

SOLICITATION, OFFER AND AWARD		1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 350)		RATING DO-C9	PAGE OF 1 24 PAGES
2. CONTRACT NO.	3. SOLICITATION NO. N00173-02-R-SE01	4. TYPE OF SOLICITATION <input type="checkbox"/> SEALED BID (IFB) <input checked="" type="checkbox"/> NEGOTIATED (RFP)		5. DATE ISSUED 08 NOV 2001	6. REQUISITION/PURCHASE NO. 71-2001-02
7. ISSUED BY DEPARTMENT OF THE NAVY Naval Research Laboratory-SSC Code 3235, Attn: EJS Stennis Space Center, MS 39529-5004		CODE N68462	8. ADDRESS OFFER TO (If other than Item 7)		

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".

SOLICITATION

9. Sealed offers in original and 3 copies for furnishing the supplies or services in the Schedule will be received at the place specified in Item 8, or if handcarried, in the depository located in Bldg 1100, Stennis Space Center, MS 39529 until 15:30 local time 10 DEC 2001
(Hour) (Date)

CAUTION - LATE Submissions, Modifications, and Withdrawals: See Section L, Provision No. 52.214-7 or 52.215-10. All offers are subject to all terms and conditions contained in this solicitation.

10. FOR INFORMATION CALL:	A. NAME Eric J. Sogard	B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS) 228-688-5980
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OFFER (Must be fully completed by offeror)

NOTE: Item 12 does not apply if the solicitation includes the provisions at 52.214-16, Minimum Bid Acceptance Period.

12. In compliance with the above, the undersigned agrees, if this offer is accepted within _____ calendar days (60 calendar days unless a different period is inserted by the offeror) from the date for receipt of offers specified above, to furnish any or all items upon which prices are offered at the price set opposite each item, delivered at the designated point(s), within the time specified in the schedule.

13. DISCOUNT FOR PROMPT PAYMENT (See Section I, Clause No. 52-232-8)	▶ 10 CALENDAR DAYS	20 CALENDAR DAYS	30 CALENDAR DAYS	CALENDAR DAYS
	%	%	%	%
14. ACKNOWLEDGMENT OF AMENDMENTS (The offeror acknowledges receipt of amendments to the SOLICITATION for offerors and related documents numbered and dated:	AMENDMENT NO.	DATE	AMENDMENT NO.	DATE

15A. NAME AND ADDRESS OF OFFEROR	CODE	FACILITY	16. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)	
15B. TELEPHONE NO. (Include area code)	15C. CHECK IF REMITTANCE ADDRESS IS DIFFERENT FROM ABOVE - ENTER SUCH ADDRESS IN SCHEDULE.		17. SIGNATURE	18. OFFER DATE

AWARD (To be completed by Government)

19. ACCEPTED AS TO ITEMS NUMBERED	20. AMOUNT	21. ACCOUNTING AND APPROPRIATION	
22. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION: <input type="checkbox"/> 10 U.S.C. 2304(c) () <input type="checkbox"/> 41 U.S.C. 253(c) ()		23. SUBMIT INVOICES TO ADDRESS SHOWN IN (4 copies unless otherwise specified) ▶ ITEM	
24. ADMINISTERED BY (If other than Item 7) CODE		25. PAYMENT WILL BE MADE BY CODE	
26. NAME OF CONTRACTING OFFICER (Type or print)		27. UNITED STATES OF AMERICA (Signature of Contracting Officer)	
		28. AWARD DATE	

IMPORTANT - Award will be made on this Form, or on Standard Form 26, or by other authorized official written notice.

**PART I - THE SCHEDULE
SECTION B
SUPPLIES OR SERVICES AND PRICES/COSTS**

B-1 SUPPLIES OR SERVICES AND PRICES/COSTS

ITEM NUMBER	SUPPLIES OR SERVICES	QTY	UNIT	UNIT PRICE	AMOUNT
0001	The Contractor shall provide the following items in accordance with the specifications set forth in Section C and its Attachment 1 and Exhibit A.				
000101	Acoustic Communications and Data Storage Buoy System (ACDS)	4	EA	\$	\$
000102	Shipboard Monitor/Control Station	1	EA	\$	\$
000103	Operation Manual	1	EA	\$	\$
000104	Technical Manual	1	EA	\$	\$
000105	Software	1	SET	\$	\$
000106	Drawings	1	SET	\$	\$
000107	Documentation Form	1	SET	\$	\$
000108	Test Plan	1	EA	\$	\$
0002	The Contractor shall provide the following items in accordance with the specifications set forth in Section C and its Attachment 2 and Exhibit A.				
000201	Acoustic Communications Modem Personal Computers (Modem PC)	4	EA	\$	\$
000202	Operation Manual	1	EA	\$	\$
000203	Technical Manual	1	EA	\$	\$
000204	Software	1	SET	\$	\$
000205	Drawings	1	SET	\$	\$
000206	Documentation Form	1	SET	\$	\$
000207	Test Plan	1	EA	\$	\$

OPTION 1

0003	Acoustic releases in accordance with Attachment 1, paragraph 8.1.	4	EA	\$	\$
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OPTION 2

0004	MCS Industrial PC in accordance with Attachment 1, paragraph 8.2.	1	EA	\$	\$
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OPTION 3

0005	MCS Variable DC Power Supply in accordance with Attachment 1, paragraph 8.3.	1	EA	\$	\$
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OPTION 4

0006	Additional ACDS Systems in accordance with Attachment 1.	4	EA	\$	\$
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OPTION 5

0007	Additional Tether Assemblies in accordance with Attachment 1, paragraph 8.5.	1	EA	\$	\$
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OPTION 6

0008	Additional Modem PC Systems	4	EA	\$	\$
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TOTAL DOLLAR AMOUNT FOR CLINs*, IF EXERCISED: \$

*CONTRACT LINE ITEM NUMBER

**SECTION C
DESCRIPTION/SPECIFICATIONS/STATEMENT OF WORK**

C-1 Items furnished under this contract shall comply with Attachment (1) and Attachment (2) Specifications, with Exhibit A, DD Form 1423, Contracts Data Requirements List, and all other Attachments cited in Section J, which are incorporated by reference into Section C.

**SECTION D
PACKAGING AND MARKING**

D-1 Preservation, packaging, packing and marking of all deliverable contract line items must conform to normal commercial packing standards to assure safe delivery at destination.

D-2 The Contractor shall mark all shipments under this contract in accordance with the edition of ASTM-D-3951-90 "Standard Practice for Commercial Packaging" in effect on the date of the contract.

**SECTION E
INSPECTION AND ACCEPTANCE**

E-1 INSPECTION AND ACCEPTANCE CLAUSES BY REFERENCE:

FAR CLAUSE TITLE

- 52.246-2 - Inspection Of Supplies - Fixed -Price (AUG 1996)
52.246-16 - Responsibility For Supplies (APR 1984)

DFARS CLAUSE TITLE

- 252.246-7000 - Material Inspection And Receiving Report (DEC 1991)

E-2 INSPECTION AND ACCEPTANCE

Inspection and acceptance of the final delivery will be accomplished by the Technical Manager (TM) or Contracting Officer Representative (COR) designated in Section G of this contract. Inspection and acceptance will be performed at the Offeror's manufacturing facility in accordance with the approved acceptance test plan.

**SECTION F
DELIVERIES OR PERFORMANCE**

F-1 DELIVERIES OR PERFORMANCE CLAUSES BY REFERENCE:

FAR CLAUSE TITLE

- 52.211-16 - Variation In Quantity (APR 1984) - The permissible variation shall be limited to: Percent increase (fill in 0)
Percent decrease (fill in 0)
This increase or decrease shall apply to all CLINs.
- 52.211-17 - Delivery Of Excess Quantities (SEP 1989)
52.242-15 - Stop-Work Order (AUG 1989)
52.242-17 - Government Delay Of Work (APR 1984)
52.247-34 - F.O.B. Destination (NOV 1991)

F-2 FAR 52.211-8 - TIME OF DELIVERY (JUN 1997)

(a) The Government requires delivery to be made according to the following schedule:

REQUIRED DELIVERY SCHEDULE		
Item No.	Quantity	Within Months after Contract Award or Exercise of Option(s)
000101	4	7
000102	1	7
000103-07	ALL	7
000108	1	7
000201	4	9
000202-06	ALL	9
000207	1	9
0003-0008	ALL	9

The Government will evaluate equally, as regards time of delivery, offers that propose delivery of each quantity within the applicable delivery period specified above. Offers that propose delivery that will not clearly fall within the applicable required delivery period specified above, will be considered nonresponsive and rejected. The Government reserves the right to award under either the required delivery schedule or the proposed delivery schedule, when an offeror offers an earlier delivery schedule than required above. If the offeror proposes no other delivery schedule, the required delivery schedule above will apply.

OFFEROR'S PROPOSED DELIVERY SCHEDULE		
Item No.	Quantity	Within Days/Months after Contract Award or Exercise of option(s)
000101	4	
000102	1	
000103-07	ALL	
000108	1	
000201	4	
000202-06	ALL	
000207	1	
0003-0008	ALL	

- (b) Attention is directed to the Contract Award provision of the solicitation that provides that a written award or acceptance of offer mailed, or otherwise furnished to the successful offeror, results in a binding contract. The Government will mail or otherwise furnish to the offeror an award or notice of award not later than the day award is dated. Therefore, the offeror should compute the time available for performance beginning with the actual date of award, rather than the date the written notice of award is received from the Contracting Officer through the ordinary mails. However, the Government will evaluate an offer that proposes delivery based on the Contractor's date of receipt of the contract or notice of award by adding (i) five calendar days for delivery of the award through the ordinary mails or (ii) one working day if the solicitation states that the contract or notice of award will be transmitted electronically. (The term "working day" excludes weekends and U.S. Federal holidays.) If, as so computed, the offered delivery date is later than the required delivery date, the offer will be considered nonresponsive and rejected.

F-3 PLACE OF DELIVERY - FOB DESTINATION

The contractor shall deliver supplies, all transportation charges paid, to destination in accordance with the clause in Section F of the Schedule titled FAR 52.247-34 FOB Destination (NOV 1991).

Receiving Officer

Naval Research Laboratory

Contract Number: *

ATTN: *

CODE: *

LOCATION: *

Bldg. *

4555 Overlook Avenue, SW

Washington DC 20375-5320

(* To be filled in at time of award.)

SECTION G
CONTRACT ADMINISTRATION DATA

G-1 PROCURING OFFICE REPRESENTATIVE

In order to expedite administration of the contract, the Administrative Contracting Officer (ACO) will direct inquiries to the appropriate office listed below. Please do not direct routine inquiries to the person listed in Item 20A on Standard Form 26.

Contract Matters- *

Security Matters- *

Safety Matters- *

Patent Matters- *

Release of Data- *

The ACO will forward invention disclosures and reports directly to the Associate Counsel for Patents, Code 1008.2, Naval Research Laboratory, Washington DC 20375-5320. The Associate Counsel for Patents will return the reports along with a recommendation to the Administrative Contracting Officer. The Associate Counsel for Patents will represent the Contracting Officer with regard to invention reporting matters arising under this contract.

(* To be filled in at time of award)

The ACO will forward invention disclosures and reports directly to the Associate Counsel for Patents, Code 1008.2, Naval Research Laboratory, Washington DC 20375-5320. The Associate Counsel for Patents will return the reports along with a recommendation to the Administrative Contracting Officer. The Associate Counsel for Patents will represent the Contracting Officer with regard to invention reporting matters arising under this contract.

G-2 TECHNICAL MANAGER - FUNCTIONS AND LIMITATIONS

* is hereby designated the cognizant Technical Manager who will represent the Contracting Officer in the administration of technical details within the scope of this contract and inspection and acceptance. The Technical Manager is not otherwise authorized to make any representations or commitments of any kind on behalf of the Contracting Officer or the Government. The Technical Manager does not have the authority to alter the Contractor's obligations or change the specifications in the contract. If, as a result of technical discussions, it is desirable to alter contract obligations or statements of work, a modification must be issued in writing and signed by the Contracting Officer. The Technical Manager, after review and signature of the "Material Inspection and Receiving Report, DD Form 250, If applicable, will forward a copy to the Administrative Contracting Officer.

(* To be filled in at time of award)

G-3 NAPS 5252.232-9000 - SUBMISSION OF INVOICES (FIXED PRICE) (JUL 1992)

- (a) "Invoices" as used in this clause does not include contractor's requests for progress payments.
- (b) The contractor shall submit original invoices with 4 copies to the address identified in the solicitation/contract award form (SF 26-Block 10; SF 33-Block 23; SF 1447-Block 14), unless delivery orders are applicable, in which case invoices will be segregated by individual order and submitted to the address specified in the order (DD 1155-Block 13 or SF 26-Block 10).
- (c) The use of copies of the Material Inspection and Receiving Report (MIRR), DD Form 250, as an invoice is encouraged. DFARS Appendix F-306 provides instructions for such use. Copies of the MIRR used as an invoice are in addition to the standard distribution stated in DFARS F-401.
- (d) In addition to the requirements of the Prompt Payment clause of this contract, the contractor shall cite on each invoice the contract line item number (CLIN); the contract subline item number (SLIN), if applicable; the accounting classification reference number (ACRN) as identified on the financial accounting data sheets, and the payment terms.
- (e) The contractor shall prepare:
 - a separate invoice for each activity designated to receive the supplies or services.
 - a consolidated invoice covering all shipments delivered under an individual order.
 - either of the above.
- (f) If acceptance is at origin, the contractor shall submit the MIRR or other acceptance verification directly to the designated payment office. If acceptance is at destination, the consignee will forward acceptance verification to the designated payment office.

G-4 INVOICING ADDRESS

With reference to paragraph (b) of the above provision, "Submission of Invoices(Fixed Price)", the contractor shall submit invoices or requests for progress payments the cognizant ACO at the address in Block 12 of the contract award form (SF26).

**SECTION H
SPECIAL CONTRACT REQUIREMENTS**

H-1 TYPE OF CONTRACT

(To be filled in at time of award)

H-2 REPRESENTATIONS AND CERTIFICATIONS

The Contractor's completed Representations, Certifications, and Other Statements of Offerors or Respondents is incorporated herein by reference in any resultant award.

H-3 OPTION(S)

The Government may require delivery of the optional items under this contract by the Contracting Officer's giving written notice anytime from date of contract award through 2 years.

H-4 ELECTRONIC AND INFORMATION TECHNOLOGY (EIT)

In accordance with Section 508 of the Rehabilitation Act of 1973 (29 U.S.C. 794d), all EIT supplies and services provided under this contract must comply with the applicable accessibility standards issued by the Architectural and Transportation Barriers Compliance Board at 36 CFR part 1194 (see FAR Subpart 39.2). Electronic and information technology (EIT) is defined at FAR 2.101.

H-5 SUBCONTRACTING PLAN

The contractor's Comprehensive Small Business Subcontracting Plan is incorporated into this contract in accordance with DFARS SUBPART 219.7 *Test Program for Negotiation of Comprehensive Small Business Subcontracting Plans*.

PART II - CONTRACT CLAUSES
SECTION I
CONTRACT CLAUSES

I-1 52.252-2 - CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available.

Also, the full text of a clause may be accessed electronically at this/these address(es):

<http://www.arnet.gov/far>

<http://heron.nrl.navy.mil/contracts/home.htm>

a. FEDERAL ACQUISITION REGULATION CLAUSES

FAR CLAUSE TITLE

- | | | |
|-----------|---|--|
| 52.202-1 | - | Definitions (MAY 2001) |
| 52.203-3 | - | Gratuities (APR 1984) |
| 52.203-5 | - | Covenant Against Contingent Fees (APR 1984) |
| 52.203-6 | - | Restrictions On Subcontractor Sales To The Government (JUL 1995) |
| 52.203-7 | - | Anti-Kickback Procedures (JUL 1995) |
| 52.203-8 | - | Cancellation, Rescission, And Recovery Of Funds For Illegal Or Improper Activity (JAN 1997) |
| 52.203-10 | - | Price Or Fee Adjustment For Illegal Or Improper Activity (JAN 1997) |
| 52.203-12 | - | Limitation On Payments To Influence Certain Federal Transactions (JUN 1997) |
| 52.204-4 | - | Printed Or Copied Double-Sided On Recycled Paper (AUG 2000) |
| 52.209-6 | - | Protecting The Government's Interest When Subcontracting With Contractors Debarred, Suspended, Or Proposed For Debarment (JUL 1995) |
| 52.211-5 | - | Material Requirements (AUG 2000) |
| 52.211-6 | - | Brand Name Or Equal (AUG 1999) |
| 52.211-15 | - | Defense Priority And Allocation Requirements (SEP 1990) |
| 52.215-2 | - | Audit And Records-Negotiation (JUNE 1999) |
| 52.215-8 | - | Order Of Precedence - Uniform Contract Format (OCT 1997) |
| 52.215-10 | - | Price Reduction For Defective Cost Or Pricing Data (OCT 1997) |
| 52.215-11 | - | Price Reduction For Defective Cost Or Pricing Data - Modifications (OCT 1997) |
| 52.215-12 | - | Subcontractor Cost Or Pricing Data (OCT 1997) |
| 52.215-13 | - | Subcontractor Cost Or Pricing Data Modifications (OCT 1997) |
| 52.215-14 | - | Integrity Of Unit Prices (OCT 1997) |
| 52.215-15 | - | Pension Adjustments And Asset Reversions (DEC 1998) |
| 52.215-17 | - | Waiver Of Facilities Capital Cost Of Money(OCT 1997) (<i>will be included if the successful offeror does not propose facilities capital cost of money</i>) |
| 52.215-21 | - | Requirements For Cost Or Pricing Data Or Information Other Than Cost Or Pricing Data - Modifications (OCT 1997) |
| 52.217-4 | - | Evaluation of Options Exercised at Time of Award (JUN 1988) |
| 52.217-7 | - | Option For Increased Quantity –Separately Priced Line Item (MAR 1989) |

- 52.219-4 - Notice Of Price Evaluation Preference For HUBZone Small Business Concerns (JAN 1999)
 Offeror elects to waive the evaluation preference.
- 52.219-8 - Utilization Of Small Business Concerns (OCT 2000)
- 52.219-9 - Small Business Subcontracting Plan (OCT 2000) Alternate II (OCT 2000)
- 52.219-16 - Liquidated Damages - Subcontracting Plan (JAN 1999)
- 52.219-25 - Small Disadvantaged Business Participation Program-Disadvantaged Status And Reporting (OCT 1999)
- 52.222-3 - Convict Labor (AUG 1996)
- 52.222-19 - Child Labor – Cooperation With Authorities And Remedies (FEB 2001)
- 52.222-20 - Walsh-Healey Public Contracts Act (DEC 1996)
- 52.222-21 - Prohibition of Segregated Facilities (FEB 1999)
- 52.222-26 - Equal Opportunity (FEB 1999)
- 52.222-35 - Affirmative Action For Disabled Veterans And Veterans Of The Vietnam Era (APR 1998)
- 52.222-36 - Affirmative Action For Workers With Disabilities (JUN 1998)
- 52.222-37 - Employment Reports On Disabled Veterans And Veterans Of The Vietnam Era (JAN 1999)
- 52.223-6 - Drug-Free Workplace (MAY 2001)
- 52.223-14 - Toxic Chemical Release Reporting (OCT 2000)
- 52.225-8 - Duty-Free Entry (FEB 2000)
- 52.225-13 - Restrictions On Certain Foreign Purchases (JUL 2000)
- 52.227-1 - Authorization And Consent (JUL 1995)
- 52.227-2 - Notice And Assistance Regarding Patent And Copyright Infringement (AUG 1996)
- 52.227-3 - Patent Indemnity (APR 1984)
- 52.227-11 - Patent Rights - Retention By The Contractor (Short Form) (JUN 1997) *(will be included if the successful offeror is a small business or a non-profit organization)*
- 52.227-12 - Patent Rights - Retention By The Contractor (Long Form) (JAN 1997) *(will be included if the successful offeror is not a small business or a non-profit organization)*
- 52.229-3 - Federal, State, And Local Taxes (JAN 1991)
- 52.229-5 - Taxes - Contracts Performed In U.S. Possessions Or Puerto Rico (APR 1984)
- 52.230-2 - Cost Accounting Standards (APR 1998)
- 52.230-3 - Disclosure And Consistency Of Cost Accounting Practices (APR 1998)
- 52.230-6 - Administration Of Cost Accounting Standards (NOV 1999)
- 52.232-1 - Payments (APR 1984)
- 52.232-8 - Discounts For Prompt Payment (MAY 1997)
- 52.232-9 - Limitation On Withholding Of Payments (APR 1984)
- 52.232-11 - Extras (APR 1984)
- 52.232-16 - Progress Payments (MAR 2000)
- 52.232-16 - Progress Payments (MAR 2000) Alternate I (MAR 2000)
- 52.232-17 - Interest (JUN 1996)
- 52.232-23 - Assignment Of Claims (JAN 1986)
- 52.232-25 - Prompt Payment (MAY 2001)
- 52.232-33 - Payment By Electronic Funds Transfer-Central Contractor Registration (MAY 1999)
- 52.233-1 - Disputes (DEC 1998)
- 52.233-3 - Protest After Award (AUG 1996)
- 52.239-1 - Privacy Or Security Safeguards (AUG 1996)
- 52.242-13 - Bankruptcy (JUL 1995)
- 52.243-1 - Changes - Fixed Price (AUG 1987)

- 52.243-6 - Change Order Accounting (APR 1984)
- 52.244-5 - Competition In Subcontracting (DEC 1996)
- 52.245-1 - Property Records (APR 1984)
- 52.245-2 - Government Property (Fixed-Price Contracts) (DEC 1989)
- 52.245-4 - Government-Furnished Property (Short Form) (APR 1984)
- 52.245-9 - Use And Charges (APR 1984)(DEVIATION)
- 52.245-18 - Special Test Equipment (FEB 1993)
- 52.245-19 - Government Property Furnished "As Is" (APR 1984)
- 52.246-23 - Limitation Of Liability (FEB 1997)
- 52.247-64 - Preference For Privately Owned U.S. Flag Commercial Vessels (JUN 2000)
- 52.248-1 - Value Engineering (FEB 2000)
- 52.249-2 - Termination For Convenience Of The Government (Fixed Price) (SEP 1996)
- 52.249-8 - Default (Fixed-Price Supply And Service) (APR 1984)
- 52.251-1 - Government Supply Sources (APR 1984)
- 52.252-6 - Authorized Deviations In Clauses (APR 1984) fill in Defense Federal Acquisition Regulation Supplement (48 CFR Chapter 2);
- 52.253-1 - Computer Generated Forms (JAN 1991)

DFARS CLAUSE TITLE

- 252.201-7000 - Contracting Officer's Representative (DEC 1991)
- 252.203-7001 - Prohibition On Persons Convicted Of Fraud Or Other Defense Contract Related Felonies (MAR 1999)
- 252.204-7000 - Disclosure Of Information (DEC 1991)
- 252.204-7002 - Payment For Subline Items Not Separately Priced (DEC 1991)
- 252.204-7003 - Control Of Government Personnel Work Product (APR 1992)
- 252.204-7004 - Required Central Contractor Registration (MAR 2000)
- 252.205-7000 - Provision Of Information To Cooperative Agreement Holders (DEC 1991)
- 252.209-7000 - Acquisition From Subcontractors Subject To On-Site Inspection Under The Intermediate-Range Nuclear Forces (INF) Treaty (NOV 1995)
- 252.209-7004 - Subcontracting With Firms That Are Owned Or Controlled By The Government Of A Terrorist Country (MAR 1998)
- 252.209-7005 - Reserve Officer Training Corps and Military Recruiting On Campus (JAN 2000)
- 252.215-7000 - Pricing Adjustments (DEC 1991)
- 252.215-7002 - Cost Estimating System Requirements (OCT 1998)
- 252.219-7003 - Small, Small Disadvantaged And Women-Owned Small Business Subcontracting Plan (DoD Contracts) (APR 1996)
- 252.219-7004 - Small, Small Disadvantaged And Women-Owned Small Business Subcontracting Plan (Test Program) (JUN 1997)
- 252.223-7001 - Hazard Warning Labels (DEC 1991)
- 252.223-7004 - Drug-Free Work Force (SEP 1988)
- 252.223-7006 - Prohibition On Storage And Disposal Of Toxic And Hazardous Materials (APR 1993)
- 252.225-7001 - Buy American Act And Balance Of Payments Program (MAR 1998)
- 252.225-7002 - Qualifying Country Sources As Subcontractors (DEC 1991)
- 252.225-7007 - Buy American Act--Trade Agreements—Balance Of Payments Program (SEP 2001)
- 252.225-7009 - Duty-Free Entry - Qualifying Country Supplies (End Products And Components) (AUG

- 2000)
- 252.225-7010 - Duty-Free Entry - Additional Provisions (AUG 2000)
 - 252.225-7012 - Preference For Certain Domestic Commodities (AUG 2000)
 - 252.225-7021 - Trade Agreements (SEP 2001)
 - 252.225-7025 - Restriction On Acquisition Of Forgings (JUN 1997)
 - 252.225-7031 - Secondary Arab Boycott Of Israel (JUN 1992)
 - 252.227-7000 - Non-Estoppel (OCT 1966)
 - 252.227-7001 - Release Of Past Infringement (AUG 1984)
 - 252.227-7013 - Rights In Technical Data--Noncommercial Items (NOV 1995)
 - 252.227-7014 - Rights In Noncommercial Computer Software And Noncommercial Computer Software Documentation (JUN 1995)
 - 252.227-7016 - Rights In Bid or Proposal Information (JUN 1995)
 - 252.227-7019 - Validation Of Asserted Restrictions--Computer Software (JUN 1995)
 - 252.227-7025 - Limitations On The Use Or Disclosure Of Government-Furnished Information Marked With Restrictive Legends (JUN 1995)
 - 252.227-7026 - Deferred Delivery Of Technical Data Or Computer Software (APR 1988)
 - 252.227-7027 - Deferred Ordering Of Technical Data Or Computer Software (APR 1988)
 - 252.227-7030 - Technical Data--Withholding Of Payment (MAR 2000)
 - 252.227-7034 - Patents--Subcontracts (APR 1984)
 - 252.227-7036 - Certification Of Technical Data Conformity (JAN 1997)
 - 252.227-7037 - Validation Of Restrictive Markings On Technical Data (SEP 1999)
 - 252.227-7039 - Patents--Reporting of Subject Inventions (APR 1990)
 - 252.231-7000 - Supplemental Cost Principles (DEC 1991)
 - 252.232-7004 - DoD Progress Payment Rates (OCT 2001)
 - 252.242-7000 - Postaward Conference (DEC 1991)
 - 252.242-7004 - Material Management And Accounting System (DEC 2000)
 - 252.243-7001 - Pricing Of Contract Modifications (DEC 1991)
 - 252.243-7002 - Requests For Equitable Adjustment (MAR 1998)
 - 252.244-7000 - Subcontracts For Commercial Items And Commercial Components (DOD Contracts) (MAR 2000)
 - 252.245-7001 - Reports Of Government Property (MAY 1994)
 - 252.247-7023 - Transportation Of Supplies By Sea (MAR 2000)
 - 252.247-7024 - Notification Of Transportation Of Supplies By Sea (MAR 2000) *(will be included if the successful offeror made a negative response to the inquiry at DFARS 252.247-7022)*
 - 252.251-7000 - Ordering From Government Supply Sources (MAY 1995)

I-2 FAR 52.223-11 - OZONE-DEPLETING SUBSTANCES (MAR 2001)

(a) *Definitions.* "Ozone-depleting substance", as used in this clause, means any substance the Environmental Protection Agency designates in 40 CFR Part 82 as –

- (1) Class I, including, but not limited to, chlorofluorocarbons, halons, carbon tetrachloride, and methyl chloroform; or
- (2) Class II, including, but not limited to, hydrochlorofluorocarbons.

(b) The Contractor shall label products which contain or are manufactured with ozone-depleting substances in the manner and to the extent required by 42 U.S.C. 7671j (b), (c), and (d) and 40 CFR Part 82, Subpart E, as follows:

WARNING

Contains (or manufactured with, if applicable) _____*, a substance(s) which harm(s) public health and environment by destroying ozone in the upper atmosphere.

*The Contractor shall insert the name of the substance(s).

I-3 DFARS 252.225-7008 - SUPPLIES TO BE ACCORDED DUTY-FREE ENTRY (MAR 1998)

In accordance with paragraph (b) of the Duty-Free Entry clause of this contract, in addition to duty-free entry for all qualifying country supplies (end products and components) and all eligible end products subject to applicable trade agreements (if this contract contains the Buy American Act - Trade Agreements - Balance of Payments Program clause or the Buy American Act - North American Free Trade Agreement Implementation Act - Balance of Payments Program clause), the following foreign end products that are neither qualifying country end products nor eligible end products under a trade agreement, and the following nonqualifying country components, are accorded duty free entry.

PART III - LIST OF DOCUMENTS, EXHIBITS, AND OTHER ATTACHMENTS
SECTION J
LIST OF ATTACHMENTS

- J-1** Attachment (1) - Specifications - 29 Pages.
- J-2** Attachment (2) - Specifications - 10 Pages.
- J-3** Exhibit A - DD Form 1423, Contract Data Requirements - 2 Pages applicable to both Attachment (1) and Attachment (2).
- J-4** Attachment (3) - Accounting and Appropriation Data. 1 page. *

(To be included at time of award)*

**PART IV - REPRESENTATIONS AND INSTRUCTIONS
SECTION K
REPRESENTATIONS, CERTIFICATIONS
AND OTHER STATEMENTS OF OFFERORS OR RESPONDENTS**

K-1 Representations, Certifications, and Other Statements of Offerors or Respondents

Each Offeror must submit a completed Representations, Certifications, and Other Statements Of Offerors or Respondents with its proposal which is available electronically in full text at

<http://heron.nrl.navy.mil/contracts/rep&certs.htm>

K-2 FILL IN FOR FAR 52.219-1 - SMALL BUSINESS PROGRAM REPRESENTATIONS (MAR 2001)

The fill in information is as follows:

The NAICS code for this acquisition is 334513.

The small business size standard is 500 employees.

SECTION L
INSTRUCTIONS, CONDITIONS, AND NOTICES TO OFFERORS OR RESPONDENTS

L-1 52.252-1 SOLICITATION PROVISIONS INCORPORATED BY REFERENCE (FEB 1998)

This solicitation incorporates one or more solicitation provisions by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. The offeror is cautioned that the listed provisions may include blocks that must be completed by the offeror and submitted with its quotation or offer. In lieu of submitting the full text of those provisions, the offeror may identify the provision by paragraph identifier and provide the appropriate information with its quotation or offer. Also, the full text of a solicitation provision may be accessed electronically at this/these address(es):

<http://www.arnet.gov/far>

<http://heron.nrl.navy.mil/contracts/home.htm>

FAR CLAUSE TITLE

52.204-6	-	Data Universal Numbering System (DUNS) Number (JUNE 1999)
52.211-2	-	Availability Of Specifications Listed In The DOD Index Of Specifications And Standards (DODISS) And Descriptions Listed In The Acquisition Management Systems And Data Requirements Control List, DOD 5010.12-L (DEC 1999)
52.214-34	-	Submission Of Offers In The English Language (APR 1991)
52.214-35	-	Submission Of Offers In U.S. Currency (APR 1991)
52.215-1	-	Instructions To Offerors- Competitive Acquisition (Mar 2001)
52.215-5	-	Facsimile Proposals (OCT 1997)
52.215-16	-	Facilities Capital Cost Of Money (OCT 1997)
52.219-24	-	Small Disadvantaged Business Participation Program - Targets (OCT 2000)
52.232-13	-	Notice Of Progress Payments (APR 1984)

L-2 FAR 52.211-14 - NOTICE OF PRIORITY RATING FOR NATIONAL DEFENSE USE (SEP 1990)

Any contract awarded as a result of this solicitation will be a DX rated order; DO rated order certified for national use under the Defense Priorities and Allocations system (DPAS) (15 CFR 700), and the Contractor will be required to follow all of the requirements of this regulation.

L-3 FAR 52.215-20 REQUIREMENTS FOR COST OR PRICING DATA OR INFORMATION OTHER THAN COST OR PRICING DATA (OCT 1997)ALTERNATE IV (OCT 1997)

- (a) Submission of cost or pricing data is not required.
- (b) Provide information described below: Offerors should provide information to enable the Contracting Officer to determine that the proposed price is fair and reasonable. Such information could include published price lists, information on previous sales of the same or similar items, or the projected costs of fabricating and installing the item (material costs, labor costs, etc).

L-4 FAR 52.216-1 - TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a Firm Fixed Price Supply contract resulting from this solicitation.

L-5 FAR 52.233-2 - SERVICE OF PROTEST (AUG 1996)

(a) Protests, as defined in Section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO) shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from the Control Desk, Code 3200, Bldg. 222, Rm. 115, Naval Research Laboratory, 4555 Overlook Ave., S.W., Washington DC 20375-5326.

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

L-6 DFARS 252.227-7017 - IDENTIFICATION AND ASSERTION OF USE, RELEASE, OR DISCLOSURE RESTRICTIONS (JUN 1995)

- (a) The terms used in this provision are defined in following clause or clauses contained in this solicitation--
- (1) If a successful offeror will be required to deliver technical data, the Rights in Technical Data-- Noncommercial Items clause, or, if this solicitation contemplates a contract under the Small Business Innovative Research Program, the Rights in Noncommercial Technical Data and Computer Software--Small Business Innovative Research (SBIR) Program clause.
 - (2) If a successful offeror will not be required to deliver technical data, the Rights in Noncommercial Computer Software and Noncommercial Computer Software Documentation clause, or, if this solicitation contemplates a contract under the Small Business Innovative Research Program, the Rights in Noncommercial Technical Data and Computer Software--Small Business Innovative Research (SBIR) Program clause.
- (b) The identification and assertion requirements in this provision apply only to technical data, including computer software documents, or computer software to be delivered with other than unlimited rights. For contracts to be awarded under the Small Business Innovative Research Program, the notification requirements do not apply to technical data or computer software that will be generated under the resulting contract. Notification and identification is not required for restrictions based solely on copyright.
- (c) Offers submitted in response to this solicitation shall identify, to the extent known at the time an offer is submitted to the Government, the technical data or computer software that the Offeror, its subcontractors or suppliers, or potential subcontractors or suppliers, assert should be furnished to the Government with restrictions on use, release, or disclosure.
- (d) The Offeror's assertions, including the assertions of its subcontractors or suppliers or potential subcontractors or suppliers shall be submitted as an attachment to its offer in the following format, dated and signed by an official authorized to contractually obligate the Offeror:
Identification and Assertion of Restrictions on the Government's Use, Release, or Disclosure of Technical Data or Computer Software.
The Offeror asserts for itself, or the persons identified below, that the Government's rights to use, release, or disclose the following technical data or computer software should be restricted:

Technical Data or Computer Software to be Furnished With Restrictions*	Basis for Assertion**	Asserted Rights Category***	Name of Person Asserting Restrictions****
(LIST)*****.	(LIST)	(LIST)	(LIST)

* For technical data (other than computer software documentation) pertaining to items, components, or processes developed at private expense, identify both the deliverable technical data and each such items, component, or process. For computer software or computer software documentation identify the software or documentation.

** Generally, development at private expense, either exclusively or partially, is the only basis for asserting restrictions. For technical data, other than computer software documentation, development refers to development of the item, component, or process to which the data pertain. The Government's rights in computer software documentation generally may not be restricted. For computer software, development refers to the software. Indicate whether development was accomplished exclusively or partially at private expense. If development was not accomplished at private expense, or for computer software documentation, enter the specific basis for asserting restrictions.

*** Enter asserted rights category (e.g., government purpose license rights from a prior contract, rights in SBIR data generated under another contract, limited, restricted, or government purpose rights under this or a prior contract, or specially negotiated licenses).

**** Corporation, individual, or other person, as appropriate.

***** Enter "none" when all data or software will be submitted without restrictions.

Date _____
 Printed Name and Title _____

Signature _____

(End of identification and assertion)

- (e) An offeror's failure to submit, complete, or sign the notification and identification required by paragraph (d) of this provision with its offer may render the offer ineligible for award.
- (f) If the Offeror is awarded a contract, the assertions identified in paragraph (d) of this provision shall be listed in an attachment to that contract. Upon request by the Contracting Officer, the Offeror shall provide sufficient information to enable the Contracting Officer to evaluate any listed assertion.

L-7 DFARS 252.227-7028 - TECHNICAL DATA OR COMPUTER SOFTWARE PREVIOUSLY DELIVERED TO THE GOVERNMENT (JUN 1995)

The Offeror shall attach to its offer an identification of all documents or other media incorporating technical data or computer software it intends to deliver under this contract with other than unlimited rights that are identical or substantially similar to documents or other media that the Offeror has produced for, delivered to, or is obligated to deliver to the Government under any contract or subcontract. The attachment shall identify - -

- (a) The contract number under which the data or software were produced;
- (b) The contract number under which, and the name and address of the organization to whom, the data or software were most recently delivered or will be delivered; and
- (c) Any limitations on the Government's rights to use or disclose the data or software, including, when applicable, identification of the earliest date the limitations expire.

L-8 INQUIRIES CONCERNING THE RFP

Any questions concerning the RFP must be submitted in writing to the Contracting Officer at the location noted in blocks 7 and 9 of the Standard Form 33, "Solicitation, Offer and Award," no less than fifteen (15) days before closing. The Government will not consider questions received after this date. Offerors are cautioned against directing any questions concerning this RFP to technical personnel at the Naval Research Laboratory.

L-9 INSTRUCTIONS FOR SUBMISSION AND INFORMATION REQUIRED TO EVALUATE PROPOSALS

(1) Information for the technical/management proposal shall be placed in Volume I and be completely separate from the business proposal (Volume II).

(2) Proposal Identification/Mailing - The proposal should be packaged for delivery so as to permit safe and timely arrival at destination. The proposal package should be sent to the address shown in Block 7 of the RFP face page and marked:

Solicitation No. N00173-02-R-SE01

Closing Date: (As specified in Block 9, RFP face page)

Attn: Code 3235

(3) Proposal Format and Length - No attempt is made to restrict the proposal format and style. However, the proposal should be written and organized so as to be compatible with the RFP. Offerors are encouraged to use recycled paper and maximize the use of double sided copying when preparing responses to solicitations.

L-10 VOLUME I - TECHNICAL/MANAGEMENT PROPOSAL

REQUIRED COPIES: 1 ORIGINAL AND 3 COPIES.

(1) The technical proposal must demonstrate an understanding of all requirements covered in the RFP's terms and conditions. The proposal must be sufficiently detailed and complete to demonstrate an understanding of and an ability to comply with the requirements of the RFP's Specifications identified in Section C. General statements that the offeror can or will comply with the requirements, that standard procedures will be used, that well known techniques will be used, or paraphrases of the RFP's Specification in whole or in part will not constitute compliance with these requirements concerning the content of the technical proposal. Failure to conform to any of the requirements of the RFP may form the basis for rejection of the proposal. Offerors may provide technical proposal(s) pursuant to CLIN 0001, 0002 or both.

(2) The following information is required:

- (a) The offeror shall provide product literature or detailed technical narrative demonstrating the capability of the system or product offered meets the government's minimum needs as detailed in Attachment (1) and/or Attachment (2).
- (b) The offeror shall provide a sample Test and Training Plan, or narrative demonstrating their approach in providing quality assurance and training as required in Attachment (1), Section 7 and/or Attachment (2), Section 6.
- (c) The offeror shall provide sample documentation or narrative demonstrating their approach in providing documentation in the form of operation and technical manuals, drawings and documentation form as detailed in Technical Performance Specifications, Attachment (1) and (2).

PAST PERFORMANCE INFORMATION

(a) Offerors shall submit the following information as part of their proposal. (Offerors are encouraged to submit the information prior to other parts of the proposal to assist the government in reducing the length of the evaluation period.) List the last 5 contracts or subcontracts completed by the offeror or predecessor companies during the past 3 years for items similar in nature to this requirement. Include in the 5 any current contracts or subcontracts for similar items that were awarded at least one year prior to the date of this solicitation. Offerors that have no similar previous or current contracts should provide the requested information for proposed subcontractors that included major or critical aspects of the requirement.

1. Name of contracting organization.
2. Contract number
3. Contract type
4. Total contract value
5. Description of the contract work
6. Contracting officer and telephone number
7. Contracting officer's representative, program manager, or similar official and telephone number

(b) Offerors shall contact the contracting organizations identified pursuant to paragraph (a) as soon as possible and request them to send past performance information on the identified contracts to the address in Block 7 of the face page of this solicitation. The past performance report which is available electronically in full text at <http://heron.nrl.navy.mil/contracts/home.htm> is to be provided to the contracting organization for this purpose. If the contracting organization has already collected past performance information on the contract pursuant to FAR Subpart 42.15, the format used to collect the information may be used instead of the past performance report.

(c) Offerors may include in their proposals specific information relating to problems encountered in performing the identified contracts and any corrective actions by the offeror. Offerors should not provide general information on their performance on the identified contracts, as this will be obtained from the contracting organizations.

L-11 VOLUME II - BUSINESS PROPOSAL

REQUIRED COPIES: 1 ORIGINAL AND 3 COPIES

(1) PRICE PROPOSAL

The offeror shall submit a business proposal that includes a price proposal with supporting information. The supporting information shall be copies of list or catalog pricing offered to the general public or a detailed breakdown including such elements as materials, direct labor, indirect cost, and other costs such as travel. The offeror shall provide exhibits as necessary to substantiate the price.

(2) SMALL BUSINESS PARTICIPATION

(a) In addition to complying with the clause at FAR 52.219-9, Small Business Subcontracting Plan (Jan 1999) with its Alternate II, proposals must include information to permit evaluation of the extent of participation of small businesses and historical black colleges or universities and minority institutions in performance of the contract. Participation to be identified may be in the form of a joint venture, teaming arrangement, or subcontract. Small business concerns that are not required by FAR 52.219-9 to submit a subcontracting plan must indicate the extent to which proposed joint ventures, teaming arrangements, or subcontracts are with historically black colleges or universities and minority institutions. Information provided should include the extent of participation of such firms in terms of the value of the total acquisition and the complexity and variety of the work such firms are to perform.

L-12 MULTIPLE AWARDS

The Government may make multiple awards resulting from this solicitation.

SECTION M EVALUATION FACTORS FOR AWARD

M-1 EVALUATION

Award will be made to that offeror whose proposal is determined to be the best value to the Government, proposed price and other factors considered. The Government reserves the right to make award to other than the low offeror.

M-2 EVALUATION FACTORS FOR AWARD

Proposals will be evaluated in accordance with the following criteria. The criteria are grouped into two major categories: Technical and Price. The major category, technical, when all factors are combined, is of greater importance than price. Technical proposals will be evaluated in accordance with the criteria stated in Section L.9 and L10. Within the category of technical, evaluation will be completed separately for CLIN 0001 and CLIN 0002. The technical factors are weighted in descending order of importance as listed in Section M.3 and M.4. Areas within the Offeror's technical proposal that are found to offer unique or innovative designs that provide for performance beyond the Government's minimum requirements as stated in Attachments (1) and (2) will receive scores reflecting a rating above acceptable or neutral.

M-3. CLIN 0001 - WEIGHTED TECHNICAL EVALUATION FACTORS

This portion of the evaluation will consider the offeror's, understanding of and demonstrated capability to adequately meet or exceed the requirements listed in Section C. The Evaluation factors to be considered are weighted in descending order of importance. The reference to corresponding Attachment paragraphs is listed in parenthesis and includes the sub paragraphs under each:

M-3-1. TECHNICAL COMPLIANCE - CLIN 0001 and Attachment (1)

- (1) Subsurface Unit (4.3)
- (2) Shipboard Monitor/Control Station (4.7)
- (3) Surface Unit (4.2)
- (4) Hydrophone Arrays (4.4)
- (5) System Specifications
 - Power Amplifier (4.5)
 - Documentation (6.0)
- (6) Acoustic Projectors (4.6)
- (7) Test Plan (7.0)
 - Options (8.0)

M-3-2. PAST PERFORMANCE – CLIN 0001

M-4. CLIN 0002 - WEIGHTED TECHNICAL EVALUATION FACTORS

This portion of the evaluation will consider the offeror's, understanding of and demonstrated capability to adequately meet or exceed the requirements listed in Section C. The Evaluation factors to be considered are weighted in descending order of importance. The reference to corresponding Attachment paragraphs is listed in parenthesis and includes the sub paragraphs under each:

M-4-1. TECHNICAL COMPLIANCE - CLIN 0002 and Attachment (2)

- (1) Modem PC Software (3.1.)
- (2) PC 104+ Personal Computer Modules (3.4)
- (3) Environmental Requirements (3.2)
External Connections (3.3)
Integration of ACOMMS Modem PC104+ (4.0)
Documentation (5.0)
Test Plan (6.0)
- (4) Digitized Data Storage Format (3.5)
Digitized Acoustic Data Timing Function (3.6)
- (5) Options (7.0)

M-4-2. PAST PERFORMANCE -- CLIN 0002

M-5. PRICE TO THE GOVERNMENT

Proposed estimated price to the Government.

M-6. SMALL BUSINESS PARTICIPATION

- (a) The extent of participation of small businesses and historically black colleges or universities and minority institutions in performance of the contract will be evaluated on the basis of the proposed extent of participation of such firms in terms of the value of the total acquisition and the complexity and variety of the work such firms are to perform.

M-7. FAR 52.217-5 - EVALUATION OF OPTIONS (JUL 1990)

Except when it is determined in accordance with FAR 17.206(b) not to be in the Government's best interests, the Government will evaluate offers for award purposes by adding the total price for all options to the total price for the basic requirement. Evaluation of options will not obligate the Government to exercise the option(s).

TECHNICAL PERFORMANCE SPECIFICATION
FOR
ACOUSTIC COMMUNICATIONS AND DATA STORAGE BUOY SYSTEMS

1 November, 2001

Naval Research Laboratory
4555 Overlook Avenue, SW
Washington, DC 20375-5350

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1.0 SCOPE

This specification establishes the requirements for four Acoustic Communications and Data Storage (ACDS) Buoy systems plus one shipboard monitor/control station to be deployed from UNOLS, U.S. Navy, or commercial oceanographic vessels as autonomous acoustic communications and data collection systems. Each ACDS buoy system will serve as an acoustic modem/repeater that can receive, transmit, and record acoustic signals in an ocean environment for continuous active operation for a minimum of 12 hours and inactive operation for a minimum of 60 hours. The ACDS buoy systems shall be moored to the ocean floor at depths to 500 meters, suspended in the water column, tethered to a surface floatation unit, and remotely controlled by a shipboard monitor/control station. A conceptual block diagram of the ACDS Buoy systems is shown in Figure 1 on page 3. The offeror may propose alternative technical approaches to the performance specification.

Each ACDS Buoy system shall include the following: surface floatation unit, subsurface unit, vertical hydrophone array, acoustic projector, cables, and shipping/deployment/recovery hardware. The surface unit is envisioned as a floatation buoy loosely tethered to the subsurface unit and containing a wireless LAN transceiver and power source. The subsurface unit is envisioned as a pressure vessel with sufficient buoyancy to suspend the attached 8-hydrophone array and single projector below it. The subsurface unit's position in the water column shall be fixed approximately 10 to 100 meters below the surface by a releasable anchor/cable assembly.

Primary electronic functions shall be contained in the subsurface unit, including two PC104 Plus (PC104+) personal computers (PC's), 10/100Base-T network hub, 8-channel hydrophone signal-conditioning postamplifier, 8-channel analog-to-digital converter, 1-channel digital-to-analog converter, 1-channel power amplifier, cable interfaces, power supplies, and batteries. One of the PC104+ PC's shall be provided by the offeror (ACDS Command PC), the other provided by the government (see paragraph 1.1 GFE payload PC). The ACDS Command PC shall be capable of continuously recording 8 channels of digitized data in 16-bit format at a sample rate of 160 ksps per channel for a minimum of 12 hours. It shall also control the various internal functions, including: communications, power control, wake on LAN, wake on timer, anchor release, etc. The GFE payload PC will perform the functions of digital signal processing of the array signals, generation of acoustic signals for transmission, and underwater digital communications.

Two acoustic projectors shall be provided to cover the bands 2-5 kHz and 15-35 kHz at a minimum continuous sound pressure level of 185 dB re 1 micropascal per volt at 1 meter. Only one projector will be deployed at a time. The acoustic projector shall be positioned one meter below the bottom of the ACDS subsurface pressure vessel.

Two vertical line arrays (VLA's) shall be provided to cover the bands 2-5 kHz and 15-35 kHz with a nominal sensitivity of -178 dB re 1 volt per micropascal. Each array shall provide 8 hydrophones mounted on a linear support frame with hydrophone spacing adjustable by the user. The VLA shall be positioned so the top hydrophone is approximately two meters below the bottom of the ACDS subsurface pressure vessel.

Each subsurface unit shall communicate with its respective surface unit via one high-speed serial link. Each surface unit shall communicate with the shipboard monitor/control station (MCS) via a radio frequency (RF) wireless local area network (LAN) using IEEE 802.11B technology. Communication functions shall include command, control, and transfer of data. Type 10/100Base-T network hubs shall be employed in each subsurface unit to facilitate Ethernet communications between the MCS GFE PC, ACDS Command PC, and the ACDS GFE Payload PC.

The shipboard Monitor/Control Station shall include the following: wireless LAN system, 50 meters of antenna cable, RF antenna, 10/100 Base-T network hub, transducer dummy loads, and cable interfaces. One umbilical cable assembly shall be provided for temporary shipboard connection between the MCS and one subsurface unit. This umbilical cable assembly shall deliver DC power to the subsurface unit and provide a high-speed serial communications link. The government will provide a variable voltage DC power supply and personal computer.

The offeror shall develop custom application and integration software for the ACDS Command PC's and MCS PC. Software developed for these PC's shall run under an operating system specified by the offeror.

The ACDS Buoy systems shall be designed for minimal power consumption and weight. The use of commercial off-the-shelf (COTS) hardware is highly desirable.

1.1 Government furnished equipment (GFE):

One PC104+ PC "stack" will be provided by the government for each subsurface unit. Also known as the Acoustics Communications Modem computer (Modem PC), this GFE Payload PC shall be collocated with the ACDS Command PC and both shall communicate via the 10/100Base-T hub. The ACDS subsurface unit shall provide a PC104 enclosure, DC power, and conditioned hydrophone signals for the Modem PC. The ACDS subsurface unit shall receive one analog output signal from the Modem PC for amplification and acoustic transmission. The acoustic communication modem functions will be performed by the GFE Payload PC and software package being procured under a separate contract.

One Pentium II class (or better) personal computer will be provided by the government for the MCS PC. Command, control, and data transfer software developed by the offeror for the MCS functions shall run on this class of PC. This GFE PC shall interface to the ACDS network via the MCS 10/100Base-T hub and wireless LAN entry point. As an option, the offeror may provide and integrate the MCS personal computer into the MCS unit.

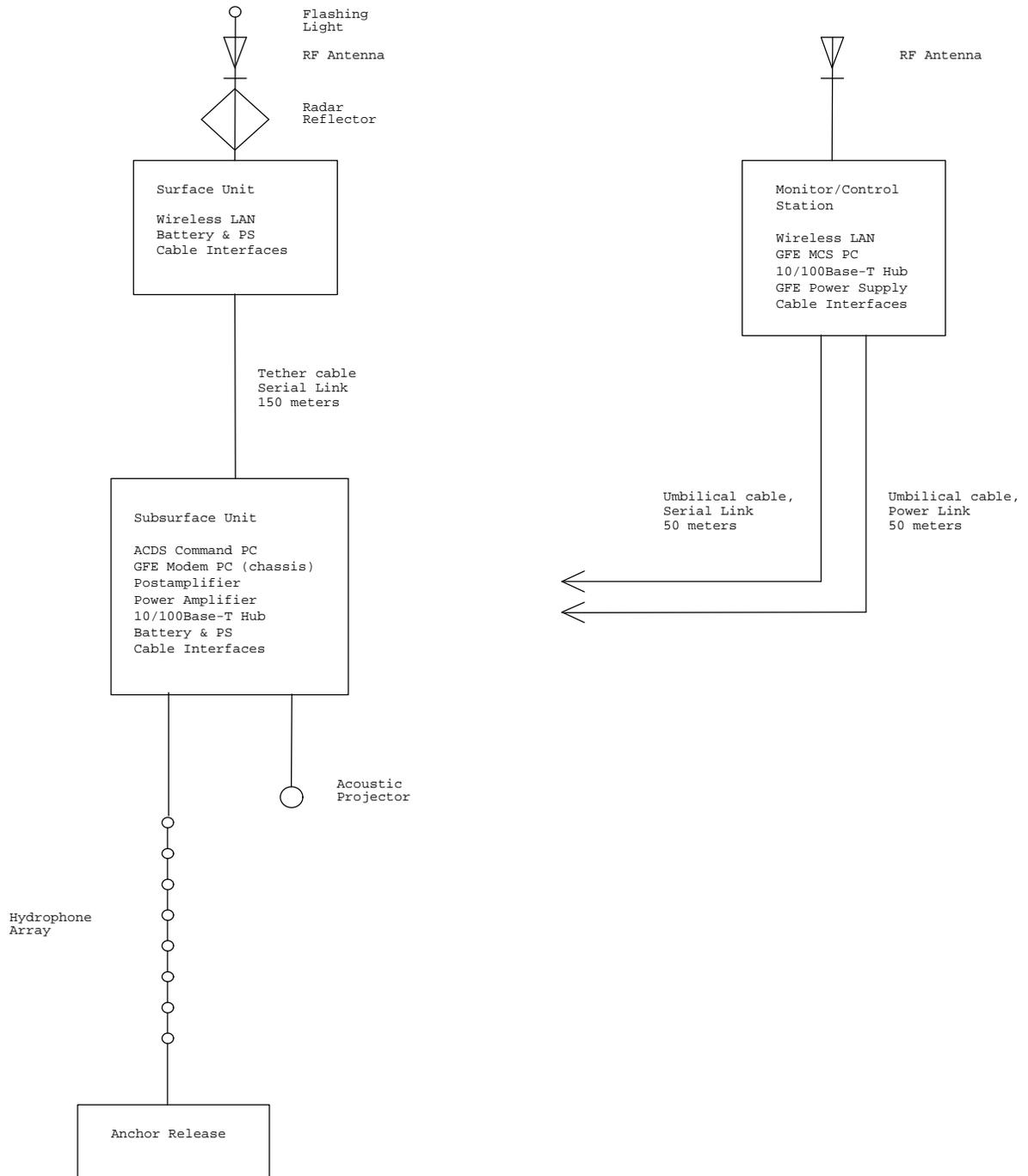


Figure 1. ACDS Buoy System Conceptual Block Diagram.

One variable-voltage DC power supply will be provided by the government to power one subsurface unit. The MCS shall provide for interfacing the GFE power supply to the umbilical power cable. As an option, the offeror may provide and integrate the power supply into the MCS unit.

The anchor and suspension cable assemblies will be provided by the government.

2.0 GLOSSARY OF TERMS

ACDS	Acoustic Communications and Data Storage
Acomms	Acoustic communications
ADC	Analog-to-digital converter, analog/digital converter
CMRR	Common mode rejection ratio
COR	Contracting officers representative
COTS	Commercial off the shelf
DAC	Digital-to-analog converter
dB	Decibel
GB	Gigabytes (1 GB = 1024 megabytes)
GFE	Government furnished equipment
Hz	Hertz
I/O	Input/output
kHz	Kilohertz
LAN	Local area network
MB	Megabytes (1 MB = 1,048,576 bytes)
MBS	Megabytes per second
MCS	Monitor/control station
MHz	Megahertz
NM	Nautical mile
NRL	Naval Research Laboratory
PA	Power amplifier
PC104+	PC104 Plus, PC/104 Plus
PS	Power supply
PSI	Pounds per square inch
RF	Radio frequency
RFP	Request for proposal
rms	Root mean square

3.0 SYSTEM DESCRIPTION

Each ACDS Buoy system shall consist of five major components: surface unit, subsurface unit, vertical hydrophone arrays, acoustic projectors, and cables/shipping/deployment/recovery hardware. A sixth component, the shipboard monitor/control station, shall be one unit shared between up to 8 ACDS Buoy systems.

3.1 Surface Unit

The surface unit shall provide the wireless LAN function, employ visibility features (e.g. flashing light and radar reflector), and provide for deployment and recovery of the subsurface unit and connected hardware. A tether shall include the hard-wired or

fiber optic high-speed communications link between the surface and subsurface units. Although loosely connected to the subsurface unit, the tether's construction shall include a strength member sufficient to support the entire subsurface structure. Electrical assemblies shall be contained within a pressure-resistant vessel that may also act as the floatation unit. The wireless LAN function shall include the access point and a bi-directional RF power amp whose functions shall be performed by a commercial product using IEEE 802.11B technology. The power amp shall be connected to a top-mounted RF antenna. Network connectivity shall employ TCP/IP protocols. Power shall be provided by batteries and, if required, a high-efficiency power converter. Battery capacity shall be designed to maintain operation for a minimum of 3 days. The surface unit's form factor shall be designed to reduce surface wave coupling (e.g. a tall cylindrical shape similar to a spar buoy). The visibility features of paint type, ownership markings, radar reflector, and flashing lights shall meet or exceed US Coast Guard and international maritime recommendations and regulations.

3.2 Subsurface Unit

The subsurface unit shall provide the acoustic signal transmitting and receiving functions, digitization of hydrophone signals, digital signal storage, and external communications. It shall employ a pressure-resistant vessel to house the electronic modules and provide enough positive buoyancy to ensure the hydrophone array and acoustical projector are suspended near-vertical in the water column. It shall be tautly tethered to the anchor release unit and loosely tethered to the surface unit. Two nearly identical computers shall be contained within: (1) one PC104+ module for ACDS operations (ACDS Command PC); and (2) one GFE PC104+ module for Acomms modem operations (Modem PC)(see paragraph 1.1). A postamplifier shall provide interface with the 8-hydrophone array and deliver 8 conditioned analog channels to each computer module. A power amplifier shall accept one analog signal from the Modem PC and provide impedance matching, amplification, and drive to the acoustic projector. A pressure sensor shall measure external pressure. Other electronic modules shall include a 10/100Base-T hub, cable interface to the surface unit, cable interfaces to the shipboard monitor/control station (MCS), power supply, and batteries. During inactive operations the ACDS Command PC and Modem PC shall be in their low-power inactive state. The postamplifier, preamplifiers, power amplifier, and other non-essential loads shall be turned off. The PC's shall individually respond to wake on LAN command packets received from the MCS GFE PC. The subsurface unit's form factor is envisioned as a tall cylindrical shape.

Battery capacity shall be designed to maintain fully active operation for a minimum of 12 hours and inactive operation for a minimum of 60 hours. Inactive operation for 60 hours shall not

require greater than 10% additional energy capacity beyond that required to support active operation for 12 hours.

3.3 Vertical Hydrophone Arrays

Two hydrophone arrays shall be delivered with each ACDS system, but only one will be deployed at a time. Each array shall cover a particular frequency band and shall consist of 8 hydrophones suspended on a semi-rigid support structure approx. 20 meters long for the low-frequency array and 2 meters long for the high-frequency array. Hydrophone spacing shall be adjustable by the user. Both arrays shall be positioned so the top hydrophone is suspended approximately 2 meters below the bottom of the subsurface pressure vessel. The anchor release unit (See paragraph 8.1 option) shall be positioned approximately 2 meters below the array. A strength member in the array cable/support structure shall support the tension between the subsurface pressure vessel and the anchor release unit(s). Two wire pairs shall link the ACDS Command PC to the independent anchor release unit(s) for the purpose of releasing the anchor on command.

3.4 Acoustic Projectors

Two acoustic projectors shall be delivered with each ACDS Buoy system, but only one will be deployed at a time. Each projector shall cover a particular frequency band. The projector shall be positioned approximately 1 meter below the bottom of the ACDS subsurface pressure vessel.

3.5 RESERVED

3.6 Shipboard Monitor/Control Station

One monitor/control station (MCS) shall be delivered with the ACDS Buoy systems. The MCS shall provide command, control, and data transfer functions for any one of up to 8 ACDS Buoy systems via wireless LAN or one hard-wired umbilical cable. The wireless LAN function shall include the access point, bi-directional RF power amp, antenna and cables, whose functions shall be performed by a commercial product group using IEEE 802.11B technology. The power amp shall be connected to the mast-mounted RF antenna via 50 meters (minimum) of low-loss cable. Network connectivity shall employ TCP/IP protocols to facilitate communications with the ACDS Buoy systems. The MCS shall be capable of identifying individual ACDS Buoy systems and maintaining digital records on each. The MCS shall provide a high-speed serial communications

link and a variable-voltage DC power link to one ACDS subsurface pressure vessel via the umbilical cable. These two functions (network connectivity and DC power) may be combined into one umbilical cable. However, two connectors shall be required at the pressure vessel. Command, control, and data transfer functions are custom software deliverables that shall be developed for use on the MCS computer. The MCS components shall be rackmounted in a shock-isolated shipping container and shall include a 10/100Base-T hub, cable interfaces, and RF wireless LAN system.

As stated in paragraph 1.1, the government will be providing the PC and power supply for the MCS in an effort to keep down costs. The government will however, consider options proposed by offerors where the PC and power supplies are integrated into the system. (see Sections 8.2 and 8.3)

4.0 DETAILED DESCRIPTION

4.1 ACDS Buoy System Specifications

4.1.1 Mechanical Requirements:

- a. Pressure Vessels: Surface and subsurface unit pressure vessels shall have a minimum operating depth in seawater of at least 500 meters.
- b. Marine connectors: All connectors shall be designed for a seawater environment and shall have a minimum operating depth in seawater greater than 500 meters. Each connector shall be provided with a waterproof protective end cap with pressure rating equivalent to that of the connector. All connectors shall have either a protective mechanical guard or be located such that they are protected from accidental damage during movement, deployment, and shipping of the ACDS Buoy systems. At each connector, a method of strain relief shall be provided which minimizes stress in the cable conductors (or optical fibers) and the connector. Each connector shall have a locking mechanism to prevent accidental disconnect.
- c. Seals: All pressure vessel joints shall have dual o-ring seals. Backup o-rings (2-piece o-ring seals) and triple o-ring seals are permitted.
- d. Finish: All exposed surfaces shall be designed to minimize deterioration of the structure by exposure to the ocean environment. As a minimum, external metal surfaces shall receive two coats of primer and topcoated with an epoxy-based paint.
- e. Attachment/Lift Points: Each pressure vessel shall be provided with a minimum of three mechanical attachment points for shipboard tie-down/storage and lifting/deployment. Lift

points shall have an operating strength of at least 10,000 newtons (2,000 lbs).

- f. Purge Port(s): Each pressure vessel shall provide for a user-supplied purge system that will allow the vessel to be cross-flow purged or evacuated and back-filled with a dry gas. Two purge ports per vessel shall be provided.
- g. Corrosion Protection: Each pressure vessel shall employ passive cathodic protection against corrosion. The protection method shall have a minimum rated usage of one year.
- h. Visibility: The top of the surface buoy shall be painted International Orange and marked with ownership information to be supplied by NRL. The surface buoy's topside structure shall incorporate radar reflectors, a flashing light, and a mast for mounting the wireless LAN antenna. The topside structure shall be anodized or painted to minimize deterioration by exposure to the ocean environment. The topside structure shall be easily removed for maintenance and access to the buoy electronics. The antenna mount shall extend a minimum of 2 meters above the buoy's mean water line.
- i. Support Cables: The tether cable, vertical array cable, and acoustic anchor release cable shall include strength members capable of supporting a working tension of at least 10,000 newtons force (2,000 lbs) and a breaking tension of at least 20,000 newtons force (4,000 lbs).

4.1.2 Temperature:

- Operating: -5°C to 55°C
- Magnetic media: 5°C to 55°C
- Storage: -40°C to 65°C

4.1.3 Shock and Vibration (minimum operating specs):

- Shock: 150 G for 2 ms (half sine wave)
- Vibration: 0.67 G over 5-500 Hz (random RMS)
- 1.0 G 0-peak 5-500 Hz (swept sine RMS)

4.2 Surface Unit

The surface unit shall operate on internal battery power throughout its deployment. Therefore, minimum power consumption and maximum power efficiency shall be primary design goals.

4.2.1 External Connections:

- J1 Tether/communications cable to the subsurface unit
- J2 Electrical cable to the RF antenna
- J3 Electrical cable to the flashing light (if powered from the internal battery)

4.2.2 Surface Decoupling

The surface unit shall be designed to minimize heave and roll; i.e. maintain the wireless LAN antenna as vertical as possible. A tall cylindrical shape (e.g. spar buoy) is envisioned as a technical approach that will meet this objective.

4.2.3 Surface Unit/Subsurface Unit Tether

Each surface unit shall be connected to its respective subsurface unit via a tether/communications cable (tether). Each tether shall be a minimum of 150 meters long and shall resist against damage caused by binding or hocking. The electrical (or optical) member shall connect to the surface unit via jack J1. The strength member shall be attached to the surface and subsurface units using a mechanical method that isolates dynamic loading of the tether's electrical (or fiber optic) communication link. The tether shall have a haired fairing along its total length. The fairing length shall be approximately twice the diameter of the tether cable. The linear density of the fairing shall conform to customary industry practice for effective reduction of current-induced strum.

4.2.3.1 Tether option. One additional 50-meter tether assembly shall be provided for each ACDS Buoy system (see Section 8.5).

4.2.4 Electrical Requirements

The surface unit shall include a user-replaceable internal battery pack to provide DC power to the wireless LAN electronics. The external flashing light may be powered by its own power source or connected to the internal battery via (optional) jack J3. Wireless LAN electronics shall include the tether/communications cable interface, wireless LAN entry point, DC voltage converter (if required), bi-directional RF power amplifier, antenna coupler (if required), cable, and antenna. Cable to the RF antenna shall be connected via jack J2. The electrical components shall be isolated from shock and vibration, and mounted for convenient removal and servicing. Internal connectors shall employ positive engagement mechanisms. The battery shall be located in the lower portion of the pressure vessel and shall be accessed from the top of the pressure vessel. The internal power supply shall provide enough energy for a minimum of 72 hours of operation. Internal battery power to the electronics shall be switched on or off by external means (e.g. installation of the tether plug or a shorting plug). If a DC voltage converter is required, the power supply specifications of Section 4.3.4 shall apply.

4.2.5 Battery Pack

The battery pack shall be the sole source of power to the surface unit for the duration of the deployment. It shall provide sufficient power for a minimum of 72 hours of continuous operation. It is envisioned as a commercial product using disposable alkaline batteries. Other power source technology may be acceptable. The battery pack shall be made up of sufficient modules to provide a minimum energy service life to support one mission. It shall use mature technology, be easily secured in the surface unit pressure vessel, and easy to replace.

- a. One fully charged battery pack shall be delivered with each ACDS surface unit. A disposable or rechargeable battery pack may be used for development and acceptance testing.
- b. Multiple battery modules shall be wired so that individual module cells are in series and the modules are in parallel.
- c. The failure of any one module shall not kill the mission.
- d. Battery modules shall fit within a volume envisioned as the bottom portion of the pressure vessel. The battery compartment shall include 50% additional volume, reserved for future use. Buoyancy design calculations shall take this reserve capacity into consideration.
- e. The battery pack shall be accessible from the top of the pressure vessel with the electronic unit(s) removed. The offeror may also provide accessibility from the bottom of the vessel.
- f. All conductors shall be sized to maintain voltage loss to less than 0.25% at maximum operational current flow.
- g. Powering up the internal electronics shall be accomplished by insertion of the cable plug or a shorting plug.
- h. Battery voltage shall be selected by the offeror.

4.2.6 RF Wireless LAN

Network protocol shall be TCP/IP and shall employ IEEE-802.11B technology with the following minimum specifications:

- Band: 2.4GHz
- Data throughput 11 megabits per second (mbps), min.
- Antenna pattern, 3 dB 360 degrees (omni) in the horizontal
45 degrees in the vertical, nominal
- Power amplifier Bidirectional, 400 milliwatts, minimum

4.3 ACDS Subsurface Unit (Subsurface Pressure Vessel)

The subsurface unit shall operate on internal battery power throughout its deployment. Therefore, minimum power consumption and maximum power efficiency shall be primary design goals.

The subsurface unit shall contain two PC104+ PC modules (of which one, the GFE payload PC, will be GFE, see paragraph 1.1), an 8-channel array postamplifier, a one-channel power amplifier, 10/100Base-T hub, tether/communications cable interface, umbilical cable interfaces, and power supply. Mechanically it shall attach to the surface buoy via a lightweight tether/cable assembly, support the hydrophone array and anchor, and support the acoustic projector. The subsurface unit shall contain sufficient positive buoyancy to assure the hydrophone/anchor cable is taut.

4.3.1 External Connections:

J1 Tether/communications cable to the surface unit
J2 Electrical cable to the hydrophone array
J3 Electrical cable to the acoustic projector
J4 Electrical cable to the anchor releases
J5 Umbilical power cable to the MCS, shorting plug, dummy plug
J6 Umbilical communications cable to the MCS (may be J1)

4.3.2 Electrical Requirements

The subsurface unit shall include a user-replaceable internal battery pack to provide DC power to the internal electrical and electronic modules. All electrical components shall be isolated from shock and vibration, and mounted for convenient removal and servicing. Internal connectors shall employ positive engagement mechanisms. The subsurface unit shall interface with the surface unit electrically (or optically) via jack J1. The subsurface unit shall interface with the MCS unit electrically (or optically) via jack J1 or J6.

4.3.3 Battery Pack

The battery pack shall be the sole source of power to the subsurface unit for the duration of the deployment. It shall provide sufficient power for a minimum of 12 hours of fully active operation plus a minimum of 60 hours of inactive operation. The 12 hours of fully active operation shall include transmission of acoustic signals on a 30% duty cycle. The battery pack is envisioned as a series-parallel arrangement of disposable alkaline batteries with a nominal voltage of 60 Volts DC. Other power source technology may be acceptable. The battery pack shall provide a minimum energy service life to support one mission. It shall use mature technology, be easily secured in the subsurface pressure vessel, and easy to replace. When connected to the monitor/control station (MCS) via the umbilical cable, the battery pack shall be electrically isolated and all external 60 Vdc power shall be supplied via the umbilical

cable's power conductors via jack J5. For deployment, a shorting plug shall be installed on the subsurface unit's power connector (J5) which shall close the battery circuit and power up the internal electronics. For shipping, a dummy plug shall be installed on the subsurface unit's power connector (J5).

- a. One fully charged battery pack shall be delivered with each ACDS subsurface unit. A disposable or rechargeable battery pack may be used for development and acceptance testing.
- b. Multiple battery modules shall be wired so individual module cells are in series and the modules are in parallel.
- c. The failure of any one module shall not kill the mission.
- d. Battery modules shall fit within a volume envisioned as the bottom portion of the buoy pressure vessel. The battery compartment shall include 50% additional volume, reserved for future use. Buoyancy design calculations shall take this reserve capacity into consideration.
- e. The battery pack shall be accessible from the top of the pressure vessel with the electronic units removed. The offeror may also provide accessibility from the bottom of the vessel.
- f. Conductors shall be sized to maintain voltage loss to less than 0.25% at maximum operational current flow.
- g. Inserting the shorting plug shall cause the PC104+ computers to boot up (they shall not be sustained on back-up power).

4.3.4 Power Supply

The power supply (PS) shall convert the battery voltage to working voltages and polarities required by the electronic units (e.g. postamplifier, preamplifier, cable interfaces, network hub, etc.). It is envisioned as a commercial product(s) using high-efficiency switching technology and capable of operation over a wide range of input DC voltages.

- a. The PS shall be highly reliable. Fully loaded, it shall not exceed 66% of its rated current capacity on any voltage output over the operating temperature range -5° to $+55^{\circ}$ C.
- b. Conductors shall be sized to maintain voltage loss to less than 0.25% at maximum operational current flow.
- c. Where technically feasible, fault protection shall be self-restoring after the fault has cleared.
- d. The power supply shall employ galvanic isolation, reverse voltage protection, overvoltage protection, and overcurrent protection.
- e. Common (ground) shall be connected to the pressure vessel at one point to ensure the metal pressure vessel acts as an effective faraday shield for the internal electronics. The

offeror's technical approach shall significantly reduce or eliminate the risk of electrolytic decomposition.

- f. A "star ground" shall be employed to reduce ground loops and enhance low-noise performance.

4.3.5 ACDS Personal Computer Modules

Two PC104+ PC modules shall form the heart of each ACDS Buoy system. The offeror shall deliver one PC104+ PC module (ACDS Command PC) as described in this section. The offeror shall also deliver one additional PC104+ enclosure for the GFE Modem PC "stack", (see paragraph 1.1). The offeror shall provide similar mounting and electrical connector hardware for both PC's. Mounting location and technique shall facilitate ease of removal and reinstallation of each module.

The ACDS Command PC shall execute programs stored in memory and shall control all of the deployed functions. The ACDS Command PC shall also communicate with the shipboard monitor/control station (MCS) via the network hub, wireless LAN, and umbilical cable. The ACDS Command PC shall store digitized acoustic signals received from the array onto high volume non-volatile memory.

GFE Modem PC interfaces: The GFE Modem PC shall receive 8 analog inputs from the postamplifier unit, conduct digital signal processing operations, and store processed information onto its own high volume non-volatile memory. The GFE Modem PC will also generate one channel of analog signal for driving the ACDS power amplifier. The Modem PC shall communicate with the ACDS Command PC and other networked components via the 10/100Base-T hub.

The GFE Modem PC's analog input cable is 1 meter long and will be provided by the government. The GFE Modem PC's enclosure shall be mounted to the subsurface unit's support structure in such a way that 1 meter of analog input cable will be sufficient. The ACDS Buoy system shall receive the single channel of analog signal from the GFE Modem PC via one coax cable and BNC plug.

4.3.5.1 ACDS Command PC Module Architecture

The ACDS Command PC module is envisioned as a PC-104+ stack employing the following (equivalent or better) components:

- 266 MHz AMD K-6E CPU board, Versa Logic model EPM-CPU-7J
- 60 Watt power supply board, Real Time Dev's model IPWR104-H60W
- Four 2.5 inch disk drives, IBM model IC25T048ATDA05(48 GB)
- Four disk drive adapter boards, Real Time Dev's model CMT6107
- Digital input/output board
- Analog to digital converter board, 8 channels, 160 kHz per ch
- Timer wake-up function
- Ruggedized enclosure, Versa Logic model VL-ENCL-4A8
(Two identical enclosures shall be delivered)

The offeror shall provide interface adapters for connecting the PC104+ module to a monitor, keyboard, mouse, floppy disk drive, CDROM, com port, parallel port, USB port, and RJ45 (Ethernet) port for stand-alone operations. The offeror may propose alternative technical approaches including combining functions onto specialty boards (e.g. ADC and digital I/O board).

4.3.5.1.1 Enclosure. Two identical commercial off-the-shelf (COTS) ruggedized PC104+ enclosures with at least one spare module space for the ACDS Command PC "stack". The enclosures shall provide ruggedized mounting for shock and vibration isolation.

4.3.5.1.2 CPU Board. A COTS PC104+ module using power-efficient technology and capable of running Windows NT/2000 or Unix-based operating systems, application software such as Matlab, and compiling programs such as Fortran and C.

4.3.5.1.3 Power Supply Board. A COTS PC104/PC104+ module utilizing power-efficient conversion technology, overvoltage protection, overcurrent protection, and reverse voltage protection. Maximum operating current for each output shall not exceed 66% of its rated current capacity on any voltage output over the operating temperature range -5° to $+55^{\circ}$ C. Where technically feasible, fault protection shall be self-restoring after the fault has cleared. Input voltage range shall be 36 to 66 Vdc.

4.3.5.1.4 Analog-to-Digital Converter (ADC) Board(s). The ADC board(s) shall be capable of digitizing 8 single-ended analog channels. It is highly desirable that the ADC shall employ 16-bit Sigma-Delta conversion technology. Conversion rate and input sensitivity shall be user programmable. The ADC shall accept an (optional) external clock to control the sample rate.

One cable assembly shall connect the ADC module to the postamplifier via a 25-pin type D male connector. Pin assignments are provided in Table 1 (Section 4.3.6).

Development Risk. The ADC module may not be commercially available as a COTS Sigma-Delta type converter in a PC104/PC104+ module that will fit within the offeror's enclosure. An external Sigma-Delta type ADC may be proposed. Alternatively, another ADC technology may be proposed that meets these specifications, fits the PC104 enclosure, and uses power-efficient technology.

- a. The sample rate for each of the 8 A/D converter channels shall be 160 kHz, minimum, for a total of 1.28 megasamples/sec.
- b. Sample initiation shall be derived from the ACDS Command PC's master clock oscillator.
- c. All 8 channels shall be sampled simultaneously and synchronized to the system clock.

- d. If the A/D converter has greater than 16-bit conversion capability, only the most 16 significant bits shall be used.
- e. Battery voltage and current shall be measured by the ADC.

4.3.5.1.5 Digital Input/Output (I/O) Board. A COTS PC104/PC104+ module capable of providing bit control of the following functions: postamplifier channel gain, postamplifier on/off, postamplifier anti-aliasing filter frequencies, power amplifier on/off, and on/off control for any other non-essential loads.

4.3.5.1.6 Disk Drives. Up to four COTS notebook-type hard disk drives shall provide a combined minimum storage capability of 192 GB. Software shall maintain one or two hard disk drives in their active states while the other drives are kept in their inactive (low-power) states. The ACDS Command PC shall be capable of continuous real-time storage of digitized signals received from the 8-channel hydrophone array.

- a. Minimum data transfer rate shall be a sustained 15 MB/second.
- b. Estimated power consumption for the active drives is 2 watts each. Estimated power consumption for the inactive drives is 0.25 watt each. Application software shall control drive states as required to support continuous read/write operations while minimizing overall power consumption.
- c. The ACDS Command PC's operating system, integration software, application software, and non-volatile storage requirements shall be provided on the main disk drive partition (e.g drive C:). Data shall be recorded to the additional partitions and drives.

4.3.5.1.6.1 Digitized Data Storage Format

- a. Acoustic data shall be stored in a blocked format. Details and examples will be provided by NRL.
- b. Each data block shall begin with a 32-byte header containing the following information on each input channel:
 - Channel gain (preamplifier plus postamplifier)
 - Sample rate
 - Number of data points (2 bytes each) in the block
- c. Header data shall include a date/time character string of the form (YYYYDDHMMSS.microsecond).
 - YYYY Year
 - DDD Julian Day
 - HHMM Hour and minute
 - SS.SSSSS Second (1 us resolution)
- d. Each data block shall contain samples taken sequentially from the hydrophone channels. Data format shall be little endian, hydrophone order shall be 1-8, and number of data points shall

be 8192 per hydrophone. (Each data block will be slightly larger than 132 kB.)

- e. Amplitude, gain, and sample rate changes shall not be implemented until the beginning of a new data block.

4.3.5.1.6.2 Digitized Acoustic Data Timing Functions

- a. ACDS system timing functions shall be derived from the ACDS Command PC clock oscillator. This oscillator shall be accurate to better than 1 part in 10^6 over a 1-day period (0.1 sec per day).
- b. The ACDS Command PC shall insert time and date into each data packet header.
- c. The ACDS system time and date shall be user readable and settable via the TCP/IP communication link.

4.3.5.2 Operating System

Each ACDS Command PC shall be delivered with an operating system that is compatible with all hardware and software specifications. The OS shall support compiling and running application software written in high-level programming languages such as Fortran, C, Matlab, etc. Licenses, original media, and owner's manuals shall be provided for each PC and operating system. The same version of operating system shall be delivered for all ACDS Command PC's.

4.3.5.3 Commercial Application Software

Commercial application software shall be provided that implements the high-level functions of the ACDS Command PC such as Matlab and network communications packages. Licenses, original media, and owner's manuals shall be provided for each module's application software. The same version of application software shall be delivered for all ACDS Command PC's.

4.3.5.4 Custom Operating System, Application and Integration Software

Custom operating system, application, and integration software shall be provided that implements the various command, control, and data transfer functions of the ACDS Buoy systems. Software shall be written in a high-level language such as C and a copy of source code(s) provided to NRL. NRL reserves the right to use, modify, and recompile source code(s) without further notice to the provider. Development tools and environments required to modify/build/debug the custom software shall also be delivered.

4.3.5.4.1 Average ADC Input Level

Upon request from the monitor/control station (MCS), the ACDS Command PC shall compute the rms average of each of the 8 input channel's acoustic levels. These averages shall be integrated over 4 seconds and transferred via LAN upload to the MCS.

4.3.5.4.2 ACDS Buoy Engineering Sensors

The ACDS Command PC shall implement the command, control, and data transfer functions of the MCS (Section 4.7). Specifications for pressure vessel status sensors:

Required:

External Pressure: 0 to 5 MPa, with $\pm 1\%$ accuracy over range

Desired:

Internal Temperature: 0 to 60°C, with $\pm 1\%$ accuracy over range

Internal Pressure: 0 to 5 kPa, with $\pm 1\%$ accuracy over range

Leak detector: Presence of water in the vessel

Table 1. Postamplifier signal jack pin assignments

PIN NUMBER	FUNCTION	CHANNEL
1	HOT	CHANNEL EIGHT
2	GROUND	CHANNEL EIGHT
3	COLD	CHANNEL SEVEN
4	HOT	CHANNEL SIX
5	GROUND	CHANNEL SIX
6	COLD	CHANNEL FIVE
7	HOT	CHANNEL FOUR
8	GROUND	CHANNEL FOUR
9	COLD	CHANNEL THREE
10	HOT	CHANNEL TWO
11	GROUND	CHANNEL TWO
12	COLD	CHANNEL ONE
13	NOT USED	
14	COLD	CHANNEL EIGHT
15	HOT	CHANNEL SEVEN
16	GROUND	CHANNEL SEVEN
17	COLD	CHANNEL SIX
18	HOT	CHANNEL FIVE
19	GROUND	CHANNEL FIVE
20	COLD	CHANNEL FOUR
21	HOT	CHANNEL THREE
22	GROUND	CHANNEL THREE
23	COLD	CHANNEL TWO
24	HOT	CHANNEL ONE
25	GROUND	CHANNEL ONE

4.3.6 Hydrophone Array Postamplifier:

The array postamplifier shall serve as the interface between the 8-channel hydrophone array, the ACDS Command PC, and the GFE Modem PC. The postamplifier shall receive signals from the 8 hydrophone preamplifiers and condition these signals for input to the A/D converters at signal levels up to ± 5 Volts, single-ended. Each channel's gain shall be individually set by the ACDS Command PC's I/O board to cover the range (nominally) 0 to 42 dB in 6 dB

steps (envisioned as 1-2-5 sequence) and controlled by the ACDS Command PC's digital I/O board. Frequency response shall be flat ± 1 dB over the range 1 kHz to 40 kHz. Spectral noise density shall be -150 dBV/ $\sqrt{\text{Hz}}$ or better at 1 kHz for all gain settings, measured with the input terminated in an impedance approximately equal to the preamp and cable. The postamplifier shall provide power to the array preamplifiers. Power (on/off) control for the postamplifier (and preamplifier) shall be provided by the ACDS Command PC's I/O board.

The postamplifier shall have two isolated signal output jacks, 8 channels each. For example, Channel 1's output to the ACDS Command PC's ADC shall be isolated from Channel 1's output to the GFE Modem PC's ADC, etc. One cable and connector assembly shall be provided for the ACDS Command PC's ADC. The government will provide a 1-meter cable assembly for connecting the GFE Modem PC's ADC to the postamplifier (see paragraph 1.1). Pin assignments are shown in Table 1 (Section 4.3.6).

If Sigma-Delta "oversampling" technology is employed in the ADC, anti-aliasing filters are not required. If successive approximation technology is used, programmable anti-aliasing filters shall be included on the ADC board or in the postamplifier. These filters shall accommodate sampling frequencies from 10 kHz to 160 kHz. If the filters are located in the postamplifier, their cutoff frequencies shall be controlled by the ACDS Command PC's I/O board.

4.3.7 External Pressure Sensor

One pressure sensor shall monitor seawater pressure external to the subsurface pressure vessel. The pressure sensor shall have a range greater than 5 megapascals (500 meters depth), and accuracy of 1% or better. The pressure sensor's output shall be read by the ACDS Command PC via digital link (e.g. NMEA serial line) or via the A/D converter.

4.4 Hydrophone Arrays

4.4.1 Physical description

Two vertical receiver arrays shall be provided for each ACDS Buoy system to cover the bands 2 kHz to 5 kHz and 15 kHz to 35 kHz. The array cable shall connect to the subsurface pressure vessel via jack J2.

- a. Array Length: The vertical arrays shall be suspended in the water volume with the top hydrophone located approximately 2 meters below the bottom of the ACDS subsurface pressure vessel. The low-frequency (2 to 5 kHz) array shall permit attaching the hydrophones at any point along a semi-rigid 20-meter support structure. The high-frequency (15 to 35 kHz) array shall permit attaching the hydrophones at any point

along a semi-rigid 2-meter support structure. The suspension and array cables shall include strength members to support the moored anchor assembly's weight.

- b. Operational Depth: The array shall function and meet all specifications when deployed in the ocean to any depth less than or equal to 500 meters.
- c. Fairing: The suspension cable and array shall be faired along its entire length with a haired fairing. The length of the fairing strands shall be at least 2 times the cable diameter. The linear density of the fairing shall conform to customary industry practice for effective reduction of current-induced strum.

4.4.2 Hydrophone Array Electromechanical Cable:

The array cable shall provide the electrical and mechanical interface between the subsurface pressure vessel, vertical hydrophone array, and the anchor release unit.

- a. Mechanical Strength: The array cable shall have a strength member capable of supporting a working tension of at least 10,000 newtons force (2,000 lbs) and a breaking tension of at least 20,000 newtons force (4,000 lbs).
- b. Mechanical Terminations: Separate electrical and mechanical terminations shall be used to provide strain relief for the electrical connector(s) and to enable the electrical connector(s) to be connected and disconnected while maintaining tension on the assembled mechanical terminations. Mechanical terminations shall be provided at both ends of the array. The array shall be a load-bearing member of the anchor line.
- c. Electrical Connector(s): The array shall be connected electrically to the ACDS subsurface pressure vessel at jack J2 via one multi-contact marine connector. The connector shall be strain relieved to prevent damage to the cable/connector assembly.

4.4.3 Hydrophone Array Electrical Requirements

- a. Channel-to-Channel Crosstalk: Crosstalk between hydrophone channels shall be less than -75 dB as measured between any two channels. This specification shall be measured by applying reference square waves of 3.5 kHz and 20 kHz at the hydrophone's crystal element input connectors. The postamplifier output voltage of adjacent acoustic channels shall be individually compared to the channel under test to determine the crosstalk level in dB. This measurement shall be made for each channel.
- b. Common Mode Rejection Ratio (CMRR): Between 1 kHz and 40 kHz, CMRR shall be greater than 60 dB per channel.

- c. DC Preamplifier Power: DC power to each hydrophone preamplifier shall be supplied by the postamplifier.
- d. Acoustic Release: The array cable shall provide interface wires to the acoustic releases.

4.4.4 Hydrophone Sensitivity and Electrical Performance

- a. Sensitivity: The nominal sensitivity of the hydrophones measured at the preamplifier input shall be -178 decibels relative to 1 volt per micropascal acoustic signal pressure. Each hydrophone shall be calibrated to an accuracy of ± 0.5 dB over the frequency range 1 kHz to 40 kHz. Calibration data shall be provided in hard-copy form and electronically in Microsoft Word 97 (or higher) format. Hydrophones shall each have serialized identification marks.
- b. Preamplifiers: Preamplifiers shall have a nominal fixed gain of 40 dB and be capable of driving 22 meters of cable with minimum signal loss or degradation caused by noise pickup or cross-talk. The preamplifier's drive circuitry is envisioned as a differential current-mode output. Conversion of the current signal to a voltage signal (for instance, by a transimpedance amplifier) shall take place within the postamplifier unit. The preamplifiers shall fully recover from acoustic signal overload (saturation) within 1 second.
- c. Passband Flatness: As measured at the postamplifier input, each hydrophone shall have a constant sensitivity to within ± 3 dB over the acoustic signal frequency range 1 kHz to 40 kHz. Phase shift between the hydrophone element's input terminals and their respective postamplifier output shall not exceed 45° over this bandwidth.
- d. Channel-to-Channel Uniformity: As measured at the post-amplifier input, each channel shall not vary more than ± 3 dB over the acoustic signal frequency range 1 kHz to 40 kHz from any other channel.
- e. Hydrophone Calibration: Provision shall be made to calibrate the hydrophone by injecting an electronic test signal directly into the hydrophone element's input terminals. This connection will also facilitate the crosstalk requirement in Section 4.4.3.
- f. Preamplifier Spectral Noise Density: The equivalent acoustical self-noise of the hydrophones shall not exceed 25 decibels relative to 1 micropascal/ $\sqrt{\text{Hz}}$ throughout the frequency range 1 kHz to 40 kHz, and referred to the input. (Approx. -155 dBV/ $\sqrt{\text{Hz}}$.) This specification shall be measured with a spectrum analyzer connected to the output of the postamplifier or input to either A/D converter. The measurement may be taken with the hydrophone's sensor element replaced with an impedance of similar value.

- g. High-Pass Filter: Each hydrophone preamplifier shall employ a high-pass filter at its front end to attenuate low-frequency ship noise and line power pickup. The filter's corner frequency shall be approximately 200 Hz with a roll-off slope of 6 dB per octave (1 pole).
 - h. Array Test Leader: The offeror shall provide one unterminated test leader assembly. This test leader shall consist of one connector which mates to the ACDS subsurface unit's array input connector (J2) and a minimum of 1 meter each of unterminated wires. Each wire shall be labeled.
- 4.5 Power Amplifier: The Power Amplifier (PA) shall receive one ± 2.5 Volt input signal from the GFE Modem PC and provide sufficient voltage and current gain to drive each acoustic projector at continuous sound pressure levels up to 185 dB re 1 micropascal per volt at 1 meter. The PA is envisioned as a commercial product using high-efficiency technology and capable of delivering a minimum of 100 watts rms electrical power to the transducer. The PA shall be capable of driving one of two frequency bands for a given deployment. These bands are: 2 to 5 kHz and 15 to 35 khz.
- a. Power conversion efficiency shall be 75% or higher.
 - b. Other components that may be required include a matching transformer, low-pass filter, and high-pass filter.
 - c. DC transitions from the D/A converter and high-frequency switching transients (if any) shall not adversely affect the ACDS Electronic Group's stability (e.g. cause a computer reset).
 - d. The ACDS Command PC's I/O card shall control power (on/off) to the PA. Manual gain control shall be provided (e.g. trimpot).
 - e. The PA shall receive its DC power directly from the battery (or via the umbilical cable) to reduce the risk of affecting other units wired to the power supply (e.g. cause a computer unit reset).
 - f. The PA's frequency band may be fixed over the range 1 kHz to 35 kHz or tuned to the desired band. If the tuning option is selected, component changes shall be modularized so the changes are easily accomplished on board a ship at sea.
 - g. For energy calculations, the power amplifier will transmit on a 30% duty cycle.

4.6 Acoustic Projectors

Two acoustic projectors shall be provided for each ACDS Buoy system to cover the bands 2 kHz to 5 kHz and 15 kHz to 35 kHz. Only one projector will be deployed at a time. The projector cable shall connect to the ACDS subsurface pressure vessel via jack J3.

- a. Location: The projector shall be suspended in the water volume at a depth of approximately 1 meter below the bottom of the ACDS subsurface pressure vessel.
- b. Operational Depth: The projector shall function and meet all specifications when deployed in the ocean to any depth less than or equal to 500 meters.
- c. Electrical Connector(s): The projector shall be connected electrically to the ACDS subsurface pressure vessel via one multicontact marine connector. The connector shall be strain relieved to prevent damage to the cable/connector assembly.
- d. Transmit Voltage Response (TVR): (free field voltage response.) Overall frequency response specification is 2 kHz to 35 kHz, covering two bands. One or two projectors may be used to meet the frequency response specification for both bands. Only one transducer (one band) will be used for a given deployment. Band 1's transducer is envisioned as having characteristics similar to or better than International Transducer Corporation's model ITC-2077. Band 2's transducer is envisioned as having characteristics similar to or better than International Transducer Corporation's model ITC-1001. For example:
 - Band 1: 2 to 6 kHz, flat ± 6 dB.
 - Band 2: 15 to 35 kHz, flat ± 6 dB.
 - Power out: 185 dB continuous rating, minimum.
 - Pattern: omnidirectional in the horizontal plane.

4.7 Shipboard Monitor/Control Station

The monitor/control station (MCS) PC shall be the end-user interface for any one of up to 8 ACDS Buoy systems. Through it, all programmable command functions shall be issued and all system status reports shall be displayed. All operational command and status display screens shall be readily printed. The MCS PC shall facilitate transfer of data from the ACDS Buoy systems onto a high-volume storage device. Software shall be developed for MCS operations on a government-supplied Pentium II (or better) class personal computer.

The MCS shall include a wireless LAN system, 10/100Base-T hub, umbilical cables, umbilical DC power supply interfaces, dummy loads, dummy load cable, and software. The MCS components shall be rackmounted in a shock-isolated shipping container. The wireless LAN components shall include the network access point, bi-directional power amplifier, RF antenna, and 50 meters (minimum) of low-loss antenna cable. A longer antenna cable is desired (up to 100 meters) but the wireless LAN's accuracy, data rate, and range specification must be met.

The government will provide one variable-voltage DC power supply for operating the ACDS subsurface unit's electronics via the umbilical cable.

As stated in paragraph 1.1, the government will be providing the PC and power supply for the MCS in an effort to keep down costs. The government will however, consider options proposed by offerors where the PC and power supplies are integrated into the system. (see Sections 8.2 and 8.3)

4.7.1 Temperature:

- Operating: -5°C to 55°C
- Magnetic media: 5°C to 55°C
- Storage: -40°C to 65°C

4.7.2 Shock and Vibration (minimum operating specs):

- Shock: 20 G for 2 ms (half sine wave)
- Vibration: 1.0 G over 5-500 Hz (random RMS)
- 0.25 G 0-peak 5-500 Hz (swept sine RMS)

4.7.3 External Connections:

- J1 Umbilical power cable to the ACDS subsurface unit
- J2 Umbilical communications cable to the ACDS subsurface unit
- J3 Electrical cable to the shipboard wireless LAN RF antenna
- J4 Electrical power cable, 120 Vac, 60 Hz

4.7.4 RF Wireless LAN: The MCS wireless LAN shall use identical components as used in the ACDS surface unit except the MCS wireless LAN antenna shall be remotely mounted (e.g to the ship's mast) at a location 50 meters or greater away from the bi-directional power amplifier. The offeror shall provide sufficient low-loss cable(s) for remote antenna mounting and may recommend configuration(s) for efficient wireless LAN operation. Network access point shall be TCP/IP and shall employ IEEE-802.11B technology with the following minimum specifications:

- Band: 2.4GHz
- Data throughput 11 megabits per second (mbps), min.
- Antenna pattern, 3 dB 360 degrees (omni) in the horizontal
45 degrees in the vertical, nominal
- Power amplifier Bidirectional, 400 milliwatts, minimum

4.7.5 Transducer Dummy Load(s): A dummy load shall be provided for each of the acoustical projectors. A 5-meter interface cable shall be provided that connects to the ACDS subsurface pressure vessel's projector jack (J3) on one end and the dummy load on the other. The dummy load shall be electrically equivalent to the projector it simulates at the frequencies of 3.5 kHz for Band 1 and 20 kHz for Band 2. Power dissipation rating shall be 400 watts rms, continuous, minimum. Dummy load assemblies shall be resistant to an exposed shipboard deck environment, mounted in ventilated enclosures, and stowed in the monitor/control station

when not in use. Each dummy load shall provide a single-ended - 40 dB (nominal) voltage monitor on a front-mounted BNC jack.

- 4.7.6 Umbilical Cable: The umbilical cable shall be 50 meters long and consist of a power cable and a serial communications (hard-wired or fiber optic) cable. One end shall mate to the ACDS subsurface pressure vessel jacks J5 and J6 (or J1). The other end shall mate to the MCS jacks J1 and J2. Separate connectors shall be used for power and communications at the ACDS subsurface pressure vessel.
- 4.7.7 GFE Power Supply: The government will provide one variable-voltage DC power supply (see paragraph 1.1) that will provide sufficient power for one fully active ACDS subsurface system via the 50 meter umbilical cable. The offeror shall provide cable and connector interfaces at the MCS for receiving power from the GFE power supply. ACDS shore power shall be delivered via MCS jack J4.
- 4.7.7.1 Option Specifications: If the option under Section 8.3 is exercised, the following specifications shall apply: Fully loaded, the power supply shall not exceed 66% of its rated current capacity on any voltage output over the operating temperature range -5° to $+55^{\circ}$ C. It's output voltage shall be manually adjustable over the range 30 to 60 Volts DC.
- 4.7.8 Software: MCS custom integration software shall implement the following command and status functions:
- a. Operational Commands: As a minimum, the following operational commands shall be issued by the MCS GFE PC and shall be transferred to the selected ACDS Buoy system via the wireless LAN or umbilical cable. A record of the most recent commands issued by the MCS GFE PC shall be maintained for each ACDS Buoy system.
- Power amplifier and postamplifier (on/off)
 - ACDS Command PC start (wake) date/time, shutdown, and reset
 - ACDS Command PC wake on LAN command
 - GFE Modem PC start (wake) date/time, shutdown, and reset
 - GFE Modem PC wake on LAN command
 - ACDS Command PC's A/D converter sample rate
 - Postamplifier gain, individual/group control
 - Read/set system time and date
 - Anchor release, two-channel capability (one employed)
 - ACDS Command PC start/stop recording acoustic data, 8 ch
 - Transfer data to/from the ACDS Command PC
 - Anti-alias filter cutoff frequencies

b. Status Requests: Status requests shall be issued by the MCS to each ACDS Buoy system automatically at programmed intervals from 5 minutes to 60 minutes and manually by the operator. Results from the 10 most recent status requests shall be stored and displayed on the MCS GFE PC for each ACDS Buoy system.

- Pressure vessel external pressure
- Average signal level for each of the 8 hydrophone channels
- Amount of stored digitized data, storage space used
- Battery voltage and current
- Estimated amount of charge left on the battery
- Power amplifier and postamplifier status (on or off)
- PC modules power state (on/off/sleep)
- PC modules start (wake) date/time if programmed
- Postamplifier gain settings
- ADC sample rate
- Anti-alias filter cutoff frequencies

The following status requests are desired:

- Leak detector status
- Pressure vessel internal temperature and pressure

4.7.8.1 Commands: Commands initiated by the operator at the MCS GFE PC shall be recorded and displayed. As a minimum, the most recent command and time/date issued shall be maintained for each ACDS Buoy system. Displays shall be printed at operator request. The command display may be combined with the status display.

- a. ACDS PC Control: ACDS Command PC turn on at a programmed date/time, off, reset. Power amplifier on/off, and postamplifier (including power to the preamplifiers) on/off. Default state shall be system off, all units off.
- b. Modem PC Control: Modem PC turn on at a programmed date/time, off, reset. Default state shall be Modem PC off.
- c. A/D Sample Rate: Controlled by the ACDS Command PC. Set the ADC conversion frequency by selecting from a table of values. Default conversion frequency shall be 160 kHz per channel.
- d. Postamplifier: Controlled by the ACDS Command PC. Individual and collective gain control for the 8 channels. Select individual/group and gain settings from a table of values. Default gain shall be 0 dB.
- e. Time/Date: Read and set the ACDS Command PC and GFE Modem PC clocks.
- f. Anchor Release: Controlled by the ACDS Command PC or acoustic command. Activate acoustic anchor release system. Individual controls for each of two release systems.

- g. ACDS Command PC Data Recording: Select channels to record to the disk drives (any combination of the 8 channels), start and stop.
 - h. Transfer Data: Read directory of files, select files for transfer, and transfer files to/from the ACDS Command PC. The MCS PC shall facilitate transfer of files to its local hard disk drive or to a connected peripheral. Data shall transfer via the wireless LAN and the umbilical cable.
- 4.7.8.2 Status: ACDS status displayed on the MCS shall be updated via request from the operator. Time of update shall be displayed. Status display shall be in metric units. The most recent ten status displays and times shall be stored in memory for recall. Displays shall be printed at operator request.
- a. User-Selectable Parameters: Display the state or value of all user-selectable parameters. A record of all command functions described in Section 4.7.8.1 a-h shall be displayed.
 - b. Acoustic Channel Levels: Display the rms voltage level for each hydrophone averaged over an interval of 4 seconds.
 - c. Recorded Data Counter: The total amount of data recorded by the ACDS Command PC's storage system or percentage of total recording capacity used shall be displayed.
 - d. Pressure, Temperature, and Leaks: Display the ACDS subsurface pressure vessel's external pressure. Internal temperature, pressure, and leak detector status are desirable.
 - e. Battery: Display the ACDS subsurface pressure vessel's voltage, current, and estimated remaining battery charge.

5.0 INTEGRATION OF THE GFE MODEM PC104 PLUS PERSONAL COMPUTER

The offeror shall determine placement of the two PC104+ PC enclosures within the ACDS subsurface pressure vessel. Sufficient wires and connectors shall be provided to permit interconnection with both the ACDS Command PC and the GFE Modem PC (see paragraph 1.1). That is, similar wires and connectors shall be provided for the GFE Modem PC's proposed position within the vessel. The ACDS Command PC shall communicate with the GFE Modem PC via the TCP/IP network hub.

- a. Power: The ACDS system shall power the GFE Modem PC with 60 volts nominal at 0.8 amperes (max) for the duration of the 12-hour fully awake state. Battery voltage will vary depending on state of battery charge. The ACDS subsurface buoy electronics shall operate over the range 36 to 66 volts.
- b. Vertical Array Signals: The ACDS postamplifier shall provide eight single-ended signals to the Modem PC's A/D converter.
- c. Projector Signal: The ACDS power amplifier shall receive one single-ended signal from the Modem PC's D/A converter.

- d. TCP/IP: One RJ45 (100Base-T) network port shall be provided for the Modem PC.

6.0 DOCUMENTATION

- 6.1 Operation Manual: This manual shall describe in detail how to operate and deploy the ACDS system. It shall contain procedures to be used for predeployment checkout, hardware and software preparation, and detail the sequence of events for a deployment and recovery. The manual shall describe communications via the wireless LAN, umbilical cable, and the capabilities and limitations of each. It shall also describe the command, status, and data transfer functions.
- 6.2 Technical Manual: This manual (or set of manuals) shall describe in detail the design of each unit, its hardware, software, and interconnections. A functional description of all circuitry and software shall be included. A detailed list of all parts and components shall also be included. For each unit of software and hardware, the part/model number and vendors' address, telephone number, and web site shall be provided.
- 6.3 Software: Software shall be provided that integrates the various functions of the ACDS Buoy system, including but not limited to the subsurface PC and the MCS units. Licenses, original media, and owner's manuals shall be provided for all commercial operating system, application, and integration software. Custom operating system, application, and integration software shall be written in a high-level language such as C and a copy of the source codes provided to NRL. Source codes shall be delivered in hard copy and electronic formats. Offeror shall provide a written procedure to edit, compile, and execute program changes to custom software along with any development software and hardware. NRL reserves the right to use, modify, and recompile the source codes without further notice to the provider.
- 6.4 Drawings: Assembly, mechanical, block, wiring, schematic, etc. drawings shall be provided for all hardware. Drawings shall be in accordance with acceptable commercial standards.
- 6.5 Documentation Form: Three hard copies of each manual listed above shall be supplied, along with an electronic copy of each manual. Electronic copies shall be provided in Microsoft Word 97 (or higher) format.

7.0 TEST PLAN

- a. The offeror shall develop a test plan for system performance and acceptance testing. This plan shall detail system testing at the offeror's manufacturing facility of all performance specifications. The plan shall detail how the manufacturer intends to prove that the system meets the specifications as defined in the RFP.

- b. Testing of the following specifications and functions shall be incorporated in the test plan:

Power drawn by each unit within the ACDS Buoy system. This test shall include direct measurement of DC voltages and currents, including the battery packs and power supplies. Calibrated test equipment shall be used. Battery voltage and current measurements shall be taken by the ACDS Command PC via the A/D converter and compared to the direct measurements. As part of the test, battery packs shall power the ACDS Buoy system for at least 12 hours.

- c. The offeror shall certify that each pair (surface and subsurface units) of ACDS battery packs is fresh and will support a 72-hour deployment under the following conditions: The ACDS system is in the standby state for a minimum of 12 hours, powers up to its fully awake state for a minimum of 12 hours, and powers down to its standby state for a minimum of 48 hours. While in the fully awake state, the projector shall deliver full power to the transducer (or dummy load) on a 30% duty cycle and the ACDS Command PC shall maintain TCP/IP network communications with the monitor/control station via the wireless LAN.
- d. The offeror shall conduct an endurance test on one ACDS Buoy system under the conditions of 7.0c (above). This test is expected to totally deplete one pair of surface and subsurface unit battery packs.
- e. The test plan shall be delivered to the COR for approval no later than 45 days prior to start of the factory test.
- f. The offeror shall provide training on the assembly, disassembly, configuration, and operation of all aspects of the ACDS Buoy systems for up to seven (7) end-users at the factory acceptance test site.

8.0 OPTIONS

- 8.1 Acoustic Releases: The offeror shall provide four dual acoustic anchor release systems. These releases shall operate to depths of 1,000 meters or greater and shall be capable of supporting an anchor of at least 5,000 newtons force (1,000 lbs). The dual release systems shall operate independently and shall employ a backup means for anchor release via electrical signals from the ACDS subsurface unit. The acoustic release systems shall be delivered with a shipboard command unit and associated hardware. Anchors will be provided by the government and will weigh a maximum of 500 lbs.
- 8.2 MCS Industrial PC. The offeror shall provide and integrate one ruggedized industrial personal computer system into the monitor/control station. Computer shall be based on Pentium II class (or better) technology.

- 8.3 MCS Variable DC Power Supply. The offeror shall provide and integrate one DC power supply into the monitor/control station. This power supply shall be capable of delivering 36 to 60 Volts DC at the ACDS subsurface pressure vessel and sufficient current for fully active operations. Fully loaded, it shall not exceed 66% of its rated current capacity over the operating temperature range of -5° to +55°C.
- 8.4 Additional ACDS Systems. The offeror shall provide one, two, three, or four additional ACDS Buoy systems.
- 8.5 Additional Tether Assemblies. The offeror shall provide one additional 50-meter tether assembly for each delivered ACDS Buoy system.

TECHNICAL PERFORMANCE SPECIFICATION
FOR
ACOUSTIC COMMUNICATIONS MODEM PERSONAL COMPUTERS

1 November 2001

Naval Research Laboratory
4555 Overlook Avenue, SW
Washington, DC 20375-5350

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1.0 SCOPE

This specification establishes the requirements for four Acoustic Communications Modem Personal Computers (Modem PC's) to be deployed as signal processing units in submerged ocean buoys. The Modem PC shall perform the following functions: analog-to-digital conversion, signal processing, digital-to-analog conversion, data storage, TCP/IP network communications, and data transfer. Custom application and integration software shall be delivered along with commercial application and operating system (such as Linux or Windows) software packages. Software developed for the Modem PC shall run under an operating system specified by the offeror. Hardware is desired to be "commercial off-the-shelf". The offeror may propose alternative technical approaches to this performance specification.

Each Modem PC shall digitize 8 channels of analog input signals from an external (government-provided) hydrophone array and shall provide 1 channel of analog output signal to an external (government-provided) power amplifier/transducer. The Modem PC signal processing capabilities shall provide for receiving and transmitting digital information via the underwater medium. In addition, the Modem PC shall implement the command, control, and communication functions (e.g. commands, status requests, and data transfers) via the TCP/IP network port.

The offeror shall deliver custom application software capable of: (1) generating one channel of phase-coherent quadrature phase shift keyed (QPSK) signals; and (2) processing 1 to 4 selected channels of QPSK signals using adaptive channel equalization and a phase-locked loop. Primary frequency bands of interest are: (1) 2 to 5 kHz; and (2) 15 to 35 kHz. Digital signal processing techniques shall be employed that permit reliable communications in an environment with 4 to 10 multipaths covering 100 symbols. The processor shall have the computational power to process 1 to 4 selected channels of acoustic data at a rate no less than 1/10 real time for the 2 to 5 kHz band. (i.e. 1 second packet of data shall take no longer than 10 seconds to process.)

The offeror shall also provide custom application software capable of: (1) generating 1 channel of phase-incoherent (low data rate) signals; and (2) processing 1 to 4 selected channels of phase-incoherent signals. The phase-incoherent signal processing technique shall be specified by the offeror.

The custom application software shall provide for detection of specific trigger signals, recording time of the event, and the estimation and correction of doppler shift (due to relative motion between platforms). The software shall also provide for scheduling transmission of output signals and processing input signals. Processed data shall be stored to a local hard disk drive partition.

The user shall be able to list and upload processed data files via the TCP/IP network port. It is highly desirable that the user may be able to list and upload processed data files via low data-rate acoustic signaling through the underwater medium.

Modem PC hardware shall include the following commercial PC104/PC104+ computer modules: CPU, DSP, ADC, DAC, I/O, HDD, and cable interfaces. It is envisioned that digital signal processing board(s) will be required. To the extent possible, the computer hardware shall employ commercial off-the-shelf (COTS) boards and components based on PC104, PC104 Plus, and current state-of-the-art computer technologies. Alternative technical approaches that meet or exceed these specifications will be considered.

2.0 GLOSSARY OF TERMS

Acomms	Acoustic communications
ADC	Analog-to-digital converter
COR	Contracting officers representative
COTS	Commercial off the shelf
CPU	Central processing unit
DAC	Digital-to-analog converter
GB	Gigabytes (1 GB = 1024 megabytes)
GFE	Government furnished equipment
HDD	Hard disk drive
Hz	Hertz
I/O	Input/output
kHz	Kilohertz
LAN	Local area network
MB	Megabytes (1 MB = 1,048,576 bytes)
MBS	Megabytes per second
MHz	Megahertz
NRL	Naval Research Laboratory
PC104+	PC104 Plus
PS	Power supply
RFP	Request for proposal
rms	Root mean square

3.0 DETAILED DESCRIPTION

The Modem PC shall include custom application software that enables digital communications via the underwater medium.

The Modem PC shall receive 8 analog inputs, conduct digital signal processing operations on any combination of 1, 2, 3, or 4 of the 8 analog inputs, and store processed information onto its own high volume non-volatile memory. The Modem PC shall also generate one channel of analog signal for driving an external power amplifier. The Modem PC shall communicate with other networked components via a 100Base-T network hub.

3.1 Modem PC Software

3.1.1 Operating System

Each Modem PC shall be delivered with an operating system that is compatible with all hardware and software specifications. The operating system shall compile and run application and integration software written in high-level programming languages such as Fortran, C, Matlab, etc. Licenses, original media, and owner's manuals shall be provided for each PC and operating system. The same version of operating system software shall be delivered for all Modem PC's.

3.1.2 Commercial Application Software

Commercial application software shall be provided that implements the high-level functions of the Modem PC such as Matlab, DSP, and network communications packages. Licenses, original media, and owner's manuals shall be provided for each module's application software. The same version of application software shall be delivered for all Modem PC's.

3.1.3 Custom Application, Integration, and Development Software

The offeror shall demonstrate how the custom application and integration software will be implemented and describe its capabilities, characteristics, and limitations. The offeror shall deliver modeling and simulation software that provides the government with the ability to test and validate the offeror's custom application and integration software.

Custom application and integration software shall be provided that implements the various command, communication, and DSP functions of the Modem PC. Software shall be written in a high-level language such as C and a copy of source code(s) provided to NRL. Development tools, environments, and drivers required to modify/build/debug the custom software shall also be delivered.

Each Modem PC shall digitize 8 channels of analog input signals from an external (government-provided) hydrophone array and shall provide 1 channel of analog output signal to an external (government-provided) power amplifier/transducer. The Modem PC signal processing capabilities shall provide for receiving and transmitting digital information via the underwater medium. In addition, the Modem PC shall implement command, control, and communications functions (e.g. commands, status requests, and data transfers) via the TCP/IP network port.

The offeror shall deliver custom application software capable of: (1) generating one channel of phase-coherent quadrature phase shift keyed (QPSK) signals; and (2) processing 1 to 4 selected channels of QPSK signals using adaptive channel equalization and

a phase-locked loop. Primary frequency bands of interest are: (1) 2 to 5 kHz; and (2) 15 to 35 kHz. Digital signal processing techniques shall be employed that permit reliable communications in an environment with 4 to 10 multipaths covering 100 symbols. The processor shall have the computational power to process up to 4 selected channels of acoustic data at a rate no less than 1/10 real time for the 2 to 5 kHz band. (i.e. 1 second packet of data shall take no longer than 10 seconds to process.)

The offeror shall also provide custom application software capable of: (1) generating 1 channel of phase-incoherent (low data rate) signals; and (2) processing 1 to 4 selected channels of phase-incoherent signals. The phase-incoherent signal processing technique shall be specified by the offeror.

The custom application software shall provide for detection of specific trigger signals, recording time of the event, and the estimation and correction of doppler shift (due to relative motion between platforms). The software shall also provide for scheduling transmission of output signals and processing input signals. Processed data shall be stored to a local hard disk drive partition. The user shall be able to list and upload processed data files via the TCP/IP network port. It is highly desirable that the user may be able to list and upload processed data files via low data-rate acoustic signaling through the underwater medium.

The offeror shall deliver a baseline DSP application and integration software package that meets these specifications. The user shall be able to edit, compile, and download changes to this application software. The user may choose to create and download alternative software of the user's choice. Development tools, environments, and drivers required to modify/build/debug the custom software shall be delivered.

3.1.3.1 Command, Control, and Communications Software Requirements:

- a. Operational Commands: The Modem PC shall implement the following commands received via the TCP/IP network hub:
- Modem PC start (wake) date/time, shutdown, and reset
 - Modem PC wake on LAN command
 - A/D converter sample rate
 - Anti-alias filter frequency (if filter is required)
 - Read/set system time and date
 - Modem PC start/stop processing acoustic data
 - Transfer data to/from the Modem PC
 - Transmit an acoustic file via the D/A converter
 - Reset the packet counter
 - Process 1 to 4 channels of phase-coherent QPSK signals
 - Process 1 to 4 channels of phase-incoherent signals

- b. Status Requests: The Modem PC shall implement the following status request received via the network:
- Amount of stored digitized data and storage space used
 - Number of packets detected
 - Running total of packets detected

3.1.3.2 Command Details:

- a. Modem PC Control: On, off, reset. Start (wake) at a programmed date/time. Default state shall be Modem PC off.
- b. Modem PC Wake on LAN command: The Modem PC shall turn on in response to a Wake-on-LAN packet received via the TCP/IP network hub or the underwater medium.
- c. A/D Sample Rate: Set the ADC conversion frequency. Default conversion frequency shall be 160 kHz per channel.
- d. Anti-alias filter frequency: (If required) Set the filter's cutoff frequency. Default shall be 80 kHz.
- e. Time/Date: Read and set the Modem PC clock.
- f. DSP Data Processing: Select channels to process, start, and stop.
- g. Transfer Data: Read directory of files, select files for transfer, and transfer files to/from the Modem PC.
- h. Transmit an Acoustic File: Select file, number of points, DAC data rate, date, time, etc. Generate an audio signal via the DAC.

3.1.3.3 Status Details:

- a. Recorded Data Counter: The total amount of data recorded by the Modem PC or percentage of total recording capacity used.

3.1.3.4 Sequential Communications:

Each modem PC shall be capable of transmitting signal files at a programmed date and time (schedule). These signal files will be provided by the government and downloaded via the TCP/IP link. (File types will include linear frequency modulation (LFM), quadrature phase shift keyed (QPSK), etc.) Each modem shall be capable of recognizing LFM signals received via the (government-provided) acoustic array and recording the event date and time.

3.2 Environmental Requirements

3.2.1 Temperature:

- Operating: -5°C to 55°C
- Magnetic media: 5°C to 55°C
- Storage: -40°C to 65°C

3.2.2 Shock and Vibration (minimum operating specs):

- Shock: 150 G for 2 ms (half sine wave)
- Vibration: 0.67 G over 5-500 Hz (random RMS)
- 1.0 G 0-peak 5-500 Hz (swept sine RMS)

3.2.3 Electrical Power:

The Modem PC shall operate on battery power throughout its deployment. Therefore, minimum power consumption and maximum power efficiency shall be primary design goals. Battery power will be provided by an external source.

3.3 External Connections:

J1 Electrical power, 60 Vdc, 0.6 Adc, max
 J2 Network interface, RJ45 jack, 100Base-T, TCP/IP protocol
 J3 Analog signal input lines, 25-pin D jack, 8 channels
 J4 Analog signal output line, BNC jack, 1 channel

3.4 PC104 Plus Personal Computer Modules

The Modem PC module is envisioned as a PC-104/PC-104+ stack employing the following (equivalent or better) components:

- Fit within an enclosure such as Versa Logic model VL-ENCL-4A8 (The enclosure itself is not a required deliverable item)
- 266 MHz AMD K-6E CPU board, Versa Logic model EPM-CPU-7J
- 60 Watt power supply board, Real Time Dev's model IPWR104-H60W
- 2.5 inch disk drive, IBM model IC25T048ATDA05(48 GB)
- Disk drive adapter board, Real Time Devices model CMT6107
- Digital signal processing board, Bittware model HPP4-28-10
- Analog to digital converter board, 8 channels, 160 kHz
- Digital to analog converter board, 1 channel, 160 kHz

The offeror shall provide interface adapters for connecting the PC104/PC104+ module to a monitor, keyboard, mouse, floppy disk drive, CDRom, com port, parallel port, USB port, and RJ45 (Ethernet) port for stand-alone operations.

3.4.1 GFE Enclosure. The PC104/PC104+ stack shall fit within a commercial off-the-shelf (COTS) Versa Logic VL-ENCL-4A8 ruggedized PC104 enclosure to be provided as Government Furnished Equipment.

3.4.2 CPU Board. A COTS PC104+ module using power-efficient technology and capable of running Windows NT/2000 or Unix-based operating systems, application software such as Matlab, and compiling programs such as Fortran and C. 256 MB of on-board 100 MHz SDRAM shall be provided. The CPU board shall provide one TCP/IP network jack, J2, using a type RJ45 connector.

3.4.3 DSP Board. One (or more) COTS PC104+ DSP modules shall provide the signal processing function with a combined minimum of 1200 megaflops/second (MFLOPS) of processing capability. The DSP board(s) shall operate on the PC104+ PCI bus (32-bits, 33 MHz) and interface directly with the ADC board(s). A minimum of 256 MB of on-board SDRAM shall be provided.

3.4.4 Power Supply Board. A COTS PC104 module utilizing power-efficient conversion technology, overvoltage protection, overcurrent protection, and reverse voltage protection. Maximum operating current for each output shall not exceed 66% of its rated current capacity on any voltage output over the operating temperature range -5° to $+55^{\circ}$ C. Where technically feasible, fault protection shall be self-restoring after the fault has cleared. Input voltage range shall be 36 to 66 Vdc or greater. The power supply board shall receive its power via jack J1.

3.4.5 Analog-to-Digital Converter (ADC) Board. One (or more) ADC modules shall be capable of digitizing 8 single-ended analog channels with input amplitude no greater than ± 5 Volts. It is highly desirable that the ADC shall employ 16-bit Sigma-Delta conversion technology. Conversion rate and input sensitivity shall be user programmable. The ADC shall accept an (optional) external clock to control the sample rate.

One cable assembly shall connect the ADC module's input connector jack, J3, to the (government-furnished) postamplifier via a 25-pin type D male connector. Cable shall be 1 meter long. Pin assignments are provided in Table 1.

Development Risk. The ADC module may not be commercially available as a COTS Sigma-Delta type converter in a PC104 module that will fit within the Versa Logic enclosure. An external Sigma-Delta type ADC may be proposed. Alternatively, another ADC technology may be proposed that meets these specifications, fits the PC104 enclosure, and uses power-efficient technology.

- a. The sample rate for each of the 8 A/D converter channels shall be programmable from 20 kHz to 160 kHz. Minimum total throughput rate shall be 1.28 megasamples/sec.
- b. Sample initiation shall be derived from the master clock oscillator.
- c. All 8 channels shall be sampled simultaneously and synchronized to the system clock.
- d. If the A/D converter has greater than 16-bit conversion capability, only the most 16 significant bits shall be used.

3.4.6 Digital-to-Analog Converter (DAC) Board. The DAC board shall be capable of producing one single-ended analog signal with an amplitude of approximately ± 2.5 Volts. The DAC shall accept an (optional) external clock to control the conversion. The sample

rate shall be programmable from 20 kHz to 120 kHz, minimum. The DAC module may be incorporated into the ADC module as long as the input and output functions do not interfere with each other. The DAC's output shall be made available via one BNC jack, J4.

Table 1. ADC signal jack pin assignments

PIN NUMBER	FUNCTION	CHANNEL
1	HOT	CHANNEL EIGHT
2	GROUND	CHANNEL EIGHT
3	COLD	CHANNEL SEVEN
4	HOT	CHANNEL SIX
5	GROUND	CHANNEL SIX
6	COLD	CHANNEL FIVE
7	HOT	CHANNEL FOUR
8	GROUND	CHANNEL FOUR
9	COLD	CHANNEL THREE
10	HOT	CHANNEL TWO
11	GROUND	CHANNEL TWO
12	COLD	CHANNEL ONE
13	NOT USED	
14	COLD	CHANNEL EIGHT
15	HOT	CHANNEL SEVEN
16	GROUND	CHANNEL SEVEN
17	COLD	CHANNEL SIX
18	HOT	CHANNEL FIVE
19	GROUND	CHANNEL FIVE
20	COLD	CHANNEL FOUR
21	HOT	CHANNEL THREE
22	GROUND	CHANNEL THREE
23	COLD	CHANNEL TWO
24	HOT	CHANNEL ONE
25	GROUND	CHANNEL ONE

3.4.7 Disk Drives. One COTS notebook-type hard disk drive shall provide a minimum storage capability of 48 GB.

- a. Minimum data transfer rate shall be a sustained 15 MB/second.
- b. Estimated power consumption for the drive while in the active (awake) state is 2 watts. Estimated power consumption for the drive while in the inactive state is 0.25 watt.
- c. The Modem PC's operating system, integration software, application software, and non-volatile storage requirements shall be stored on the main disk drive partition (e.g drive C:). Data shall be recorded to an additional partition.

3.5 Digitized Data Storage Format

Raw and processed (base-banded, decoded, etc.) data shall be stored in a blocked format. Each file shall contain the estimated signal to noise ratio, sample rate, carrier frequency,

estimated Doppler, and processed symbol sequence. The "ground truth" bit error rate shall be included.

File Name Convention: WFMN_YYYYDDDDHHMMSS_CH

WF	Signal type
MN	Modem designator (number)
YYYY	Year
DDD	Julian day
HH	Hour
MM	Minute
SS	Second
CH	Channel designator (encode combinations of channels)

3.6 Digitized Acoustic Data Timing Functions

- a. Modem PC system timing functions shall be derived from the PC's CPU board clock oscillator. This oscillator shall be accurate to better than 1 part in 10⁶ over a 1-day period (0.1 sec per day).
- b. The Modem PC shall insert time and date into each data packet header.
- c. The Modem PC system time and date shall be user readable and settable via the TCP/IP communication link.

4.0 INTEGRATION OF THE ACOMMS MODEM PC104 PLUS PERSONAL COMPUTER

The Modem PC shall interface with other components co-located in a government-furnished underwater communications vessel. [see Attachment (1) to this RFP; ACDS system]

- a. Power: The Modem PC is expected to draw 0.6 amperes (max) at 60 volts DC while in the fully awake state.
- b. Hydrophone Array Signals: The Modem PC shall receive eight single-ended signals from the (government provided) hydrophone array.
- c. Projector Signal: The Modem PC shall deliver one single-ended signal to the (government provided) power amplifier and projector.
- d. TCP/IP: One RJ45 (100Base-T) network port shall be provided by the Modem PC.

5.0 DOCUMENTATION

- 5.1 Operation Manual: This manual shall describe in detail how to operate the Modem PC. It shall contain procedures to be used for hardware and software integration, and detail the sequence of events for communications. It shall also describe the command, status, and data transfer functions.

- 5.2 Technical Manual: This manual (or set of manuals) shall describe in detail the design of each unit, its hardware, software, and interconnection. A functional description of all circuitry and software shall be included. A detailed list of all parts and components shall also be included. For each unit of software and hardware, the part/model number and vendors' address, telephone number, and web site shall be provided.
- 5.3 Software: A software manual shall describe the various functions of the Modem PC and shall provide flow charts of the application, integration, and data processing functions. Software shall be written in a high-level language such as C and a copy of the source codes provided to NRL. Source codes shall be delivered in hard copy and electronic formats. Licenses, original media, and owner's manuals shall be provided for all operating system, application, and integration software. Offeror shall provide a written procedure to edit, compile, debug, and execute program changes along with any development software and hardware. NRL reserves the right to use, modify, and recompile the source codes without further notice to the provider. The offeror shall provide a minimum of one day of training on use of the software dedicated to the theory, application, editing, compiling, and loading. See section 6.0d.
- 5.4 Drawings: Assembly, mechanical, block, wiring, schematic, etc. drawings shall be provided for all hardware. Drawings shall be in accordance with acceptable commercial standards.
- 5.5 Documentation Form: Three hard copies of each manual listed above shall be supplied, along with an electronic copy of each manual. Electronic copies shall be provided in Microsoft Word 97 (or higher) format.

6.0 TEST PLAN

- a. The offeror shall develop a test plan for system performance and acceptance testing. This plan shall detail system testing at the offeror's manufacturing facility of all performance specifications. The plan shall detail how the manufacturer intends to prove that the Modem PC meets the specifications as defined in the RFP. The offeror shall deliver modeling and simulation software that provides the government with the ability to test and validate the offeror's custom application and integration software.
- b. The tests shall include direct measurement of DC voltages and currents for the entire assembly and major subassemblies.
- c. The test plan shall be delivered to the COR for approval no later than 45 days prior to start of the factory test.
- d. The offeror shall provide training on the assembly, disassembly, configuration, and operation of all aspects of

the Modem PC's for up to seven (7) end-users at the Naval Research Laboratory.

7.0 OPTIONS

7.1 Additional Modem PC Systems. The offeror shall provide not more than four additional Modem PC's.

CONTRACT DATA REQUIREMENTS LIST

(2 Data Items)

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 220 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503. Please DO NOT RETURN your form to either of these addresses. Send completed form to the Government Issuing Contracting Officer for the Contract/PR No. listed in Block E.

A. CONTRACT LINE ITEM NO. 0001 and 0002	B. EXHIBIT A	C. CATEGORY: TDP _____ TM _____ OTHER _____
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D. SYSTEM / ITEM	E. CONTRACT / PR NO. 71-2001-02	F. CONTRACTOR
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1. DATA ITEM NO. A003	2. TITLE OF DATA ITEM Test Plan	3. SUBTITLE
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4. AUTHORITY (Data Acquisition Document No.)	5. CONTRACT REFERENCE Attch (1) para 7, Attach (2) para 6	6. REQUIRING OFFICE
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7. DD 250 REQ DD	9. DIST STATEMENT REQUIRED	10. FREQUENCY One Time	12. DATE OF FIRST SUBMISSION See Blk 16	14. DISTRIBUTION		
8. APP CODE		11. AS OF DATE See Blk 16	13. DATE OF SUBSEQUENT SUBMISSION N/A	a. ADDRESSEE	b. COPIES	
					Draft	Final
					Reg	Repro

16. REMARKS The Contractor shall delivery a Test Plan for system performance and acceptance in accordance with Attachment (1) paragraph 7.0 and Attachment (2) paragrraph 6.0 at least 45 days prior to scheduled start of the factory test. Complete documented results of the Acceptance Test will be provided to the Government upon completion of the factory test.	15. TOTAL →
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17. PRICE GROUP
18. ESTIMATED TOTAL PRICE

1. DATA ITEM NO. A004	2. TITLE OF DATA ITEM	3. SUBTITLE
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4. AUTHORITY (Data Acquisition Document No.)	5. CONTRACT REFERENCE	6. REQUIRING OFFICE
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7 DD 250 REQ	9. DIST STATEMENT REQUIRED	10. FREQUENCY	12. DATE OF FIRST SUBMISSION	14. DISTRIBUTION		
8. APP CODE		11. AS OF DATE	13. DATE OF SUBSEQUENT SUBMISSION	a. ADDRESSEE	b. COPIES	
					Draft	Final
					Reg	Repro

16. REMARKS	15. TOTAL →
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17. PRICE GROUP
18. ESTIMATED TOTAL PRICE

G. PREPARED BY Eric J. Sogard	H. DATE	I. APPROVED BY	J. DATE
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