial ports are fully compliant with the 16550 programming model.

Discrete I/O

The C163 provides up to 12 general-purpose discrete I/O lines, which are divided into six groups of two lines each. Each group may be configured as two single-ended channels or one differential RS-422 channel.

Each channel may be independently configured as input or output. When configured as inputs, each of these channels may be programmed to generate an interrupt on any level shift event.

HD Audio

The PCH supports Intel's High Definition (HD) Audio, which is compliant with Microsoft's Universal Audio Architecture (UAA). Using an HD Audio codec, the C163 provides stereo input and output interfaces.

PMC/XMC Expansion Slots

The C163 provides two industry standard PMC/XMC expansion sites for extended flexibility and integration of additional elements to the SBC. Connectors and other components relevant to each site are assembled according to the selected C163 I/O Variant (see *I/O Variants* and *Ordering Information* below).

PMC slots are interconnected to the PCH through a PCIe-PCI-X bridge. Bus operation is automatically configured according to the capabilities of the installed PMC.

XMC slots are directly connected to the CPU. PCIe bus operation (speed, number of lanes) is automatically configured according to the capabilities of the installed XMC. The XMC slots are fully compliant with VITA 42.

The following table summarizes PMC/XMC site capabilities and characteristics:

	PMC/XMC 1	PMC/XMC 2
Location	Inner Site	Outer Site
PCIe Interface (Gen 2 @ 5 GHz)	x8/4/2/1	x8/4/2/1
PCI Interface	33/66 MHz	33/66 MHz
PCI-X Interface	133/66 MHz	100/66 MHz
PCI I/O Signaling Levels	Universal (3.3V/5V)	3.3V
Max current available from +5 Vdc (PMC/XMC)	2 A/3 A	2 A/3 A
Max current available from +3.3 Vdc	2 A	2 A
+12 Vd _{CAUX}	0.5 A	0.5 A
-12 Vd _{CAUX}	0.5 A	0.5 A
Power per site (max)	10 W	20 W

I/O Routing

C163 on-board I/O resources and PMC/XMC I/O are routed to the VME P2 and P0 backplane connectors.

Due to the limited number of I/O pins available on the P2 and P0 connectors, it is not possible to simultaneously route all C163 on-board I/O plus all PMC/XMC I/O to the backplane. For this reason, a number of different I/O variants are available, as shown in the *I/O Variants* section below..

On air-cooled versions, some of the I/O interfaces are available at the front panel. Refer to the front panel section for more information.

Timers

The C163 includes one 32/64-bit and seven 32-bit timers/counters providing high-precision timing functionality. These timers can be chained together (cascaded) to support long timing interval counting applications.

A real-time clock (RTC) provides time and date keeping. Both standard and windowed (avionics style) watchdog timers are available on the C163. Implemented in the system FPGA, the windowed watchdog must be serviced within a software programmable window defined by minimum and maximum times. If serviced too early, too late, or not at all, this watchdog timer will generate a timeout event. It may be independently set to generate a non-maskable interrupt or to reset the SBC.

Elapsed Time Recorder

An on-board electronic Elapsed Time Recorder (ETR) records the C163's cumulative operating time and number of power on-off cycles in dedicated NVRAM. ETR data is software accessible by the user.





Front Panel Connectors and Switches

The air-cooled version of the board is provided with a front panel, which includes the following:

- One GbE port (RJ45 connector)
- One USB 2.0 and USB 3.0 ports (standard USB 3.0 connector)
- One RGBHV and one DVI output (standard DVI-I connector)

The front panel GbE and DVI ports are at the expense of one backplane GbE port and one DVI port. Other front panel I/O is in addition to backplane I/O.

Intelligent Platform Management Interface (IPMI)

The C163 IPMI controller supports system-level management monitoring of board health and status via the I²C bus at the P1 connector, in accordance with VITA 38. This enables external monitoring of board resources such as rail voltages, board temperatures, and board information.

Drop-in Compatibility

As a true drop-in replacement for Aitech's C160 and C162 SBCs, the C163 provides a convenient upgrade path for systems currently using the C160/C162. The C163 delivers increased processing power while retaining the same form factor and identical pinout.

Software

Test and Diagnostic Features

The C163 is supplied with a customized BIOS tailored to its architecture, capabilities, and features.

The BIOS includes POST capabilities as well as system configuration options for boot device, boot sequence, etc.

A JTAG/COP interface to the processor is provided for debugging and development purposes.

Operating Systems

The C163 with its custom BIOS fully supports installation and operation of the following operating systems:

- Microsoft Windows™
- Linux®
- WindRiver VxWorks®

Operating system specific device drivers are provided for all on-board resources, allowing the user to take full advantage of the C163's powerful features.

Support for other operating systems may be available upon request.

Mechanical Features

The C163 is available in both air-cooled and conduction-cooled mechanical formats. Both are single slot 6U modules.

A custom metal frame integral to the conduction-cooled version of the C163 provides excellent rigidity and shock resistance. The frame also provides an array of stiffeners to support rugged PMCs/XMCs.

Dimensions

Air-cooled: per IEEE Std 1101.10-1996

Conduction-cooled: per IEEE Std 1101.2-1992

Weight

Air-cooled: < 800 g (1.75 lbs)

Conduction-cooled: < 1100 g (2.43 lbs)

Thermal Management

Careful mechanical design, including custom heatsinks combined with a metal frame, allow for optimal heat dissipation and relief of the board. The C163 is also equipped with two temperature sensors, located at temperature-critical locations, to monitor board temperature and provide temperature data to user application software.

Power Requirements

The C163 takes all its power from the VME backplane. It should be provided with +5.0 V, +3.3 V, and ±12 V as defined by the VME64x specification (±12 V is required for PMC/XMC compliance only; the C163 does not require ±12 V for its own operation).

All other power sources required by C163 resources are generated on board.

In its fully featured configuration (no PMCs/XMCs installed), C163 power consumption is as follows:

Input Voltage	Current
+3.3V	TBDA
+5.0V	TBDA
+12V	0A (no PMC/XMC mounted)
-12V	0A (no PMC/XMC mounted)
Power	TBD (W)

Environmental Features

Please refer to the Aitech Ruggedization datasheet.

Accessories

For system integration and other development purposes, the TM163 Rear Transition Module (RTM) provides convenient access via standard connectors to all C163 I/O interfaces and all PMC/XMC I/O. The RTM supports both the air-cooled and conduction-cooled versions of the C163 when mounted in a commercial air-cooled chassis.





C163

4th Gen. Intel Core™ i7 6U VME SBC

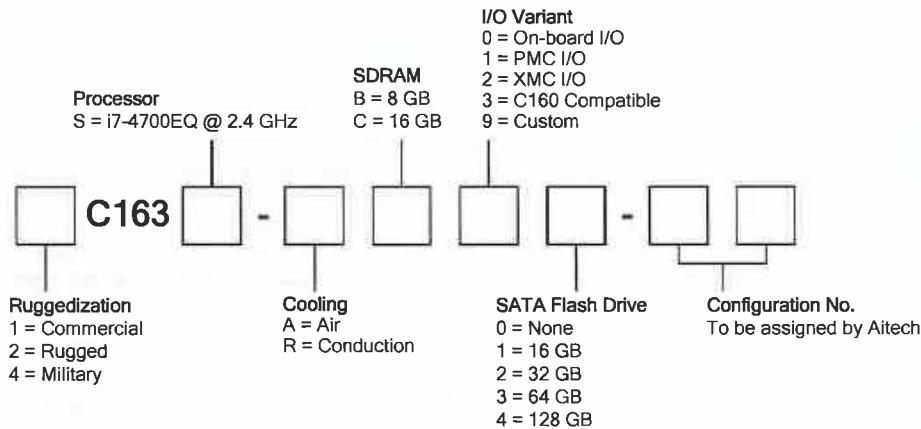
I/O Variants

The C163 is available in four basic I/O variants as shown in the table below. These configurations are hard-wired at the factory and are not configurable by the user. Customized versions can also be produced to meet specific customer requirements. Contact an Aitech sales representative for more information.

	Variant #0 On-board I/O	Variant #1 PMC I/O	Variant #2 XMC I/O	Variant #3 C160 Compatible
GbE	4	2	1	2
DVI	2	N/A	N/A	N/A
RGBHV	1	1	1	1
Discrete	4	8	8	8
Serial	4	4	1	2
CANbus	2	N/A	N/A	N/A
USB 2.0	7 *	2 *	2 *	4 *
SATA	2	2	2	2
Audio	In and Out	In and Out	N/A	In and Out
PMC #1 I/O	55	64	N/A	64
PMC #2 I/O	22	64	N/A	58
XMC #1 I/O	N/A	N/A	Diff 20, SE 38	N/A
XMC #2 I/O	N/A	N/A	Diff 20, SE 38	N/A

* Air-cooled versions of the C163 include one additional USB 2.0+3.0 port, available only at the front panel

Ordering Information



Example: 4C163S-RB02-00

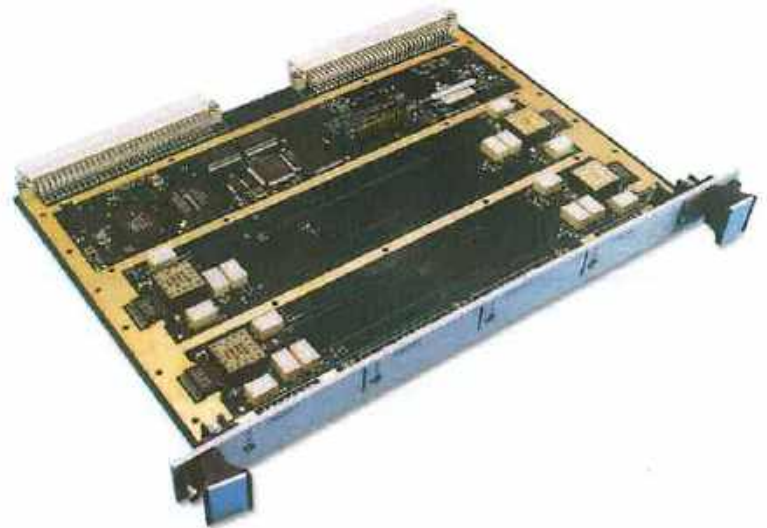
For more information about the C163 or any Aitech product, please contact Aitech Defense Systems sales department at (888) Aitech-8 (248-3248).

Names, products, and/or services mentioned are trademarks or registered trademarks of their respective holders. All information contained herein is subject to change without notice.

C163
Rev 1.0 Jun 2014

Aitech Defense Systems, Inc.
A member of the Aitech Rugged Group
19756 Prairie Street, Chatsworth, CA 91311
Tel: (888) Aitech-8 (248-3248) Fax: (818) 407-1502 e-mail: sales@rugged.com web: www.rugged.com





RQVME2-1553

High Density VME Interface

Architecture

The RQVME2-1553 provides new levels of performance and flexibility for MIL-STD-1553A and B Notice II on the VMEbus and is 100% compatible with QVME-1553 functionality.

Available in commercial, industrial and conductively cooled versions with one, two or four dual-redundant channels, the RQVME2-1553 includes advanced API (Application Programming Interface) software that reduces application development time.

Standard features include selectable transformer or direct coupling, 1 Mbyte of RAM per channel, 45-bit message time-tagging, triggers, extensive BC & RT link-list structures, error detection/injection, advanced BC functionality, automatic/ manual RT Status Bit and Mode Code responses plus IRIG/GPS synchronization capabilities.

Optional IRIG-B signal Receiver/Generator, variable voltage outputs and environmental are available. The RQVME2-1553 Bus Monitors provide unparalleled error detection and 100% monitoring of fully loaded buses.

Multi-function Interfaces

RQVME2-1553 multi-function interfaces are easily configured to operate with simultaneous Bus Controller, 31 Remote Terminals and Bus Monitor functionality.

Single Function Interfaces

Single-function RQVME2-1553 interfaces have all the features and functionality of the multi-function versions, but only one major operational mode is enabled at a time. Each interface can independently emulate either a Bus Controller or 31 Remote Terminals or Bus Monitor.

Software

Our high-level "abstract" 1553 API provided in source code, along with support for Windows® and VxWorks® (contact the factory for supported operating system versions). To access 1553 functionality without software development, BusTools/1553, MIL-STD-1553 bus analysis, simulation and data logging/monitoring solution is available.

FEATURES:

- 1, 2 or 4 Independent MILSTD-1553 Dual Redundant Channels
- RoHS compliant
- Multi-function Features
 - Simultaneous Bus Controller, 31 Remote Terminals, or Bus Monitor
- Single-function Features
 - Bus Controller, 31 Remote Terminals, or Bus Monitor
- Bus Controller – BC
 - BC -> RT, RT -> BC, RT -> RT
 - Mode Codes, Broadcast and single-shot messaging
 - Programmable time delays
 - Major/Minor frames
 - Real-time conditional branching
 - Two aperiodic messaging methods
- Remote Terminal – RT
 - 1 to 31RT's
 - RT data wrapping
 - Multiple RT buffers
 - 1760 startup time w/busy bit set
 - Dynamic Bus Control
 - Automatic Mode Code and status bit responses
 - Programmable response time
 - Hardwired RT address selection
- Architecture
 - BC & RT error injection/detection
 - BC & RT link list structures
 - 1 Mbyte RAM per channel
 - Onboard diagnostic bus (non-ruggedized boards only)
 - Ruggedized industrial and conductively cooled options
 - IRIG-B Receiver/Generator option



RQVME2-1553 High Density VME Interface

Specifications

Physical

- 6U VME
- Standard configuration has front bezel I/O
- RoHS compliant (RQVME2-1553)
- Non RoHS (QVME2-1553) contact factory for availability

Environmental

- Standard operating temperature range: 0°C to +70°C
- Optional ruggedized, conductively cooled, extended temp range: -40°C to +85°C
- Relative humidity: 5 to 90% (non-condensing)

Software

- API – High-level libraries with source code included for Windows® and VxWorks® (contact the factory for supported operating system versions)
- GUI – Optional support for BusTools/1553 GUI Bus analyzer with PCI-MXI-2 (mf boards only)

Connections

- Programmable direct or transformer coupling
- Transition cabling for each channel
 - Two CJ70 jacks for 1553
 - Two BNC (male) for trigger in/out
 - Two BNC (male) for IRIG in/out
- 4 bi-directional avionics-level dedicated discretes
- On-board diagnostic bus

Multi-function Operational Modes

- Simultaneous BC, 31 RTs and BM

Single-function Operational Modes

- BC or 31 RTs or BM

On-board Shared RAM

- 1 Mbyte per dual-redundant channel

Interface

- A16, A24, A32 addressing
- D16, D32 data transfer
- VXI MODID supported

Optional Configurations

- 1, 2 or 4 dual-redundant channels
- Variable voltage transceivers
- Optional rear panel (P2) I/O
- Optional ruggedized, -40°C to +75°C operating temperature range
- Optional ruggedized, VITA compliant conductive cooling (max +85°C rail temp)
- Optional conformal coating
- Optional TRIG-B Receiver (AM or DC/TTL) and Generator (DC/TTL)

Power (+5 VDC @ 75% 1553 bus duty cycle)

- 2 channels: 1.2A typical
- 4 channels: 1.8A typical

Bus Controller

- Programmable control over:
 - Major and minor frame content and timing
 - Intermessage gap times
 - Response time-out and late response
 - Multiple BC retry
- Modify messages, data or setup while card is running
- Insert aperiodic messages into a running BC list
- "Oneshot" mode for simplified BC operation
- Conditional message sequencing based on real-time message data or status
- Selectable interrupt generation and status messages
 - Full range of system conditions
 - All detectable errors
- Full error detection
 - Invalid word - Late response
 - Bit count error - Early response
 - High word - No response
 - Low word - Incorrect RT address
 - Inverted sync - Parity error
- Extensive programmable error injection (on a per word basis)
- Synchronize BC operation to external time source

Bus Monitor

- Capture 100% fully loaded bus traffic with:
 - Time-tagging - Error status
 - Word status - Message status
 - RT response time
- Interrupts can be selected by RT / SA / WC
- Extensive filtering and triggering options
 - By individual RT/subaddress
 - Transmit, receive or broadcast mode codes
 - Internal or external triggering
 - Trigger output on user specified data
- Real-time bus playback with RT edit mode
- 45-bit, microsecond resolution timetagging
- IRIG/GPS synchronization

Remote Terminal

- Multiple RT simulation (up to 31 RTs)
- Programmable error injection (on a per word basis)
- Modify data, status words or setup while card is running
- Programmable message content (linked message buffers)
- Interrupts can be generated on a per message basis upon End of Message and error conditions
- Hardware RT addressing

Ordering information

RQVME2-1553-1SA	MIL-STD-1553 Single-function, single dual-redundant channel, fixed voltage, 6U VME interface board, RoHS compliant
RQVME2-1553-1M	MIL-STD-1553 Multi-function, single dual-redundant channel, variable voltage, 6U VME interface board, RoHS compliant
RQVME2-1553-2SA	MIL-STD-1553 Single-function, four dual-redundant channels, fixed voltage, 6U VME interface board, RoHS compliant
RQVME2-1553-2M	MIL-STD-1553 Multi-function, two dual-redundant channels, variable voltage, 6U VME interface board, RoHS compliant
RQVME2-1553-4SA	MIL-STD-1553 Single-function, four dual-redundant channels, fixed voltage, 6U VME interface board, RoHS compliant
RQVME2-1553-4M	MIL-STD-1553 Multi-function, four dual-redundant channels, variable voltage, 6U VME interface board, RoHS compliant
-R suffix	Ruggedized, extended temperature, transformer coupled
-C suffix	Conduction cooled, ruggedized, extended temperature, conformal coated, transformer coupled, rear I/O
-K suffix	Conformal coated, transformer coupled
-W suffix	IRIG-B Receiver (AM or DC/TTL) Generator (DC/TTL)

Optional Software

BT-1553	MIL-STD-1553 Bus Analysis & Data Logging software for Windows
LV-1553	Lab/View support for MIL-STD-1553

WE INNOVATE. WE DELIVER. YOU SUCCEED.

Americas: 866-OK-ABACO or +1-866-652-2226

Asia & Oceania: +81-3-5544-3973

Europe, Africa, & Middle East: +44 (0) 1327-359444

Locate an Abaco Systems Sales Representative visit: abaco.com/products/sales

abaco.com  @AbacoSys

©2016 Abaco Systems. All Rights Reserved. All other brands, names or trademarks are property of their respective owners. Specifications are subject to change without notice.





Fig. 1 - Ceramic Fuse 1 A







Fig. 1 - Ceramic Fuse 5 A





Miniature circuit breakers 10kA type NBN, NCN, NDN



NEW

Description

- Protects circuits against over-
- Provides isolation to down-

Technical data

- Conforms to
- ISI marking
- CE marking

- Ratings - 0.5 to 63 A
- No. of poles - 1P, 2P, 3P & 4P
- Tripping curves - B, C & D
- Breaking capacity
- Suitable for isolation as per









Features & benefits

- Positive Contact Isolation

- Ergonomized toggle for com-
- Insulated safety shutter for fin-
- Laser marking to ensure per-
- Front product labeling for dis-
- Energy Limiting Class 3 to

- Direct mounting of wide range

Connection

			B Curve	C Curve	D Curve	
	1P			NCN100N	NDN100N	
				NCN101N	NDN101N	
				NCN102N	NDN102N	
				NCN103N	NDN103N	
				NCN104N	NDN104N	
				NBN106N	NCN106N	NDN106N
				NBN110N	NCN110N	NDN110N
				NBN116N	NCN116N	NDN116N
				NBN120N	NCN120N	NDN120N
				NBN125N	NCN125N	NDN125N
				NBN132N	NCN132N	NDN132N
				NBN140N	NCN140N	NDN140N
				NBN150N	NCN150N	NDN150N
NBN163N	NCN163N	NDN163N				
	2P			NCN200N	NDN200N	
				NCN201N	NDN201N	
				NCN202N	NDN202N	
				NCN203N	NDN203N	
				NCN204N	NDN204N	
				NBN206N	NCN206N	NDN206N
				NBN210N	NCN210N	NDN210N
				NBN216N	NCN216N	NDN216N
				NBN220N	NCN220N	NDN220N
				NBN225N	NCN225N	NDN225N
				NBN232N	NCN232N	NDN232N
				NBN240N	NCN240N	NDN240N
				NBN250N	NCN250N	NDN250N
NBN263N	NCN263N	NDN263N				
	3P			NCN300N	NDN300N	
				NCN301N	NDN301N	
				NCN302N	NDN302N	
				NCN303N	NDN303N	
				NCN304N	NDN304N	
				NBN306N	NCN306N	NDN306N
				NBN310N	NCN310N	NDN310N
				NBN316N	NCN316N	NDN316N
				NBN320N	NCN320N	NDN320N
				NBN325N	NCN325N	NDN325N
				NBN332N	NCN332N	NDN332N
				NBN340N	NCN340N	NDN340N
				NBN350N	NCN350N	NDN350N
NBN363N	NCN363N	NDN363N				
	4P			NCN400N	NDN400N	
				NCN401N	NDN401N	
				NCN402N	NDN402N	
				NCN403N	NDN403N	
				NCN404N	NDN404N	
				NBN406N	NCN406N	NDN406N
				NBN410N	NCN410N	NDN410N
				NBN416N	NCN416N	NDN416N
				NBN420N	NCN420N	NDN420N
				NBN425N	NCN425N	NDN425N
				NBN432N	NCN432N	NDN432N
				NBN440N	NCN440N	NDN440N
				NBN450N	NCN450N	NDN450N
NBN463N	NCN463N	NDN463N				



