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LOCKHEED ELECTRONICS COMPANY
HOUSTON AEROSPACE SYSTEMS

A Division of Lockheed Aircraft Corporation

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DRC 3200-1108
INTERFACE STUDY REPORT

Report Number 537012

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Systems Engineering Section
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TABLE OF CONTENTS

Paragraph		Page
1.0	INTRODUCTION	1
1.1	OBJECTIVE	1
1.2	BACKGROUND	1
1.3	SCOPE	1
2.0	GENERAL APPROACH	1
3.0	SYSTEM REQUIREMENTS	2
4.0	SOLUTIONS TO SATISFY THE REQUIREMENTS	2
4.1	GENERAL	2
4.2	3206-418 ADAPTER	3
4.3	CDC 3200-3800 SATELLITE COUPLER	3
4.4	PURCHASED SPECIAL INTERFACE	4
4.5	LEASE TERMINAL EQUIPMENT AND HIGHSPEED DATA LINK	4
5.0	RECOMMENDATIONS	5

LIST OF FIGURES

Figure		
1	1108-3200 COMMUNICATION SYSTEM	7
2	1108-3200 COMMUNICATION SYSTEM AND BIO-MED INPUT ON A COMMON COMPUTER CHAN	8
3	1108-3200 COMMUNICATION SYSTEM AND BIO-MED INPUT ON SEPARATE CHANNELS	9

1.0 INTRODUCTION

1.1 OBJECTIVE

The objective of this project is to analyze the requirements for the transmission of data from the Control Data Corporation (CDC) 3200 computers, I/O and Telemetry computers, to the UNIVAC 1108 Computer located in the Data Reduction Center (DRC). This report presents the analysis and recommendations to satisfy the requirements.

1.2 BACKGROUND

When it is desired to process with the UNIVAC 1108, information which resides in the CDC 3200 computer, it has been the practice to make a tape on the CDC computer and physically carry this tape to the UNIVAC 1108 computer. This has proved to be a time consuming job. With the increasing activity in the DRC, it is desirable to eliminate this task and find a more desirable and faster means of communication between the CDC 3200 computers and the UNIVAC 1108 computer.

1.3 SCOPE

This report provides a preliminary analysis of the DRC 3200/1108 Computer Communications System requirements, and gives recommended methods of satisfying the given requirements.

2.0 GENERAL APPROACH

The first objective was to obtain the complete system requirements as known by the Computation and Analysis Division (CAD) personnel. These system requirements were obtained verbally at various meetings with the CAD personnel. After the requirements were obtained several methods were determined that would yield a solution and meet all of the given requirements. Existing equipment was examined for possible

utilization in these solutions. The third and last objective was to recommend a solution that would be the most economical and fit within the time schedule of the DRC.

3.0 SYSTEM REQUIREMENTS

The system requirements which were obtained from D. H. Hay, CAD, are as follows:

- a. The system must allow the transfer of data from either the I/O computer or the Telemetry computer, to the UNIVAC 1108 computer located in the DRC. This transfer of data must be in a half duplex communication mode. Communication will occur during missions, as well as between missions.
- b. The data transfer rate must not be less than 40.8 KBS.
- c. The transfer of data must not impact the present function of either the I/O or Telemetry computer, or the UNIVAC 1108 computer during a mission.
- d. All software for the system will be handled by CAD personnel.

In addition to the above requirements, there is other information that must be considered in selecting the solution to meet these requirements. It is anticipated that both of the CDC 3200 computers will be replaced within the next 18 months. This means that the solution should be compatible with new, and as yet unknown, equipment.

Another consideration is the possible requirement for receiving Bio-Med data in the DRC from two AT&T 201-B data sets. This is not a firm requirement at this time. However, it is anticipated that it will be in the near future.

4.0 SOLUTIONS TO SATISFY THE REQUIREMENTS

4.1 GENERAL

There are four alternative solutions which would satisfy the given requirements. These alternatives involve modifying and using

existing equipment, design new equipment and lease existing equipment from various vendors. Each of the alternatives will require some special programming for both the UNIVAC 1108 and the CDC 3200 computers. Also, each alternative will require a CDC 8275 switch and at least two additional CDC 3206 data channel controllers. The four alternatives are as follows:

- a. Modify the existing 3206-418 adapter.
- b. Modify the existing CDC 3200-3800 satellite coupler.
- c. Procure an interface, designed specifically for this purpose.
- d. Lease the necessary computer terminal equipment to use the AT&T Model 301-B highspeed (40.8 KBS) data communication links.

Each of the above alternatives is discussed in the following paragraphs.

4.2 3206-418 ADAPTER

This equipment was designed and built by UNIVAC. D. H. Hay of CAD feels this equipment would not be feasible for this application because of internal timing and software problems. Presumably the timing and software problems could be solved. To solve the hardware design problems would require 3000 to 4000 manhours and an elapsed time of from 8 to 12 months. However, D. H. Hay feels that this piece of equipment is sufficiently poor to rule out its consideration for this application. Also, the modification would produce a specialized piece of equipment for which maintenance would be required. This would mean that personnel must receive specialized training for this particular piece of equipment.

4.3 CDC 3200-3800 SATELLITE COUPLER

This unit is designed to interface the CDC 3200 computer and the CDC 3800 computer. In order to use this equipment the "3800 side" of the interface must be redesigned. This would represent a major design effort since the input and output of the 1108 and 3200

are considerably different. The design and modification would require approximately 5000 manhours and an elapsed time of approximately 12 months for completion. This modification would produce a specialized piece of equipment for which maintenance personnel must be trained.

4.4 PURCHASED SPECIAL INTERFACE

An interface, designed and manufactured by Lockheed Electronics Company (LEC) to meet the given requirements, would have an estimated cost of \$13,000 for material, require 5,600 manhours and have a delivery time of 13 months. The material costs are for cabinets, trays, Philco WDL logic, power supplies and the necessary cables. The estimate of manhours includes design engineering, technician, clerical, and drafting time required to design, manufacture, and document the interface and to train maintenance personnel.

This interface will be of a very specialized nature and will be designed for a specific task. This means that the present maintenance personnel will require additional specialized maintenance training.

4.5 LEASE TERMINAL EQUIPMENT AND HIGHSPEED DATA LINK

This alternative requires only standard computer terminal equipment suitable for providing an input to the AT&T Model 301-B data communication links. This is standard equipment with the various vendors and can be leased on a monthly basis. The monthly lease fee and delivery are shown in the list below:

<u>Description</u>	<u>Monthly Lease Fee</u>	<u>Delivery</u>
1 CDC 3275 Data Set Controller	\$ 410.00	5 months
1 CDC 8275 Switch	75.00	Less than 5 months
2 CDC 3206 Data Channel Controllers	125.00	Less than 5 months
1 UNIVAC WTS with cabinet, power supply and data set interface	600.00	4 months
1 AT&T 301-B Data Communication Link	<u>165.00</u>	Less than 3 months
Total Monthly lease	\$1500.00	

As shown above, the longest lead item is the CDC equipment. However, it might be possible to improve this delivery time.

It is necessary to have a CDC 3275 data set controller specifically for this task. It is not possible to share other CDC 3275 units which presently exist in the DRC. Also, it will be necessary to have the AT&T 301-B Modems because the output of both the CDC 3275 and the UNIVAC WTS is a serial bit stream. This bit stream is clocked out of the units by the 301-B modem clock.

Since this is standard equipment with the various vendors, there will be no special maintenance problems. Maintenance contracts already exist with the proposed vendors and this would be an addition to those contracts.

5.0 RECOMMENDATIONS

The first three alternatives will require LEC design, modification and manufacturing time, in addition to the cost of the materials. These alternatives require approximately 12 months to design, modify, check, and deliver a completed interface. Since it is expected that the CDC 3200 computers will be removed within 18 months, only six months of use of the interface unit would be available. Also, at the end of the 18 months or when the CDC 3200 computers are replaced, a piece of equipment would exist that could not be used for any other tasks. Also, there would be the possibility of design problems that would extend the estimated time to complete the interface.

Since design time is at a premium, any approach requiring LEC manpower would require negotiation with LEC to assign project priorities.

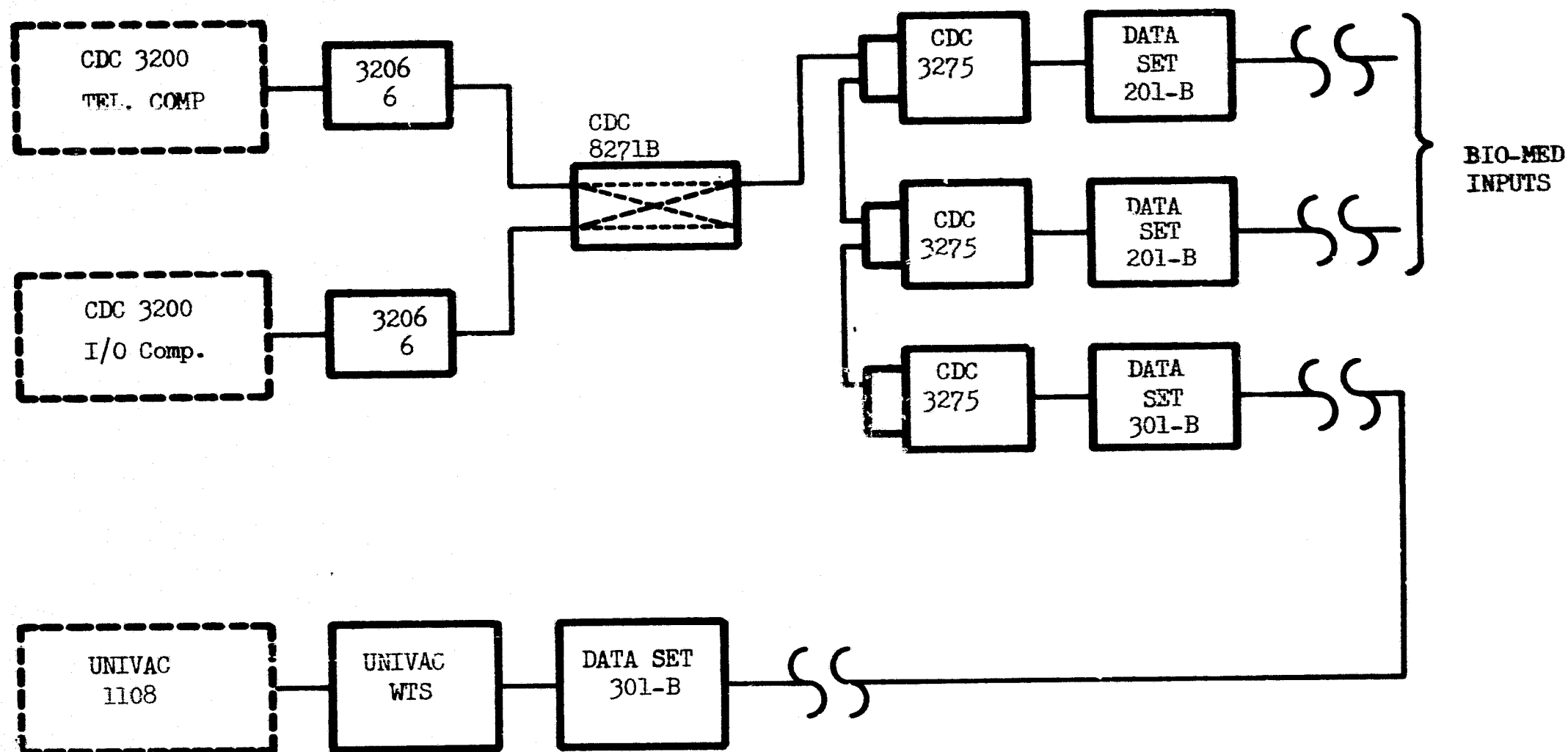
In view of the above information it is recommended that CAD lease the necessary computer terminal equipment and the AT&T 301-B data communication link. A list of the required equipment and vendors is shown in paragraph 4.5. The maximum time required to procure this

equipment is approximately 5 months. This would provide 13 months of service. At the end of this time the equipment could be used for other tasks or returned to the vendor. When the CDC 3200 computers are replaced with other processing equipment, the appropriate data set controllers for the new equipment can be leased and used in conjunction with the UNIVAC terminal equipment.

The total lease cost for a period of 13 months is \$19,500.00. This cost is for the equipment shown in Figure 1. Figure 1 shows the proposed configuration of the DRC 3200/1108 communication system. The existing equipment is shown in dotted lines. All other equipment must be obtained. This configuration will allow the UNIVAC 1108 computer to communicate with either the I/O Computer or Telemetry Computer in the DRC, but not simultaneously. Both CDC 3200 Computers will be required to use Data Channel #6. This channel is not being used at the present time.

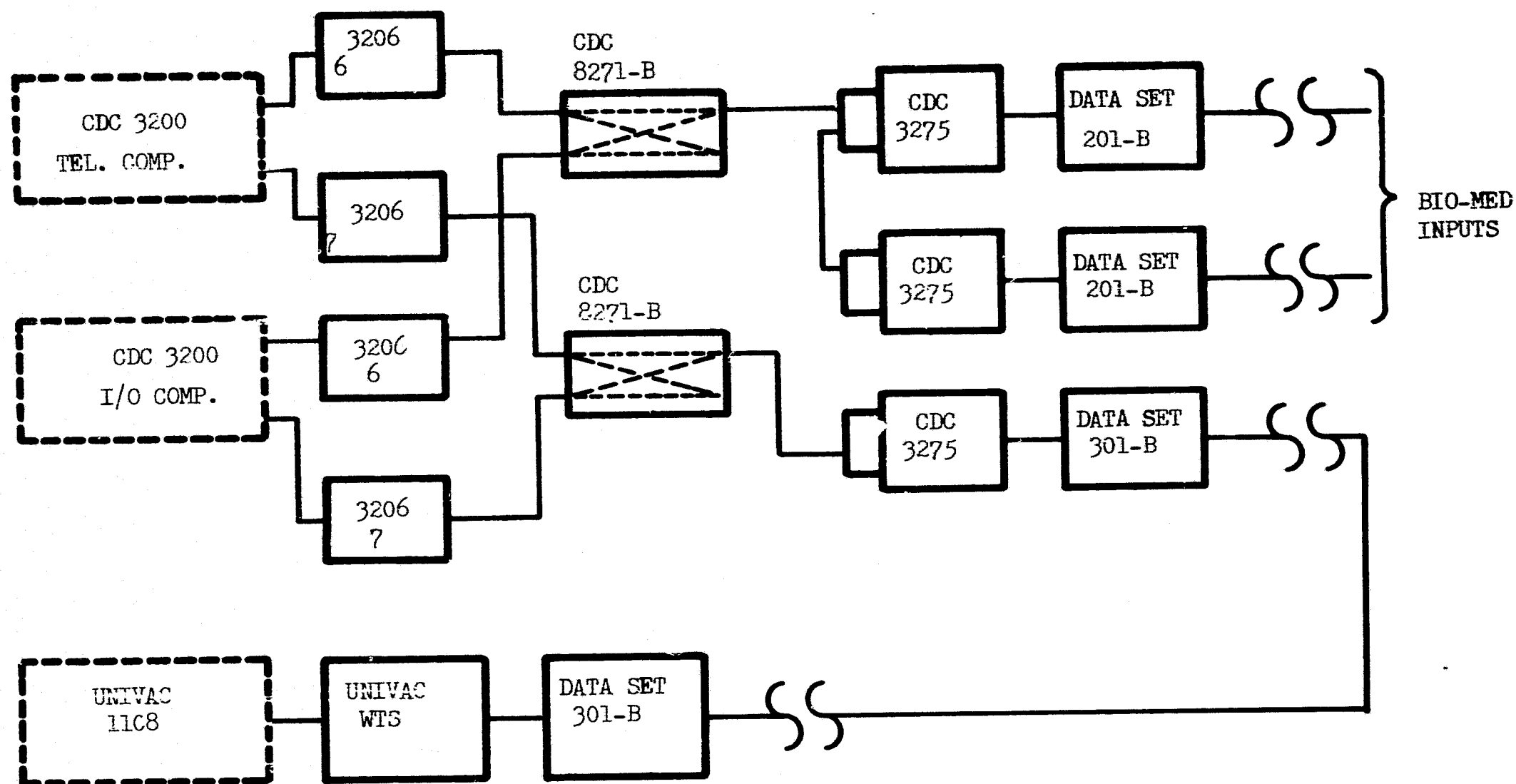
(As noted in Paragraph 3.0, another consideration in making this addition to the DRC is the possibility of the requirement to receive Bio-Med data in the DRC. The Bio-Med data would be received by either the I/O Computer or Telemetry Computer from two AT&T Model 201-B data sets. It is possible to use only one computer data channel to handle both the 3200/1108 communication and receive Bio-Med data. This configuration is shown in Figure 2. However this configuration will make the software complex.

If it becomes a firm commitment that the DRC must receive the Bio-Med data, it is recommended that the configuration shown in Figure 3 be given consideration. This configuration would relieve the software problem. However, this configuration requires two additional CDC 3206 data channel controllers and both data channel 6 and 7 on both the I/O and Telemetry computers must be used.



NOTE: Existing Equipment
shown by dotted lines.

FIGURE 2 1108-3200 COMMUNICATION SYSTEM
AND BIO-MED INPUT ON A COMMON COMPUTER CHAN



NOTE: Existing Equipment
shown by dotted lines.

FIGURE 3 1108-3200 COMMUNICATION SYSTEM AND
BIO-MED INPUT ON SEPARATE CHANNELS