AD-A058 308 ROCKWELL INTERNATIONAL ANAHEIM CA AUTONETICS MARINE --ETC F/G 17/2
SHIPBOARD DATA MULTIPLEXING SYSTEM ENGINEERING DEVELOPMENT MODE--ETC(U)
MAY 78 W M GREGORY N00024-78-C-7129
UNCLASSIFIED C78-500.1/301 NL

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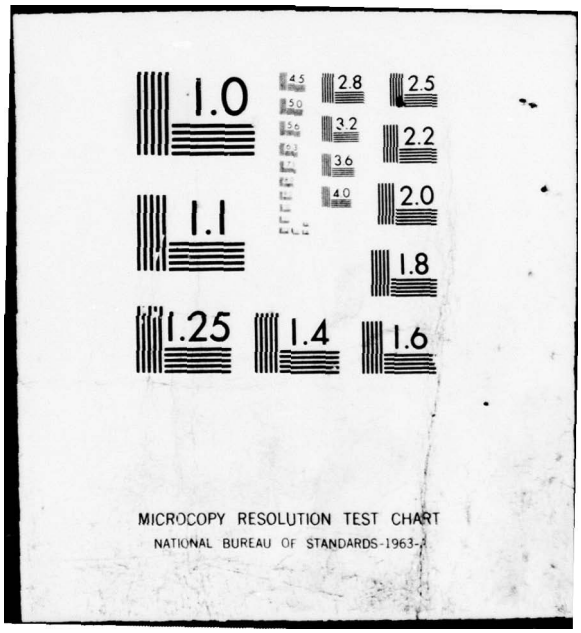
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LEVEL III

Rockwell International

C78-500.1/301

Shipboard Data Multiplexing System Engineering Development Models (SDMS-EDM).

LEVEL

SDMS/EDM

[redacted] TECHNICAL / INTERIM PROGRESS rept. no. 1,

For Period 16 Jan[redacted]-[redacted] 30 Apr[redacted]78,

PREPARED UNDER CONT[redacted] N00024-78-C-7129

for

THE DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND

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1.0 SUMMARY

This is the first monthly technical progress report submitted under Contract N00024-78-C-7129 for the development, test and delivery to the U.S. Navy, Naval Sea Systems Command, of two (2) Engineering Development Models (EDM) of a Shipboard Data Multiplexing System (SDMS). Since this is the first such report, this presentation is slightly different from that planned for future reports in that it (1) covers a longer period (4 months) and (2) it's organized to establish a technical baseline to which future reports will relate.

Activity during this reporting period is reflected in the program overview chart of Figure 1 with in process or completed efforts indicated by darkened triangles.

As reflected in the schedule overview chart, Rockwell initiated anticipatory development effort on the program in January (16th) in advance of contract award (March 9th). Subsequent to contract award, a major portion of the program efforts have been devoted to the establishment of a firm technical baseline in preparation for contract definitization and subsequent inclusion into the Dynamic Design Documents (D^3). Other efforts initiated during this period include:

(a) basic hardware definition

(b) basic hardware design

(c) software definition and design

(d) preparation of detail schedules for all EDM program activities.

As indicated in item (d) above, preparation of detail schedules is in process and will be included in the next and all subsequent progress reports.

Also, it is to be noted that in addition to the technical progress, which is CDRL Sequence No. A02V, this report will cover the progress and/or status of the following activities:

(a) Reliability Status (A005)

(b) Maintainability Status (A012)

(c) LOR Status (A02H)

(d) Technical Manual Status (A00F)

2.0 TECHNICAL PROGRESS

2.1 General

The technical progress on the SDMS-EDM for this reporting period is reflected in the Technical Proposal, T77-894/301, dated 20 April 1978. Obviously, it is impractical to summarize the content of the above document in this report. Instead, since this is the first in a series of technical progress reports, the main thrust of this submittal will be to briefly describe:

(a) The significant differences between the Technical Proposal and either prior EDM concepts, or the ADM or SA equipment; and

(b) progress or changes in approaches which are not reflected in the technical proposal.

The combination of the technical proposal and the supplementary information described above will provide the baseline for subsequent submittals.

2.2 Prime Mission Equipment

2.2.1 Traffic Controller (TC)

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

The ADM-TCU used only one tunable receiver to detect vacant channels; the EDM-TC uses two tunable receivers to increase the speed of detecting vacant channels. Two 8 x 32 polling sequence PROMs were used in the ADM-TCU, whereas the

2.2.1 (Continued)

EDM-TC uses one 8 x 256 PROM to provide greater flexibility in establishing the polling sequence. The ADM channel offer message was 10 data bits long using differential Manchester. The EDM message is 9 data bits long and uses conventional Manchester code. The EDM-TC has a local BITE indicator, the ADM-TCU had none.

B. Progress Since Technical Proposal Submittal

Preliminary power requirements have been established for the secondary voltage levels. The total primary power input is estimated to exceed the EDM specification requirement. The probable increase in power is the result of additional BITE circuitry, the change from three phase to single phase primary power, and other changes which are under consideration.

A preliminary method for selecting the TC configuration has been defined using a pre-wired strap.

2.2.2 Area Multiplexer (AM)

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

The EDM-AM will use a 3-step protocol for processing source initiated messages thus requiring only one channel offer; the ADM AM used a dual two-step protocol requiring two channel offers. The message format for EDM is 16 bit + parity conventional Manchester; the ADM used 18 bit plus parity differential Manchester. The SA-AM required 5 RMID PROMs per AMH, the EDM-AM

2.2.2 (Continued)

uses 1 PROM per AMH thus reducing the number of PROMs required to re-configure the AM/RM connectivity. A new method of reporting AM BITE data is used on EDM.

B. Progress Since Technical Proposal Submittal

Preliminary power requirements have been established for the AM.

Preliminary design of the cable controller module has been started using PROM control logic for flexibility. The encoder/decoder portion of this module has also been started. An LSI encoder/decoder chip has been evaluated and found to have a 4 bit time delay to decode a message - this is not acceptable for the SDMS-EDM system.

2.2.3 Remote Multiplexer

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

1. The EMR transfer concepts provides for a positive response from the RM to the IOM with no buffering in the TIB. This concept simplifies the TIB logic, and provides a logical approach for re-requesting. Also, it requires a continuous scan of the IOM and delays the RM response time to EMRs.
2. The EDM will use 512 x 8 message PROM instead of 256 x 8 PROM.
3. The EDM will employ bit-by-bit encoding and synchronous IØ addressing for facilitating a 30 usec IOU to IOU propagation delay.

2.2.3 (Continued)

4. The message rate monitoring mechanization will be improved.

B. Progress Since Technical Proposal Submittal

1. The RM/IOU data transfer requirements with message programming options have been mutually defined by Rockwell and the Navy/SEMCOR. A preliminary investigation into the memory size needed to implement these expanded requirements indicates that the present 4K limitation will be exceeded. Plans are to perform a more in-depth investigation during the next report period and advise/recommend accordingly.
2. It is anticipated that pending changes to the requirements for transferring IOU to IOU via the local RM, and serial interconnection of IOUs will have a significant impact on the RM design.
3. The control concepts for the externally controlled message by RMs or local EMRs have been reviewed and agreed to. However, a specification change is required to implement this agreement.

2.2.4 Input/Output Unit (IOU)

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

No significant differences. However, the following two additional items are noteworthy.

1. The EDM will employ a BITE ENABLE signal for BITE monitor as opposed to the ADM which used a special code with IOM 16 address and its sub-addresses.

2.2.4 (Continued)

2. The EDM will have two TIB modules while the ADM has one.

B. Progress Since Technical Proposal Submittal

1. Flow and block diagrams of RMH-IOU/IOM interfaces are being developed.

2. Evaluation of system redundancy together with an analysis of a common handshake LSI that can be utilized on all of the I/O modules is in process. Some of the options under consideration are: a) redundant data files for each half of one common data file for both halves, and 2) data file that can be both in the read and write modes at the same time or a file that has an exclusive read or write mode.

2.2.5 Maintenance Unit (MU) and Peripherals

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

The added MU functions for EDM are:

1. System integration support mode of operation - This function is a real time checkout of signal operation from source point to MU (sink point). This information will be displayed by a Computer Display Terminal (CDT).

2. Message update rate monitoring mechanization for EDM will be improved.

3. PROM generation and verification program is being implemented into the MU design. This program will provide a means of generating memory data for programming a PROM.

2.2.5 (Continued)

4. The ME mechanization will utilize a controller that is similar in RMH firmware design. This controller provides the ME with the capability of making N requests with γ time periods. This design implements a requirement that the AN/UYK-20 could not perform; scheduling at SDMS message rate(s).
5. The MU program will provide an expanded system interconnectivity configuration from that provided in ADM. The AMH will provide RMH interconnect configuration via MU BITE requests.

The deleted/changed MU function for EDM are:

1. The MU will not provide a SDMS Status Panel as part of the MU hardware design.
2. The MU software will be designed to provide SDMS status information to an external monitor, by interfacing the AN/UYK-20 to an IOU/IOM.

B. Progress Since Technical Proposal Submittal

1. The physical MU requirements (weight, size and power) have been estimated.
2. Preliminary supplier coordination for the MU rack and AN/UYK-20 cabinet enclosures has been initiated.
3. An initial outline of the MU program performance specification (PPS) was completed.

2.2.5 (Continued)

4. MU peripheral equipment:

(a) The AN/UYK-20 computer and the AN/USH-26(V) Magnetic Tape Unit power requirement change from 3 phase to single phase was documented by outgoing letter 78AN67406 to NAVSEC.

(b) Discussions with the Navy indicates that the first AN/UYK-20 delivery is scheduled for 6/30/78. Considering the power change and the addition of the RS 232C I/O channel, this schedule seems optimistic.

(c) A preliminary draft of the MU printer specification "DmC 1500" from Datametrics Corporation has been received. Detailed review of this specification is in progress.

(d) Information on the Computer Display Terminal (CDT) Tektronix RE 4012 has been received, review is in process.

2.2.6 System

2.2.6.1 RF Transceivers

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

No significant differences.

B. Progress Since Technical Proposal Submittal

As a result of problems uncovered during the recent investigative exercises on the ADM system at NOSC, the following R.F. module performance tests will be implemented on the EDM program:

2.2.6.1 (Continued)

1. Measure and specify the FM detector zero crossing error over full dynamic signal level range, rather than at one level only.
2. Measure and specify the $\overline{\text{XEN}}$ (enable transmit) turn-off delay for each RF module.

Work has been continuing toward finalizing the EDM VCO (Voltage Controlled Oscillator) design. Five Tx (transmit) VCO modules have been built and temperature tested with excellent results. Work is now progressing toward finalization of the local oscillator VCO EDM design.

2.2.6.2 Cables and Miscellaneous Bus Hardware

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

No significant differences.

B. Progress Since Technical Proposal Submitted

During the recent ADM investigative efforts at NOSC, San Diego, it was determined that excessive SWR (Standing Wave Ratio) existed on all five coax main cable and stub systems. The SWR was in excess of the 2:1 SWR which was used during the ADM contract. Matching networks were determined and fabricated to reduce the SWR to 1.5.1 or less. These matching networks were installed on selected taps, and resulted in improved system performance. As an example, one path had 10-15 re-requests per 1000 samples. After

2.2.6.2 (Continued)

installation of matching networks, the re-requests were reduced to 0-3 per 1000 sample intervals. Each tap and cable combination will be checked for EDM to eliminate a reoccurrence of this problem.

2.2.6.3 Battery Pack Assembly

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

No significant difference.

B. Progress Since Technical Proposal Submitted

Development of a draft of the Battery Pack specification has been started.

2.2.6.4 Power Supplies

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

The power requirements for some power supplies have been increased because of increased loads.

B. Progress Since Technical Proposal Submitted

Specifications for the EDM power supplies are in work. EMI/RFI requirements are being developed for the power supplies and the line filters.

2.2.6.5 Mechanical and Environmental Considerations

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

No significant differences.

B. Progress Since Technical Proposal Submittal

1. Analysis of the TC unit was performed to determine the thermal effects of the following:

(a) Provide TC BITE with indicator lamps.

(b) Provide single phase power.

(c) Increased wattage of the RF board.

The results of the thermal analysis indicates that there is a problem in maintaining less than 100°C junction temperature (with 50°C ambient air temperature) on certain components utilizing free convection cooling. However, by the use of dissipators on the hot components on the RF board, and/or by use of a fan(s) in the TC, the thermal requirements can be satisfied.

The above reliability model is being modified to reflect the latest RF board configuration. The final TC configuration will be based on satisfying the required MTBF.

2. Airborne noise measurements at NOSC on the SA-RM assembly have verified that changes to reduce the noise to acceptable levels will be required on the EDM system. Alternative methods are being considered.

2.2.7 Input/Output Modules (IOM)

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

No significant differences.

B. Progress Since Technical Proposal Submittal

New IOM requirements have been defined by the Navy for most IOMs. These requirements are being evaluated for feasibility, cost and potential problem areas. A preliminary review of eleven IOMs was completed during this reporting period. Table I summarizes the old and new requirements for these eleven IOMs.

The new requirements for the D.C. analog in low resolution (8 ch) IOM present a significant problem. Z_{in} scaling requirements are 10 MΩ $\pm$ 1%. Satisfaction of this scaling requirement requires the use of 0.1% precision resistors. This is impractical for large resistance values. Rockwell will request the Navy to re-evaluate this requirement.

The requirements for the additional eight IOMs will be evaluated during the next reporting period.

2.3 Test Equipment

2.3.1 Peculiar Support Equipment

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

Some equipment which was previously identified as Peculiar Support Equipment has been redesignated as Engineering Test Equipment. These include the:

TABLE I - IOM REQUIREMENT COMPARISON

O L D	N E W
DC Analog In, Low Accuracy (8-CH) 1. Zin - Differential - 1 MΩ Zin - Common Mode - 1 MΩ	DC Analog In, Low Resolution (8-CH) 1. Zin - Differential 10 ± 1% MΩ Zin - Common Mode 2.5 ± 1% MΩ
DC Analog Out, Low Accuracy (8-CH)	DC Analog Out, Low Resolution (8-CH) No Change
Synchro Input, High Accuracy 1. Accuracy, End - Point (Max.) ± 1/2 LSB ± 0.05 DEG	Synchro Input, Single Speed 1. Accuracy - ± 4.3 Minutes of Arc
Synchro Output, High Accuracy	Synchro Output, Control Devices 1. Loss of Synchro Reference Voltage
Synchro Output, High Power 1. Module to Occupy one channel.	Synchro Output, Torque Devices 1. Module may occupy two adjacent module positions. 2. Loss of Synchro Reference Voltage 3. 10-BIT Accuracy may be a problem when torque load is applied. 4. Discrete validity switch should be NØ so that switch will close when module is inserted and open if error occurs.

O L D	N E W
Disc. Out, Iso., Sw. Closure (AC & DC) 1. 4 Types of Solid-State Relays (4 Ch. each) (a) 3-140V, 10-1000 mA, 60-400 Hz (b) 3-75V, 10-400 mA, DC (c) 3-140V, 10-75 mA, DC (d) 3-140V, 10-1000 mA, DC 2. Isolation Impedance = 100 MΩ	Disc. Out, Iso, Sw. Closure (AC) 1. 1 Type of Relay (16 Channels) (a) 3-144V RMS, 10-1000 mA RMS 2. Isolation Impedance = 100KΩ Disc. Out, Iso., Sw. Closure, (DC) 1. 1 Type of Relay (16 Channels) (a) 3-150V DC, to 1-1000 mA 2. Isolation Impedance = 100KΩ
Tri-Level Dis. Out (8 Channels) 1. Isolation Impedance - 100MΩ	Tri-Level Dis. Out (8 Channels) 1. Isolation Impedance - 100KΩ 2. Transient Input Voltage - ± 1500V 3. Modified Sub-address Scheme
Tri-Level Disc. In (8 Channels) N/A	Tri-Level Disc. In (8 Channels) 1. New Subaddress Scheme 2. Max. Alarm Current - 50 ma 3. Isolation Impedance - 100 KΩ 4. Ground Fault Detection Voltage - 30V RMS 5. Ground Fault Impedance - 1KΩ 6. Supervisory Fault Sensing Voltage - 15.5V (max.)

O L D	N E W
Disc. In, Switch Closure (16 Channels) 1. Any 2 Channels Programmable via EMR 2. Voltage Range -0.8 to +0.8 VDC with current range 0.1 to 0.8 ma.	Disc. In, Switch Closure (16 Channels) 1. Any 4 Channels Programmable via EMR 2. Maximum Voltage 15 +15.5 VDC with current range 0.1 to 0.8 ma. 3. New Subaddress Scheme.
Disc. In, Iso, Voltage Level (16 Channels) 1. Two Channels for TTY 2. Any 4 Channels Programmable via EMR 3. Two Input Voltage Ranges Range 1: Zero: <1.5VDC, <1.5V Peak, <1.5V RMS; One: >3VDC, >5V Peak, >3V RMS Range 2: Zero: <15VDC, <15V Peak, <15V RMS; One: >30VDC, >50V Peak, >30V RMS 4. Isolation Impedance - 100 MΩ	Disc. In, Iso, Voltage Level (16 Channels) 1. One Channel for TTY 2. Any Channel Programmable via EMR 3. One Voltage Range Zero: <0.4VDC, <1.5VDC (Inv.), <0.5 VDC, <3V RMS, <15V RMS, <5 ma (Inv.) One: >2.4VDC, >10VDC (Inverted Logic), >5VDC, >19V RMS, >86V RMS, >20 ma (Inv.) 4. Isolation Impedance - 100KΩ 5. New Subaddress Scheme

O L D

Disc. Out, Voltage Level (16 Channels)

N E W

Disc. Out, Voltage Level (16 Channels)

1. Logic Load Sink Current, 0.4V (max.) - 16 ma
   Logic Load Source Current, 2.4V (max.) - 1.6 ma
   LED Voltage, 10 ma (max.) - 2.0 V.
   Lamp Source Voltage (max.) - 35V
   Lamp Sink Current, Continuous (max.) - 125 ma

2. Output Voltage, 16 ma Sink (max.) +0.4V
   160 ma Sink (max.) 1.0V
   10 ma Source (min.) 2.0V
   1.6 ma Source (min.) 2.4V

3. Modified Sub Address Scheme

2.3.1 (Continued)

RM Coupler

AM Simulator

RM Simulator

IOU Simulator

Module Test Fixtures

B. Progress Since Technical Proposal Submittal

Nothing to report - major efforts on these tasks have been deferred pending FY79 funding.

2.3.2 Factory Test Equipment

Nothing to report - major efforts on these tasks have been deferred until FY79.

2.4 Software Development

2.4.1 Simulation Program

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

No significant differences.

B. Progress Since Technical Proposal Submittal

Since the SDMS-EDM simulation program must be prepared using SIMSCRIPT programming language, efforts to date have concentrated on examining the simulation programming requirements relative to SIMSCRIPT use. Also, arrangements have been made for two key simulation engineers to attend the May 1978 SIMSCRIPT course titled, "The Basic Steps of Simulation, Model Building and SIMSCRIPT II.5™".

2.4.2 Operational Programs and Firmware

A. Significant Differences Between Technical Proposal and Earlier Hardware or Concepts

No significant difference.

B. Progress Since Technical Proposal Submittal

The following tasks have been accomplished:

MU - A tentative PPS outline has been developed. Work on the PPS is continuing.

RM - The major effort has been directed towards understanding and assessing the impact of various IOM message transfer requirements (NRZ and high speed serial).

3.0 RELIABILITY ($\bar{R}$)

3.1 General

Primary efforts during this reporting period were devoted to planning and organizing the tasks assignments for accomplishing the EDM $\bar{R}$ contract requirements. An $\bar{R}$/Safety Engineer and a Parts Manager were appointed. A preliminary Preferred Parts List was generated and $\bar{R}$ prediction activity started.

3.2 Reliability Management Summary

Specific tasks conducted during this initial reporting period and activities planned for the next reporting period are indicated below.

3.2.1 Reliability/Safety Management

A responsible Reliability/Safety Engineer has been assigned to the program. During this reporting period, scheduling of reliability/safety program tasks have been accomplished, review of the EDM equipment specification requirements has been initiated, EDM technical baseline data has been updated, and preliminary CDRL milestone scheduling has been completed. Activity scheduled for the next reporting period includes (1) preparation of reliability design criteria for internal distribution to SDMS designers, and (2) preparation of reliability and safety program plans.

3.2.2 Reliability/Safety Analysis

Preparation for SDMS-EDM reliability prediction activity has been started. The first prediction effort will consist of performing a series of updated MTBF prediction of the TC to evaluate effect of several alternate cooling methods on the MTBF. These predictions will

3.2.2 (Continued)

support a design tradeoff decision regarding the possible need for a cooling fan or heat dissipators within the TC. The predictions are scheduled for completion prior to a meeting with NOSC/SEMCOR on June 7, 1978.

3.2.3 Parts Reliability

An SDMS Parts Manager has been assigned. An SDMS Preferred Parts List was issued to design personnel on April 25, 1978.

Preparation of the SDMS program Parts Control Plan (CDRL A02Q) has been commenced.

3.2.4 Data Items

Nothing to report.

3.3 $\overline{R}$ Schedule Problem Narrative

Nothing to report.

3.4 $\overline{R}$ Trend Summary

Nothing to report.

4.0 INTEGRATED LOGISTICS SUPPORT

4.1 General

Preparation of the preliminary ILS plan commenced during this reporting period. This plan will cover sections 1 through 4 and is scheduled for submittal in mid June. The remaining sections of the plan will be submitted in August with the complete plan, revised to include Navy comments, to be submitted in November.

Other Logistics efforts centered around updating of the Logistic's technical baseline in preparation for contract negotiations and inclusion in D^3.

4.2 Maintainability ($\bar{M}$) Status

The SDMS-EDM maintainability program was formally initiated with a briefing presented by the $\bar{M}$ engineers to the design engineers. This briefing was intended to indoctrinate the design engineers on shipboard maintenance concepts for the purpose of stimulating a better understanding of the operational $\bar{M}$ requirements and the $\bar{M}$ program as a whole. The briefing also served to initiate lines of communication between the $\bar{M}$ and design functions.

The next major efforts on the $\bar{M}$ program is the development and distribution of $\bar{M}$ design guidelines to the design engineers and the preparation of the $\bar{M}$ program plan.

4.2.1 $\bar{M}$ Problem Summary

Nothing to report.

4.2.2 GFE $\bar{M}$ Problems

Nothing to report.

4.2.3 $\overline{M}$ Trend Summary

Nothing to report.

4.3 Level of Repair (LOR)

Activity on this task is being held in abeyance pending the availability of FY79 funding.

5.0 TECHNICAL STUDIES AND ANALYSES

The following is a listing of studies and analyses accomplished during this reporting period:

IOU to IOU Data Transfer Propagation Delay

I/O Addressing Timing Requirements

EMR Control Concepts

RM/IOU Interface Requirements

IOU/TIB/IOM Interface Requirements

IOU Power Requirements and Distributions

SA-RF Module Test Report

Preliminary Thermal Analysis to TC Unit

Preliminary Layout of TC Free Convection Air Cooled

Preliminary Layout of TC Forced Convection Cooled

6.0 MEETINGS

The following meetings were held at the Rockwell Anaheim facility:

(a) EDM Development Spec Re ew	20 Jan 1978
(b) EDM Factfinding	13, 14 & 15 Feb 1978
(c) SDMS-EDM Program Review	21 Mar 1978

6.0 (Continued)

(d) SDMS-EDM Program Review 3 Apr 1978

(e) SDMS-EDM Program Review 13 Apr 1978

(f) SDMS-EDM Program Review 27 Apr 1978

(g) SDMS-EDM Program Review 10 May 1978

The following meetings were held at NOSC, San Diego:

(a) IO/RM Requirements Review 24 Apr 1978

(b) ADM System Problems Review 27 Mar 1978

7.0 PENDING, UNRESOLVED PROBLEMS

7.1 Engineering

A. TC Cooling

B. Excessive Airborne Noise

C. CPU Size Limit of 4K

7.2 Logistics

Nothing to report.

7.3 Operations

Nothing to report.

7.4 Other

Nothing to report.

8.0 DOCUMENTS TRANSMITTED

The following SDMS-EDM related documents were transmitted to the Navy during this report period:

(a) Minutes of Program Review Mtg of 21 March 78 (A030)

(b) Minutes of Program Review Mtg of 3 April 78 (A030)

(c) Minutes of Program Review Mtg of 13 April 78 (A030)

(d) Minutes of Program Review Mtg of 27 April 78 (A030)

(e) Minutes of Program Review Mtg of 10 May 78 (A030)

(f) Cost Performance Report (A031)

(g) EDM Management Proposal (Vol. I)-Prelim.

(h) EDM Technical Proposal (Vol. II)-Prelim.

(i) EDM Cost Proposal (Vol. III)-Prelim.

(j) Letter 78AN67406, dated 23 March 1978, subject: Recommendations for GFE for the SDMS-EDM Maintenance Unit

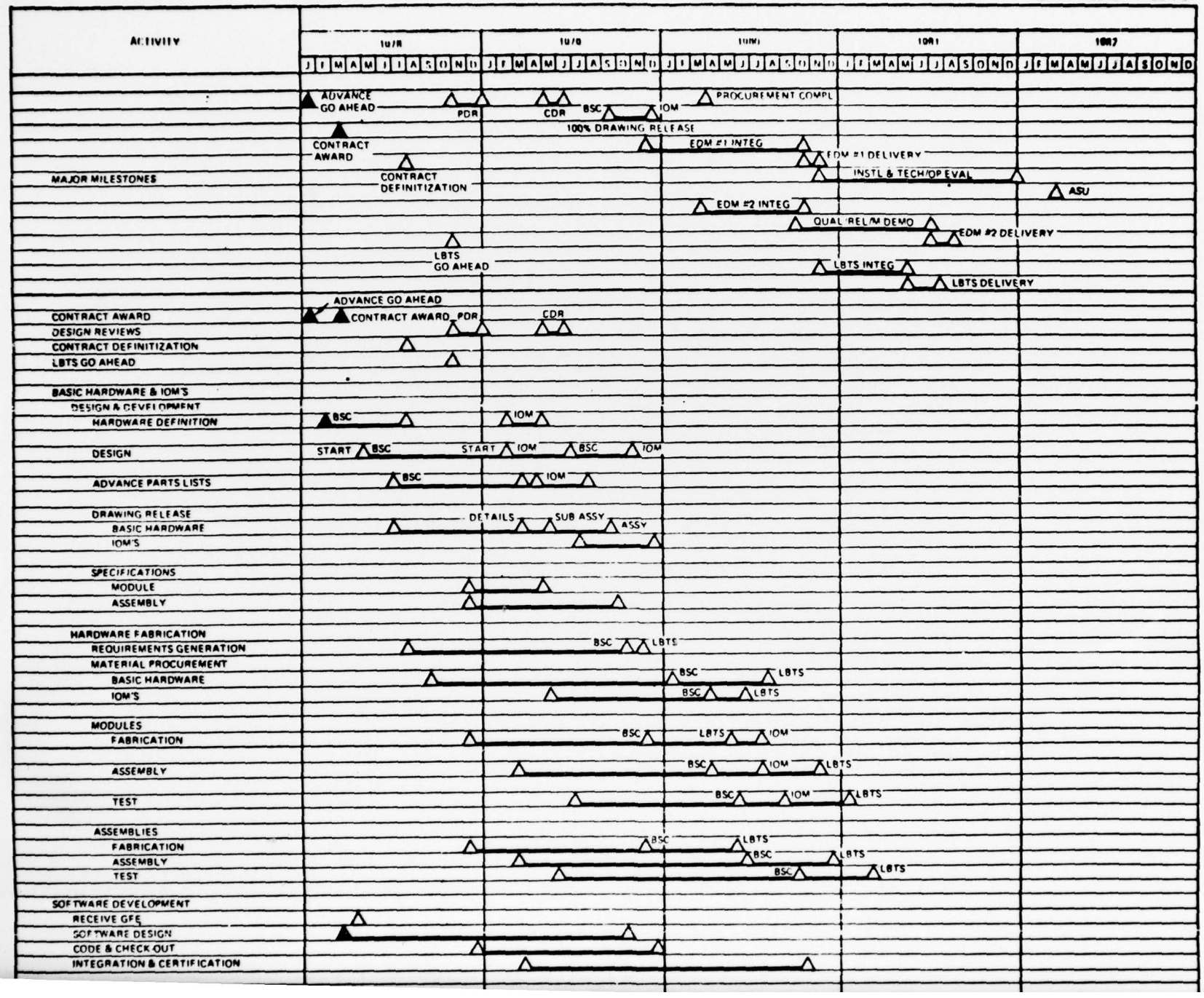
9.0 DOCUMENTS RECEIVED

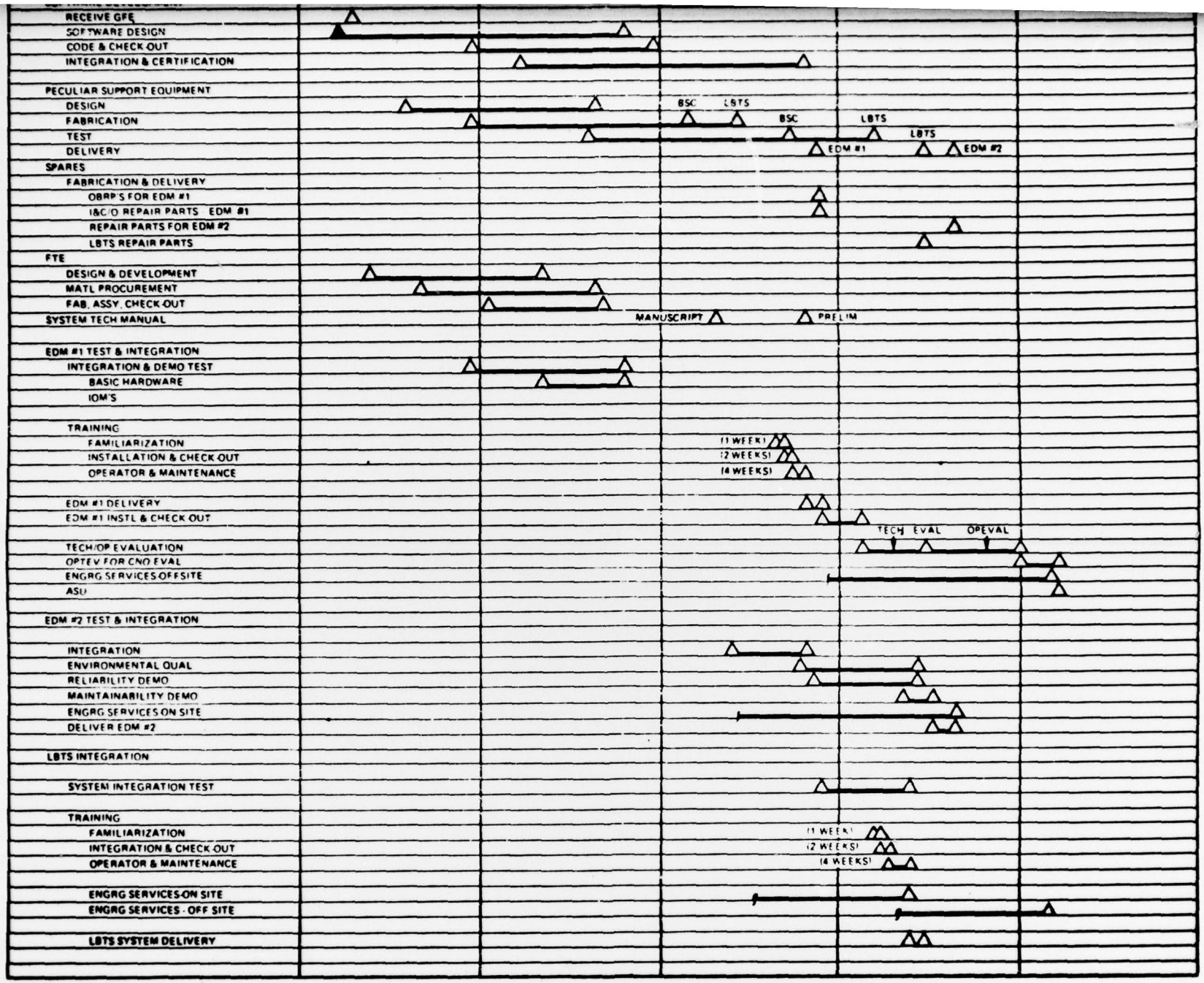
The folloiwng EDM related documents were received by Rockwell during this report period:

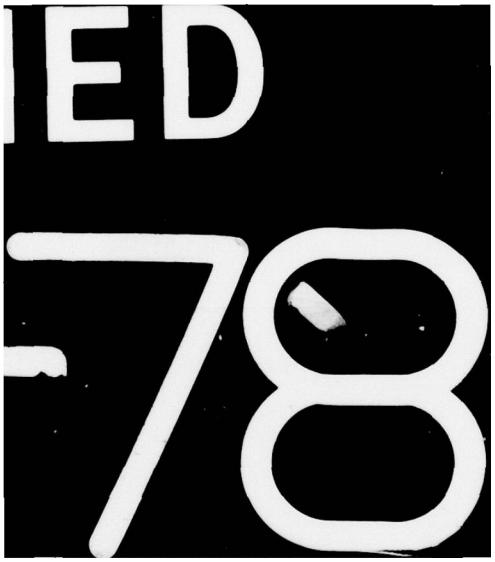
(a) MU Printer (DMC 1500) specification from Datametrics Corporation.

FIGURE 1. SDMS-EDM PROGRAM OVERVIEW

DATA AS OF 4-28-78




RECEIVE GFE
SOFTWARE DESIGN
CODE & CHECK-OUT
INTEGRATION & CERTIFICATION
PECULIAR SUPPORT EQUIPMENT
DESIGN
FABRICATION
TEST
DELIVERY
BSC
LBTS
BSC
LBTS
LBTS
EDM #1
EDM #2
SPARES
FABRICATION & DELIVERY
OBRP'S FOR EDM #1
I&C/D REPAIR PARTS EDM #1
REPAIR PARTS FOR EDM #2
LBTS REPAIR PARTS
FTE
DESIGN & DEVELOPMENT
MATL PROCUREMENT
FAB, ASSY, CHECK-OUT
SYSTEM TECH MANUAL
MANUSCRIPT
PRELIM
EDM #1 TEST & INTEGRATION
INTEGRATION & DEMO TEST
BASIC HARDWARE
IOM'S
TRAINING
FAMILIARIZATION
INSTALLATION & CHECK-OUT
OPERATOR & MAINTENANCE
(1 WEEK)
(2 WEEKS)
(4 WEEKS)
EDM #1 DELIVERY
EDM #1 INSTL & CHECK OUT
TECH EVAL
OPEVAL
TECH/OP EVALUATION
OPTEV FOR CNO EVAL
ENGRG SERVICES OFFSITE
ASU
EDM #2 TEST & INTEGRATION
INTEGRATION
ENVIRONMENTAL QUAL
RELIABILITY DEMO
MAINTAINABILITY DEMO
ENGRG SERVICES ON SITE
DELIVER EDM #2
LBTS INTEGRATION
SYSTEM INTEGRATION TEST
TRAINING
FAMILIARIZATION
INTEGRATION & CHECK-OUT
OPERATOR & MAINTENANCE
(1 WEEK)
(2 WEEKS)
(4 WEEKS)
ENGRG SERVICES-ON SITE
ENGRG SERVICES - OFF SITE
LBTS SYSTEM DELIVERY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78