# LEHMAN BROTHERS

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AT&T

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BARBARA MOAKLER BYRNE
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April 14, 1993

CC Tony Wallace
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Ms. Ilene Jacobs
Vice President & Treasurer
Digital Equipment Corporation
111 Powdermill Road
Maynard, MA 01754-1418

Dear Ilene:

You asked our views on whether Digital should be concerned about providing requested confidential competitive information if it were to choose AT&T Capital as its vendor finance partner. We understand your concern but believe that AT&T Capital and its parent AT&T would likely be amenable to providing representations to assure you that this information will be held closely by AT&T Capital and not be used for any other purpose than the vending program.

The information requested by AT&T Capital is a standard request for such a program. AT&T Capital, as you know, is being spun off from its parent this summer in an initial public offering of 15% of its stock to the public. Going forward, the Capital subsidiary will have a separate charter and Board of Directors from AT&T. AT&T is likely to retain 80% ownership to continue tax consolidation. The proposed transaction with Digital and similar transactions are important to AT&T Capital's future growth. Consequently, we believe they will be willing to provide you with protective representations.

We recommend that you request to see a copy of AT&T Capital's new corporate charter to ascertain what businesses it is prevented by charter from entering. In addition, we believe that you should request the following three representations from AT&T Capital:

- AT&T Capital will not divulge confidential Digital information to AT&T.
- AT&T Capital will not own Digital equity securities.
- AT&T Capital will restrict confidential Digital information to the business unit responsible for the administration of the Digital finance program.

We believe that AT&T Capital will provide these assurances. We further recommend that you request a representation from AT&T regarding it not owning Digital equity securities. AT&T may not be willing to grant such a representation since they might see it as setting a cumbersome precedent. However, with confidentiality assurances from Digital and given their concerns to properly position AT&T Capital competitively in the market, you may be able to reach an acceptable level of agreement on this issue.

In closing, AT&T Capital's data requests are normal in the course of business. We understand Digital's concern about potentially putting sensitive information in the hands of an entity whose majority shareholder has businesses which compete with yours. However, given the circumstances, we believe that Digital can adequately protect itself with representations from AT&T Capital and possibly AT&T itself.

Please call me if I can be of further assistance.

Sincerely,

Barbara

Barbara M. Byrne

BMB:mas

# THE DATAKIT PROGRAM

# DIGITAL EQUIPMENT CORPORATION

digital

# THE DATAKIT PROGRAM

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# CHAPTER 1

# INTRODUCTION

This document presents the program plan for the DATAKIT® program. As such, it provides an overview of the AT&T DATAKIT network, an in-depth look at the DIGITAL products being developed to provide connectivity between VAX processors and DATAKIT, and a review of relevant business management issues.

If you are not familiar with the DATAKIT network, the chronology of events leading up to the current program, or the products being developed— namely the DKS100 and the KMS11-KD, you may wish to review the sections in this chapter.

For a more detailed discussion of the DKS100 and KMS11-KD products, you can review Chapters 2 through 6.

- Chapter 2 presents a product description of the DKS100.
- Chapter 3 discusses the environment in which the DKS100 will operate. The *environment* includes the users, the hardware, and the software.
- Chapter 4 provides a description of the KMS11-KD product.
- Chapter 5 discusses the environment in which the KMS11-KD will operate. Paralleling the structure of Chapter 3, the *environment* includes the users, the hardware, and the software.
- Chapter 6 lists the deliverables that DIGITAL has agreed to provide to AT&T.

In contrast to the preceding chapters, the topics covered in Chapter 7 are related to specific business management issues. These issues are of particular importance to everyone connected with the DATAKIT program, as they are intrinsically related to the success of the DATAKIT program.

More specifically, the topics that are addressed include

- aspects of administration, such as the composition of various teams and the relationships between these teams.
- the responsibilities and the accountability of the various team members.
- the types of meetings to be held over the course of the program, the individuals who are expected to attend these meetings, and the frequency with which each type of meeting will be held.
- the types of reports to be produced by team members—from engineers to the Program Manager, the frequency with which they should be prepared, and the recipients of those reports.
- the schedule of significant milestones, included projected dates, revised dates (if applicable), and actual dates.

In addition, Chapter 7 includes a list of individuals associated with the DATAKIT program, their ALL-in-1 addresses, and their DTN numbers. It is hoped that this directory will be a handy reference for all those associated with the DATAKIT program.

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® DATAKIT is a registered trademark of AT&T Bell Laboratories.

## 1.1 What is DATAKIT?

The DATAKIT network, developed by AT&T, serves as a backbone for wide area communications, allowing geographically remote communication devices, such as computers and terminals, to be interconnected. Computers, such as VAX processors, connect to the DATAKIT network through the DATAKIT Computer Port Modules (CPMs) of a particular DATAKIT Virtual Circuit Switch (VCS) that is connected to the network; terminals and personal computers are similarly connected to DATAKIT Terminal Port Modules (TPMs).

The DATAKIT VCS® is functionally a digital virtual circuit switch that uses an internal packet switch protocol capable of switching 44,000 DATAKIT VCS packets per second. A virtual circuit is a sequence of packets joined together by a switch module (switch circuit pack) to form a transmission path between host computers and between network terminals and host computers. With a virtual circuit, bandwidth is provided on demand, whenever data is ready to send.

Virtual circuit throughput is normally limited by the speed of the interfaces and the connected devices rather than by the speed of the internal packet switch (a packet is a sequence of 18 envelopes; each envelope is a 10-bit value containing a data or address byte.) Transmission delay through the virtual circuit is extremely low, typically less than one millisecond.

Several types of trunk modules are available to interconnect DATAKIT VCS nodes:

- The high-speed trunk module provides a limited distance, high-speed communication link,operating at a speed of 8 megabits per second (Mbps).
- The DDS trunk module provides a long distance, low-speed communication link, operating at speeds of 56, 19.2, and 9.6 Kilobits per second (Kbps) over Dataphone® Digital Service (DDS) lines, or at speeds of 19.2 and 9.6 Kbps over analog private lines.
- The T1 trunk module provides a long distance, high-speed communication link, operating at a speed of 1.544 Mbps over a T1 carrier.

The following figure shows how these types of trunk modules can be used in a typical DATAKIT VCS network.

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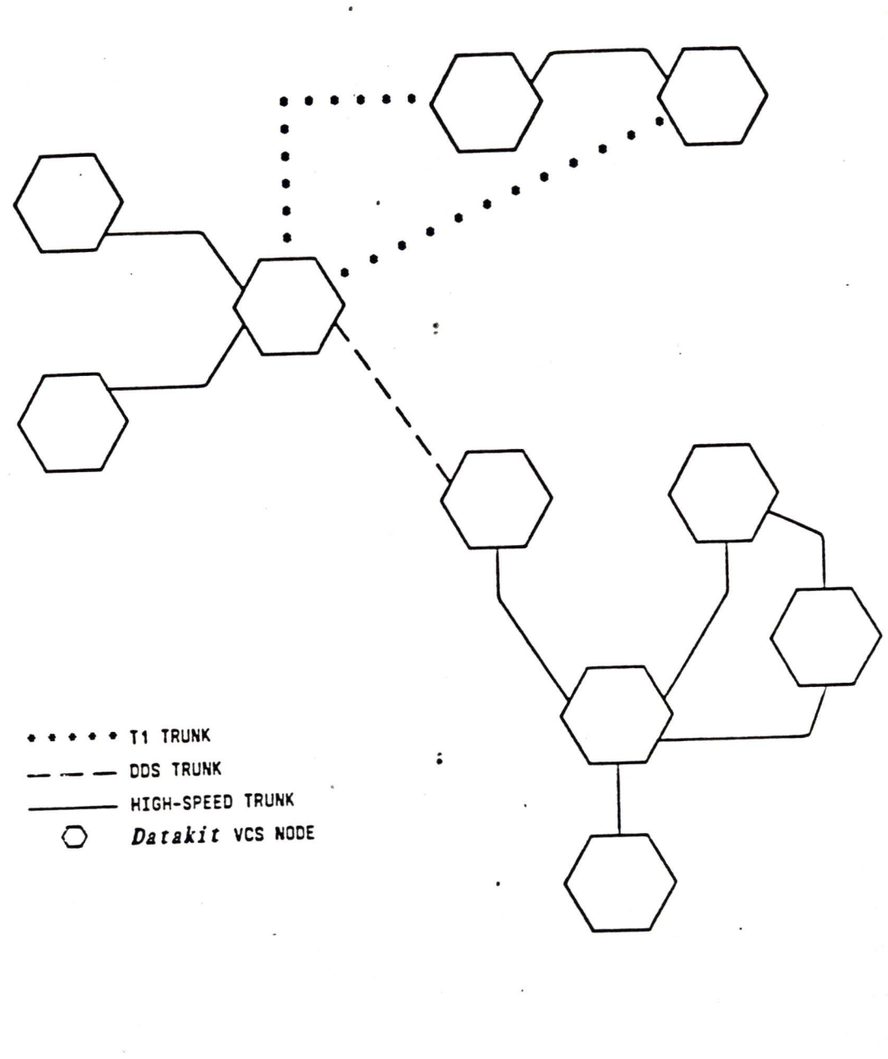
® Dataphone is a registered trademark of AT&T Bell Laboratories.

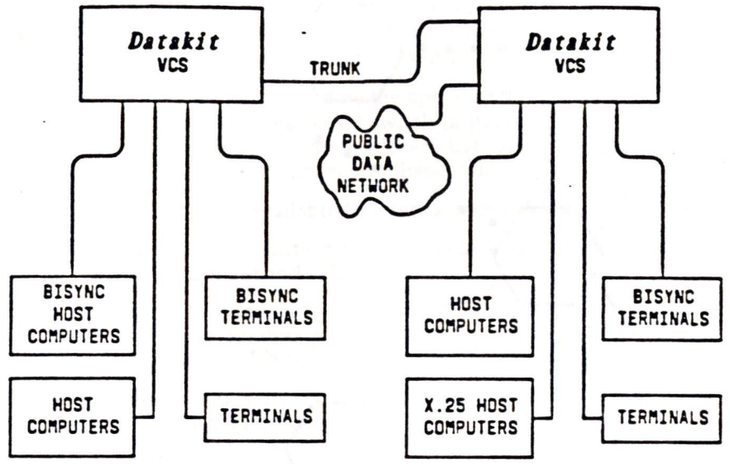


**Figure 1: Trunk Network**



With a a trunk interconnecting two DATAKIT VCS nodes, as shown in the following figure, the network terminals and host computers at both locations have access to all the host computers, regardless of location. Host computers, with the exception of X.25 hosts, can establish virtual circuits among themselves to transfer files. Within the DATAKIT VCS network, X.25 hosts can only receive calls. The network terminal users may establish virtual circuits to any of the host computers.

**Figure 2: Node Network**




Users "dial" a host a a terminal by typing the name of the host computer in response to the DESTINATION:prompt. The DATAKIT VCS translates the name to the physical address of the host computer and sets up the connection. The DATAKIT VCS also gathers network management information such as traffic statistics and usage sensitive billing data.

## 1.2 The VAX Connection: Some Background Information

To better understand the significance of the current DATAKIT project—and the associated contract between DIGITAL and AT&T, it is helpful to see the project in a historical context, rather than as an isolated event.

- *February 1984*

  AT&T approached DIGITAL with an interface board to be used with the KMS11-B to provide interconnection to DATAKIT terminal users in a VAX/UNIX environment. AT&T supplied the microcode; DIGITAL designed and built the necessary interconnections and created the KMS11-K product. It was first shipped in November 1984.



- *September 1986*

  AT&T asked DIGITAL to provide an equivalent product for the VMS environment. At that time, the only DIGITAL product that could connect VAX processors to DATAKIT in the VMS environment was the DZ11. (The capabilities of the DZ11 are quite limited.) In July 1988, the first shipments of this product, called the KMS11-KV, took place. The KMS11-KV allows users to connect to a distant VMS system via a DATAKIT network, but it does not provide access to DECnet.

- *May 1987*

  A bus-independent, high-speed interconnection for DATAKIT users into the VAX/VMS and the UNIX environments was proposed. The need for such an interconnection was clear: There was no product which allowed AT&T to use any bus other than the UNIBUS.

  At the same time, expansion of the functionality of the KMS11-KV to include DECnet was also discussed. This product, which is known as the KMS11-KD, is scheduled for First Customer Ship in May 1989. The KMS11-KE will be available at the same time to permit upgrade of the KMS11-KV sites to KMS11-KD functionality.

- *August 1988*

  The proposed bus-independent, high-speed interconnection is being developed concurrently with the KMS11-KD and is known as the DATAKIT Server 100 (DKS100), order code DEFAT. It connects DATAKIT users to multiple VAX processors running VMS or to a single VAX running UNIX. The VAX processor(s) and the DKS100 are connected across a DECnet/Ethernet/IEEE 802.3 LAN. The connections between the DKS100 and the AT&T DATAKIT is fiber optic. First Customer Ship of this product is scheduled for July 1989.

## 1.3 An Overview of the New Products

As indicated above, while the KMS11-K and and the KMS11-KV provide connectivity to the DATAKIT network, neither product fully meets the needs of AT&T and its customers. In contrast, the DKS100 and the KMS11-KD will be able to meet AT&T's current and future needs.

The following paragraphs briefly describe both the DKS100 and the KMS11-KD products. The next four chapters provide a detailed description of each product and the environment required for each.

### The DKS100

The DKS100 will not only connect VAX processors to the DATAKIT network, but will also significantly increase the number of connections between VAX processors and the DATAKIT network in UNIX environments and will significantly improve the quality of service in all environments.

The DKS100 will support up to 512 channels for both UNIX and VMS users connecting to the DATAKIT network. This product will consist of a DATAKIT Server 100 (hereafter DKS100) and associated host software. The DKS100 itself will consist of hardware, firmware, and server software. The host software will either be VMS or UNIX-based, depending on the operating system environment. In the VMS environment, multiple hosts will be able to directly access a DKS100.

The product will be designed in a modular fashion so that it will be able to support 2000 DATAKIT channels, if and when the number of channels increases or the DKS100-DATAKIT physical interface changes.

In addition, this product, will provide a definite advantage over the present KMS11-K product in that it will not only be independent of the various bus architectures provided by Digital Equipment Corporation for its family of VAX processors, but will also provide better performance.

### The KMS11-KD

The second product being developed—the KMS11-KD—will permit users running VMS on VAX processors to connect to DATAKIT and will allow VMS hosts to be part of the DECnet network. Since DECnet provides VMS users with many valuable host-to-host capabilities, such as task-to-task communication and remote file and record access, this functionality is of great importance to VMS users.

**NOTE:** While the KMS11-KV permits communication between terminals and hosts, it does not allow those hosts to be part of the DECnet network. The KMS11-KD will provide all of the functionality of the KMS11-KV plus those DECnet features that are essential to VMS users.



# CHAPTER 2

# THE DKS100 PRODUCT

The DKS100 product will consist of hardware, firmware, and software. The DKS100 will have two data links, a Network Interface (NI) port which will allow the DKS100 to be connected to an Ethernet/IEEE 802.3 Local Area Network (LAN) and a Fiber Interface (FI) port which will allow the DKS100 to be connected to a DATAKIT CPM-HS module.

The DKS100 may be used in two mutually exclusive operating system environments, those environments being UNIX System V and VMS. In both environments, however, the DKS100 essentially performs the same function. That is, it will provide connections between the DATAKIT network and a VAX processor running UNIX or VMS and will allow terminals directly connected to DATAKIT to connect to either type of node. The connections between nodes—which must be from one UNIX node to another or from one VMS node to another—will be transparent to both the users and hosts. Incoming calls from across the wide area will be received and, if the host in question is available, the call will be appropriately acknowledged. Outgoing calls from a local host will be received, and the Call Setup Procedure will be accomplished in conjunction with the call initiating host. Sessions, once set up, will be managed and maintained by a gateway which is "synchronous" in nature in that it implements interleaved flow control, if required by the Grade of Service (GOS) selected.

On power up, the DKS100 will run subsystem self-tests. All major partitions within each of the DKS100 subsystems will be thoroughly tested to provide a total test coverage goal of not less than 95%. If a fatal error is detected during self-test, the occurrence and type of error will be displayed on status LEDs. Upon execution of a self-test, the DKS100 will request a program download via the Maintenance Operation Protocol (MOP). The DKS100 may also be downloaded via a MOP "trigger" request which will prompt the DKS100 to request a program download. Upon successful download of the DKS100 server software, the DKS100 will enter operational mode. The DKS100 software is responsible for mapping requests and data received from the host into DATAKIT requests and data (and vice-versa), as well as managing the Universal Receiver Protocol (URP) and CPM-HS on behalf of the host.

The DKS100 works in conjunction with host-resident software, which is either UNIX-based or VMS-based software. The host software is responsible for formatting host-transmitted data and commands into a format suitable for delivery to a DKS100, which then converts this data into DATAKIT format.

The management interface to the DKS100 also resides on the host. This will allow a user to read the status and counters of a DKS100. The host maintains the database of DATAKIT addresses that identify the path to the remote nodes.

The DKS100, acting as a gateway between the processor and DATAKIT, will terminate Universal Receiver Protocol (URP), the AT&T protocol which is used to implement and provide sessions between a pair of communication entities. Therefore, it will interpret all Level B and Level C Control Information Units (IUs), and provide support for Grades of Service (GOS) 1 through 5. Level D control information and user data will be transported between the DKS100 and applicable hosts by using a protocol defined expressly for this service. That protocol, provisionally called "ARK," will provide guaranteed data delivery between the host and DKS100. It will manage DATAKIT's Universal Receiver Protocol (URP) and will implement end-to-end (host-host) flow control. More specifically, the functions that will be implemented will include: Host Registration, Open Channel, Close Channel,

Read Statistics, Transmit Express Data, Transmit Block Data, Transmit Character Data, and Return Flow Control Token.

The DKS100 will support error and data link traffic counters. Data link and other relevant system errors will be counted and may be requested by a remote management system. (The types of errors being counted will include parity errors, Level B framing errors, Level C framing errors and NI CRC errors.) In the event of a fatal system error or crash, the server will be capable of requesting an upline dump of the server software.



# CHAPTER 3

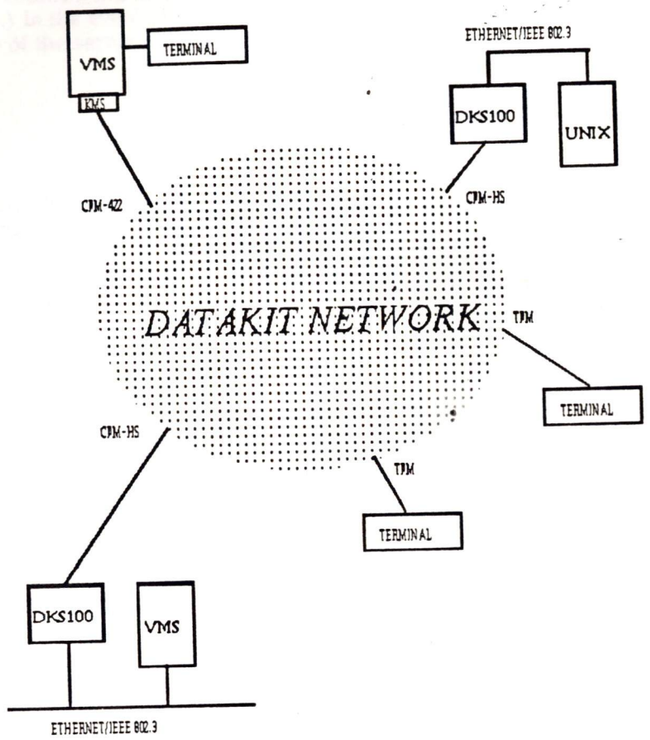
# DKS100 ENVIRONMENT

This section describes the environment in which the DKS100 hardware and software will operate. While the environment is, in part, defined in terms of the operating system for which the product will be developed, it is also described in terms of the individuals who will use the product, the context and conditions under which it will be used, and the hardware and software that will be needed so that it can be installed and work properly.

## 3.1 Users

As shown in the following figure, the DKS100 users will be individuals working in VMS or UNIX environments.

Figure 3: DKS100 Environmental Overview






### 3.1.1 UNIX

In a UNIX environment, the individuals using the DKS100 fall into several groups. For example:

- users whose terminals are directly connected to DATAKIT via Terminal Port Modules (TPMs) and who log on to VAX processors running UNIX

  All of the connections currently supported on VAX processors running DKhost will be supported on VAX processors connected to the DKS100 (DEFAT-Bx). Therefore, users in this group will be able to communicate with one other and will be able to initiate calls to the users described in the next bulleted item.

- users who are resident on VAX processors running UNIX which are connected to DATAKIT via Computer Port Modules (CPMs)

  Users in this group will be able to communicate with one other and will be able to receive calls from users in the group described above.

- users who are responsible for installing the DKS100 and associated host software

  Since this product is installed by the customer, these users will be system managers or operators.

- users who are responsible for configuring the DKS100 software

  These users will be system managers, network managers, or operators.

- users who need to diagnose and isolate DATAKIT or DKS100 problems in the field

  DKS100 diagnostic tools will be provided for these users, which will verify that the DKS100 is working properly.

### 3.1.2 VMS

In a VMS environment, the individuals using the DKS100 product fall into several groups. For example:

- users whose terminals are directly connected to DATAKIT via Terminal Port Modules (TPM) and who log on to VAX processors that are running VMS

  These users must initiate a call through DATAKIT to a particular VAX processor before logging on to that processor and using DECnet services. Once the call is accepted and the users are connected to the VAX processor, the connection through the DATAKIT network will be transparent. These users will have access to the same DECnet services as the users described in the next bulleted item.

- users connected to VAX/VMS processors who invoke DECnet services

  Unlike the users described above, these users will log on to the VAX processor directly. When establishing host-to-host communications via DECnet, the presence of DATAKIT will be transparent to users in this category.

Users in this category will be able to perform a variety of tasks requiring host-to-host communication, using such DECnet utilities as SET HOST, MAIL, PHONE, and PRINT/REMOTE. They will, for example, be able to log on to a remote host, copy files from one host to another, edit files on a remote node, and queue files for printing on another node.

- users who are responsible for installing the DKS100 software

  Since this product is installed by the customer, these users will be system managers or operators. They will install the software by invoking the VMSINSTAL procedure from a privileged account.

- users who are responsible for configuring the DKS100 software

  These users will be system managers, network managers, or operators. A configuration procedure will be provided which will prompt these users to input the DATAKIT addresses for those nodes for which DECnet connections are to be established.

- users who need to diagnose and isolate DATAKIT or DKS100 problems in the field

  DKS100 diagnostic tools will be provided for these users, in addition to statistical counters, which will verify that the DKS100 is working properly.

## 3.2 Hardware

The DKS100 hardware, a self-contained, standalone box, will come in two configurations. The first will be rack-mounted, 5.25 inches high, and fit into a standard 19-inch equipment rack. The second will be a table-top version which comes with plastic covers.

Each configuration will have three external connections:

- The first will connect the DKS100 to an AC power source.
- The second will connect the DKS100 to a DATAKIT with a DATAKIT CPM-HS computer port module via a pair of 62.5 micron fiber optic cables.
- The third will connect the DKS100 to an Ethernet/IEEE 802.3 transceiver or DELNI and then, in turn, to a host VAX. The connection between the DKS100 and transceiver or DELNI will be made with an Ethernet/IEEE 802.3 transceiver cable.

### 3.2.1 Configurations

#### 3.2.1.1 Interfaces

The DKS100 will have two interfaces: one to an Ethernet/IEEE 802.3 LAN and another to a DATAKIT CPM-HS module.



#### 3.2.1.1.1 Ethernet/IEEE 802.3

The DKS100 Ethernet/IEEE 802.3 (Network Interface) port will comply with the Ethernet and IEEE 802.3 standards.

#### 3.2.1.1.2 CPM-HS

The CPM-HS port will conform to the CPM-HS specification, described in *The Functional Specification for the DKS100*.

### 3.2.1.2 Hardware Supplied by the End User

The end user will supply

- the host-based Ethernet/IEEE 802.3 interface and all of the cables and other Ethernet equipment required to connect the DKS100 to the Ethernet/IEEE 802.3 LAN (that is, DELNI and transceiver cables).
- the 62.5 micron fiber optic cables that connect the DKS100 to the CPM-HS module in the DATAKIT. These cables must be compatible with the AT&T Technologies ODL 50 Transmitter (Part No. 1252B) and ODL 50 Receiver (Part No.1352B).

### 3.2.1.3 VAX Processors

The DKS100 will work with any of the VAX processors.

### 3.2.1.4 Power Requirements

| | |
|---|---|
| **Line Voltage:** | 100 to 120 Volts at 2 amps or 220 to 240 Volts at 1 amp |
| **Line Frequency:** | 60/50 Hz |
| **Power:** | 240 Watts (or less) of AC power. |

Note: This product is intended to be sold and distributed in the North American area only.

### 3.2.1.5 Environmental Requirements

| | |
|---|---|
| **Temperature:** | 5 ° to 50 ° C |
| **Humidity:** | 10% to 90% noncondensing |

The DKS100 will comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of U.S. FCC Rules.

#### 3.2.1.6 Safety

The DKS100 will comply with Digital Equipment Corporation's standard product safety requirements which are consistent with industry standards.

## 3.3 Software

### 3.3.1 Software Licenses

This section identifies the software licenses needed to use the DKS100 software and associated host software.

In a UNIX environment, the host must have the appropriate license(s) needed to run UNIX.

Both VAX/VMS and DECnet-VAX must be running on the VAX processor which is managing the DKS100. There are two types of DECnet licenses available: an end node license and a full function routing license. The VMS host software requires that a full function routing license be installed on a VAX processor that is "directly connected" to a DKS100.

A full function license is required when there are two circuits. Since a full function DECnet-VAX license allows the node to perform routing, additional circuits can be defined for connections to other VAX/VMS nodes.

### 3.3.2 Connectivity in the VMS Environment

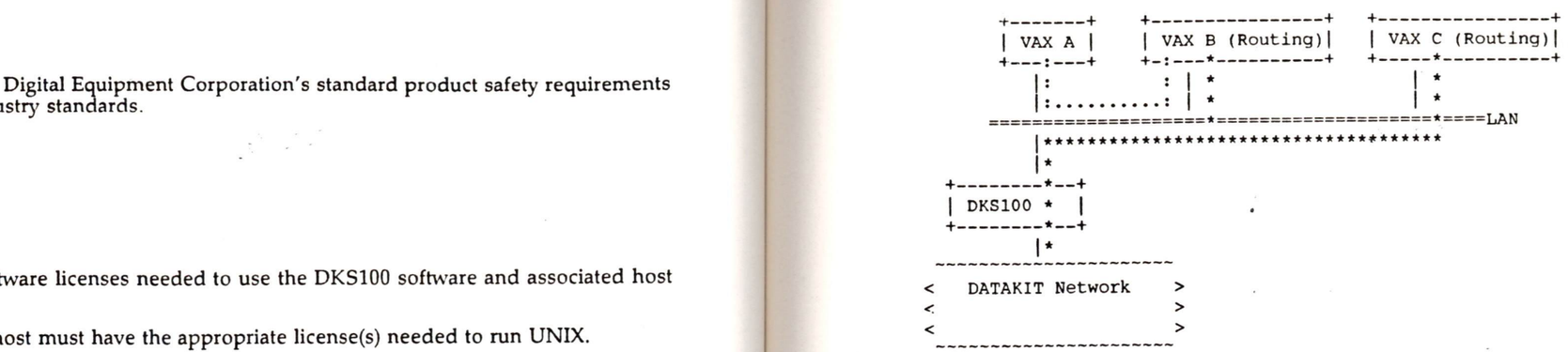
As shown in the following diagram, two types of nodes may be connected to the DKS100 for DECnet traffic: nodes which are directly-connected (routing nodes) to the DKS100 and nodes which are connected to the DKS100 via a routing node.

Given that each "directly-connected" VMS node must have a routing license and that DECnet guidelines restrict the number of routers on a single LAN, the total number of VMS nodes that can have a "direct" connection to the DKS100 for DECnet traffic is limited to 32. Each of these routing nodes will be required to run the VMS host software supplied with the DKS100 product, to allow the direct connection to the DKS100.

Since nodes communicating directly with the DKS100 for DECnet traffic can route traffic through the DKS100 on behalf of the other nodes, this restriction does not limit the total number of nodes on the LAN that may communicate across the DATAKIT with other nodes and all DECnet connections from all nodes are still transparent to the user.

In the diagram below, all of the VAX processors are running VMS/DKS host software; VAX B and VAX C are running DECnet routing software, allowing them to communicate directly with the DKS100 for DECnet circuits. VAX A is not a router, and so must connect to the DATAKIT through VAX B (or alternatively, VAX C).






A VMS host serviced by a DKS100 and a KMS11-KD based VMS host may establish direct communications across a DATAKIT network.

Because the single DKS100 manages connections on behalf of multiple hosts, it will map between the actual DATAKIT channel numbers and the hosts' view of the channel numbers. All hosts will share the common CSC channel, so the DKS100 will also ensure that a single host's messages and responses are mapped properly.

The DKS100 host will generate the DATAKIT Keepalive messages on its CSC channel. A dead host will be disconnected with no effect on the DKS100.

To establish DECnet connectivity, the VMS system manager will key in (once) the DATAKIT addresses of all the other remote VMS hosts with which the local node wants to establish direct communications. Both the local node and the remote nodes must be routers. Subsequently, each time the local node is booted, it will establish a call to those nodes.

When a call is set up, the local node receives a Routing Update from the remote node. This Routing Update contains information about all the nodes at that remote site. The local node then forwards that Routing Information over the local Ethernet. Meanwhile, the same type of information passes from the local node to the remote node. The exchange of this routing information now allows any node on one LAN to communicate over the correct path to a node on the other LAN.

The various VMS system managers must exchange information about the DATAKIT addresses of the various VMS nodes, because each system manager must manually enter the addresses of the other nodes. This only needs to be done once. If an address changes, all hosts referencing that address must be changed.

A customer may segment their network into multiple DECnet areas or not, independent of the DKS100s. Level II Routers must be running the VMS host software provided with the DKS100 if it needs to communicate with another similarly-configured Level II Router via DATAKIT.

## 3.4 Compatibility with Existing Products

As previously indicated, a VMS host connected to the DATAKIT network via a DKS100 may establish direct communications with a VMS host connected to DATAKIT via the KMS11-KD.

The design and development of the DKS100 is directly related to the design (and therefore any changes in the design) of other products. Those products include, but are not limited to, UNIX, VMS, DECnet, and DATAKIT. Therefore, it is essential that Digital obtain the current releases of all of these products at a specified time in the development cycle—more specifically, after the Top Level Design phase is finished.

The following sections specify which products (and which versions of those products) will be needed.

### 3.4.1 DATAKIT VCS Software

The DKS100 will be compatible with the DKhost software (internally known as Build 35).

### 3.4.2 UNIX

The DEFAT-Bx version of the DKS100 will be targeted for the most current release and version of UNIX System V running on VAX processors.

### 3.4.3 VAX/VMS

The DEFAT-Ax version of the DKS100 will be compatible with the most current version of VAX/VMS and DECnet at the time of the Top Level Design.

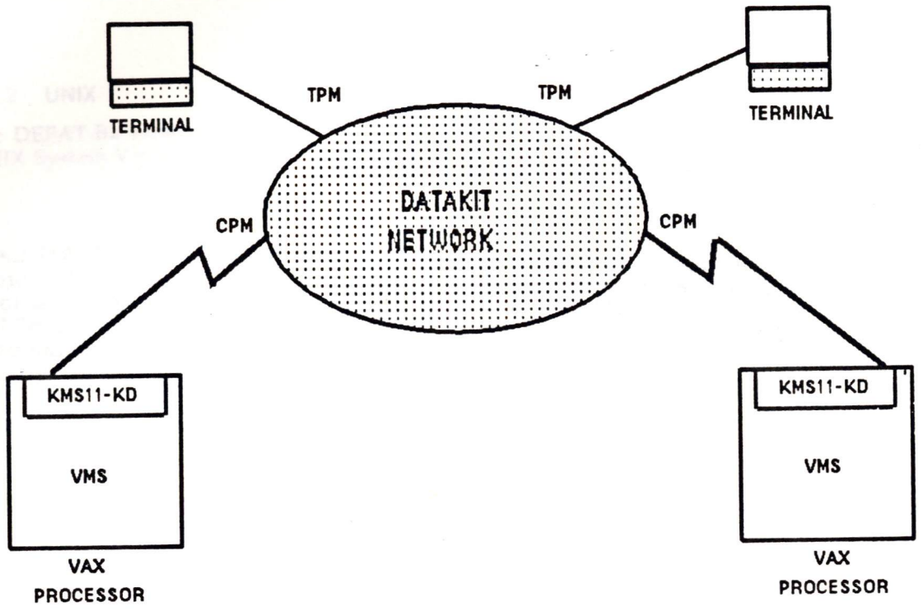


# CHAPTER 4

# THE KMS11-KD PRODUCT

The KMS11-KD, which will implement AT&T Technologies Level D protocol and the DATAKIT Call Setup Procedures, will allow users running VMS on appropriately configured and licensed VAX processors to be part of both the DATAKIT network and the DECnet network. As indicated in the following figure, users with terminals connected to the DATAKIT network will be able to call VAX/VMS systems which are connected to the DATAKIT network; users on one VAX/VMS processor can use DECnet to connect to another VAX/VMS processor when each processor has a KMS11-KD connection to DATAKIT.

**Figure 4: Architectural Overview**




DECnet will provide the following capabilities for users connected to VAX processors which are, in turn, connected to the DATAKIT network:

- Task-to-Task Communication
- Remote File and Record Access
- Terminal-to-Terminal Communication
- Network Terminal Communication
- Network Management



A brief summary of each of these services follows:

- **Task-to-Task Communication**

  Task-to-Task Communication services enable two cooperating programs on different nodes to exchange data. This is accomplished via calls to System Service routines.

- **Remote File and Record Access**

  Remote File and Record Access services allow users to perform file transfers, manipulate files residing on remote nodes, and submit command files on remote nodes for execution.

- **Terminal-to-Terminal Communications**

  Terminal-to-Terminal Communications services allow two terminal users real time communications. This service is utilized on VAX/VMS by the Phone Utility.

- **Network Terminal Communication**

  Network Terminal Communication services permit a user logged on to a local VAX/VMS host to log on to a remote VAX/VMS host. This functionality is implemented on VAX/VMS by the SET HOST command.

- **Network Management**

  Network Management services allow the user to do the following:

  — change and examine network parameters

  — examine network counters and events which are indicative of network performance

  — test links at both the data link and logical link levels

  — set and display the state of links and nodes

# CHAPTER 5

# KMS11-KD ENVIRONMENT

## 5.1 General Description of Users

The individuals using the KMS11-KD product fall into several groups. For example:

- users whose terminals are directly connected to DATAKIT via Terminal Port Modules (TPM) and who log on to VAX processors that are running VMS

  These users must initiate a call through DATAKIT to a particular VAX processor before logging on to that processor and using DECnet services. Once the call is accepted and the users are connected to the VAX processor, the connection through the DATAKIT network will be transparent. These users will have access to the same DECnet services as the users described in the next bulleted item.

- users connected to VAX/VMS processors who invoke DECnet services

  Unlike the users described in the above, the users in this group will log on to the VAX processor directly. When establishing host-to-host communications via DECnet, the presence of DATAKIT will be transparent to users in this group.

  Users in this category will be able to perform a variety of tasks requiring host-to-host communication, using such DECnet utilities as SET HOST, MAIL, PHONE, and PRINT/REMOTE. They will, for example, be able to log on to a remote host, copy files from one host to another, edit files on a remote node, and submit batch jobs on another node.

- users who are responsible for installing the KMS11-KD software

  Since this product is customer installable, these users will be system managers or operators. They will install the software by invoking the VMSINSTAL procedure from a privileged account.

- users who are responsible for configuring the KMS11-KD software

  These users will be system managers, network managers, or operators. A configuration procedure will be provided which will prompt these users to input the DATAKIT addresses for those nodes for which DECnet connections are to be established.

- users who need to diagnose and isolate DATAKIT or KMS11-KD problems in the field

  Diagnostic tools will be provided for these users, in addition to statistical counters, which will verify that the KMS11-KD product is working properly.

## 5.2 Hardware

This section identifies the hardware required for the KMS11-KD product.

### 5.2.1 KMS Module

The KMS11-K module will be required during the on-line operations of the product. This module is composed of a Digital KMC microprocessor, AT&T-developed microcode, and a KD Interface card (KDI), and an I/O distribution panel which physically connects the KMS11-K to a DATAKIT Computer Port Module (CPM 422) via two 25-pair cables (transmit and receive). The KMS11-K occupies two slots on a VAX UNIBUS.

### 5.2.2 VAX Processors

The KMS11-KD product will be supported on the following VAX processors:

- VAX 11/730, 11/750, 11/780, and 11/785
- VAX 8200 and 8250
- VAX 8500, 8530, and 8550
- VAX 8600 and 8650
- VAX 8700

Each VAX processor must be configured with a UNIBUS adapter.

Future VAX processors that are configured with a UNIBUS adapter will be supported, subject to testing.

### 5.2.3 Host Memory

In addition to the host memory required by VAX/VMS, The KMS11-KD requires sufficient host memory to contain the following:

- the KMS11-KD code
- 50K bytes for transmitting and receiving data
- 1200 bytes for accumulating statistics
- 1200 bytes for the *cmdbuf* area
- 1200 bytes for the *statbuf* area
- 16K bytes for a scratch pad area
- 8200 bytes of permanently allocated space to save a copy of the microcode in case of a power failure

**NOTE:** The above numbers are approximate.



## 5.3 Software Licenses

To use the terminal LOGIN component of the KMS11-KD, only VAX/VMS must be running on the VAX processor in which the KMS11-KD is installed. However, a DECnet license is needed to use the DECnet component of the KMS11-KD. There are two types of DECnet licenses available: an end node license or a full function routing license. The KMS11-KD product is compatible with both types.

When an end node license is installed, DECnet will not do any routing. All data packets destined for the end node are accepted but no packets will be retransmitted to another node. Another constraint of an end node license is that there can only be one active DECnet circuit for the node.

In contrast, when full license DECnet is installed, the node acts as a routing node and can retransmit data packets to another node, thereby performing routing.

## 5.4 Compatibility with Existing Products

As previously indicated, a VMS host connected to the DATAKIT network via the KMS11-KD may establish direct communications with a VMS host connected to DATAKIT via a DKS100.

The design and development of the KMS11-KD product is directly related to the design (and therefore any changes in the design) of other products. Those products include, but are not limited to, VMS, DECnet, DATAKIT, and the KMS11-K. Therefore, it is essential that Digital obtain the current releases of all of these products at a specified time in the development cycle—more specifically, after the Top Level Design phase is finished.

The following sections specify which products (and which versions of those products) will be needed:

### 5.4.1 KMC11-B Microcode

The KMS11-KD product will be compatible with Build 35 of the microcode, developed by AT&T.

### 5.4.2 DATAKIT VCS Software

The KMS11-KD will be compatible with the software for the DATAKIT (internally known as Build 35).

### 5.4.3 VAX/VMS

The KMS11-KD will be compatible with the most current version of VAX/VMS and DECnet at the time of the Top Level Design.



# CHAPTER 6

# DELIVERABLES

DIGITAL has contracted to deliver the following deliverables to AT&T in connection with the current DATAKIT project.

For the DATAKIT SERVER 100 product:

- DATAKIT SERVER 100 (DKS100)
- firmware image(s) for DKS100 processor(s)
- DKS100 Version 1.0 system software image
- Software packages for VMS or UNIX System V (including automatic installation procedures and installation verification procedures)
- DKS100 Network Installation Manual
- DKS100 Network Reference and Configuration Manual
- DKS100 Software Installation Guide for VMS or DKS100 Software Installation Guide for UNIX System V
- DKS100 Network Identification Card
- Release Notes

For the KMS11-KD product:

- the executable code for the VMS and DECnet drivers
- an executable control program
- the AT&T KMS11 microcode for the KMS11-K hardware
- KMS11-KD Software Installation Guide
- KMS11-KD Network Reference and Configuration Manual

# CHAPTER 7

# PROGRAM ORGANIZATION AND SCHEDULE

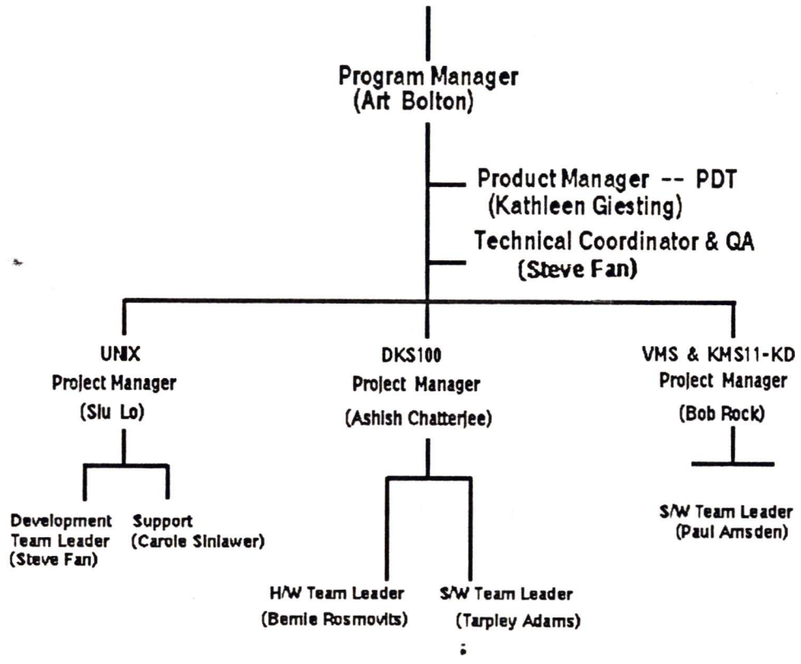
Just as the functional specifications and design of the DKS100 and KMS11-KD are of primary importance to the engineers and others developing these products, so the functional organization of the program for these products is essential to the project leaders and others involved in managing the DATAKIT program. Within Digital, the division of work for this program is as follows:

1. DKS100 Hardware and internal firmware and software - CSS/NSG
2. DKS100 UNIX host software - NJCD/SWS
3. DKS100 VMS host software - CSS/NSG
4. DKS100 - host communications - NSG/SWS jointly
5. KMS11-KD - CSS/NSG
6. Overall Program Management (per AT&T request) - NJCD/SWS

Accordingly, the following figure is provided as a graphic representation of the current program organization. Following that figure is information pertaining to the composition of various teams involved in the DATAKIT program.

The balance of the sections in this chapter provide additional information that is directly relevant to the management of the DATAKIT program—and by extension, to the success of DATAKIT program. More specifically, these sections present detailed information pertaining to the types of meetings to be held, the kinds of reports to be provided, and the reporting structure within various teams.

## 7.1 Functional Organization for Program






| | |
|---|---|
| Program Management Team: | Program Manager<br>Product Manager<br>Technical Coordinator<br>Project Managers |
| Project Management Teams: | Project Manager<br>Team Leaders |
| Product Development Team: | Program Manager<br>Product Manager<br>Manufacturing/Distribution<br>CSSE (Field Service)<br>SASE (Sustaining Engineering)<br>F & A (Finance & Administration)<br>QA (Quality Assurance)<br>Project Managers<br>Technical Publications |

## 7.2 Accountability

### PROGRAM MANAGER

| Responsible For | Accountable To |
|---|---|
| Principal Customer Interface | NJCD/SWS Management |
| Managing Program to Schedule and Budget | and CSS Management |
| Resolving Issues Involving Program Management Team Members | |
| Reviewing and Approving All Documents Provided to Customer | |
| Resolving DIGITAL Business Issues (internally) | |
| Managing Resolution of Customer Business Issues | |
| Making Final Decisions for Program | |

### PRODUCT MANAGER

| Responsible For | Accountable To |
|---|---|
| Principal Interface to Manufacturing/Distribution | Program Manager |
| Principal Interface to Services (Field Service and Sustaining Engineering) | |
| Principal Interface to Documentation | |
| Lead Product Development Team (PDT) consisting of representatives from Engineering, Manufacturing/Distribution, Field Service, Finance & Adminstration, and Marketing | |
| Resolve issues among PDT members | |
| Managing Products to Schedule and Budget | |

### TECHNICAL COORDINATOR

| Responsible For | Accountable To |
|---|---|
| Mapping to Functional Specification Commitments | Program Manager |
| Planning Program and Design Consistency | |
| Coordinating QA and Certifications | |
| Coordinating Product Testing | |



### PROJECT MANAGER

| Responsible For | Accountable To |
|---|---|
| Planning Team Activities | Program Manager |
| Delivering Tasks, Assignments, and Goals for Team Members | |
| Managing Project to Schedule and Budget | |
| Directing Necessary Tests and Certifications | |
| Ensuring Technical Accuracy and Integrity of Project Work | |

### TEAM LEADER

| Responsible For | Accountable To |
|---|---|
| Leading Technical Effort of Engineers | Project Manager |
| Consulting with Other Team Leaders | |
| Coordinating Technical Reviews of Projects | |
| Checking Technical Accuracy of Team's Work | |

### ENGINEER

| Responsible For | Accountable To |
|---|---|
| Performing Technical Work As Assigned | Team Leader |
| Participating in Project Reviews | |

## 7.3 Meetings

| Meeting | Meeting Type | Coordinated/Led By | Frequency | Attendees |
|---|---|---|---|---|
| Program Review ** | Customer | Sales/Program Manager | 2-3 Months | • Customer<br>• Sales<br>• Program Manager<br>• Product Manager<br>• Project Managers |
| Technical Working Group | Customer | SWS Project Manager | 3-4 Weeks | • Project Managers<br>• Customer Technical Project Manager<br>• Team Leaders |
| Program Review ** | DIGITAL | Program Manager | 2-3 Months | • CSS & SWS Management<br>• Program Management Team<br>• Team Leaders (as needed) |
| Program Management | DIGITAL | Program Manager | Weekly | Program Management Team:<br>• Program Manager<br>• Technical Coordinator<br>• Product Manager<br>• Project Managers |
| Product Development Team | DIGITAL | Product Manager | 1-2 Weeks | • Product Manager<br>• Project Managers<br>• MFG, CSSE, SASE, etc. |
| Project Management | CSS/SWS | Project Manager | Weekly | • Project Manager<br>• Team Leaders |
| Team Meeting | CSS/SWS | Team Leader | As Needed | • Team Leader<br>• Engineers |

** Tentative Dates for DIGITAL and Customer Reviews

| | |
|---|---|
| Week of 10/17 | DKS100 |
| Week of 1/9 | DKS100 |
| Week of 2/13 | DKS100 |
| Week of 4/3 | KMS11-KD |
| Week of 5/22 | DKS100 |



## 7.4 Reports

| Report | From | To | Frequency |
|---|---|---|---|
| Work Done/Issues | Engineer | Team Leader (cc to Project Manager) | Weekly |
| Progress/Issues | Team Leader | Project Manager | Weekly |
| Progress/Issues | Project Manager | Program Management Team | Weekly |
| Progress/Issues | Technical Coordinator/QA | Program Management Team | Weekly |
| Progress/Issues | Product Manager | Program Management and Product Development Team Members | Weekly |
| Informal Issues | Program Management Team | Management *** | Weekly |
| Progress/Issues | Program Management Team | Management *** | Bi-weekly |
| Progress | Program Manager | DEC Office of Program Management and Program Management Team | Monthly |

*** Management includes J. Groh, G. Smetana, B. Burke, J. Strathmeyer, B. King, V. Luong, V. Zagari, S. Weller, G. Helton, and Product Development Team Management.

## 7.5 Schedule

### DKS100 Hardware

| Milestones | Projected Dates | Revised Dates | Actual Dates |
|---|---|---|---|
| Functional Specification | 3/15/88 | – | 3/15/88 |
| Top Level Design | 7/8/88 | – | – |
| Final Draft | – | 7/8/88 | 7/8/88 |
| Approved | – | 7/29/88 | – |
| Detailed Design | 9/16/88 | – | – |
| Mechanical Design | 11/15/88 | – | – |
| First Build/Components | 12/21/88 | – | – |
| First Assembly | 1/3/89 | – | – |
| First Pass-Test & Debug | 2/13/89 | – | – |
| Integration-HW/SW/FS | 4/21/89 | 3/15/89 | – |
| Second Pass-Build & Assembly | 6/9/89 | 5/22/89 | – |
| Integration-Host SW-UNIX & VMS | 4/21/89 | 5/22/89 | – |
| Alpha/System Testing | 6/9/89 | 6/18/89 | – |
| Beta Testing | 7/14/89 | 6/28/89 | – |
| Acceptance Test | 7/14/89 | – | – |
| First Revenue Shipping | 7/31/89 | – | – |

### DKS100 Software

| Milestones | Projected Dates | Revised Dates | Actual Dates |
|---|---|---|---|
| Functional Specification | 3/15/88 | – | 3/15/88 |
| Top Level Design | 7/8/88 | – | – |
| Final Draft | – | 7/8/88 | 7/8/88 |
| Approved | – | 7/29/88 | – |
| Detailed Design | 9/16/88 | 9/9/88 | – |
| Code/Unit Test - Phase I | 12/23/88 | 11/7/88 | – |
| Code/Unit Test - Phase II | 1/27/89 | 1/23/89 | – |
| Integration Phase I | – | 12/19/89 | – |
| Integration Phase II | 4/21/89 | 2/13/89 | – |
| Integration w/HW | 4/21/89 | 5/22/89 | – |



## Joins Hardware Schedule

### UNIX Software

| Milestones | Projected Dates | Revised Dates | Actual Dates |
|---|---|---|---|
| Functional Specification | 3/15/88 | – | 3/15/88 |
| Top Level Design | 7/8/88 | 8/12/88 | – |
| Detailed Design | 9/16/88 | 10/7/88 | – |
| Development/Code | 12/23/88 | 12/9/88 | – |
| Unit Test | 1/27/89 | – | – |
| Integration Testing | 4/21/89 | 3/17/89 | – |
| Integration w/HW | 4/21/89 | 5/22/89 | – |

### VMS Software

| Milestones | Projected Dates | Revised Dates | Actual Dates |
|---|---|---|---|
| Functional Specification | 3/15/88 | – | 3/15/88 |
| Top Level Design | 7/8/88 | 8/12/88 | – |
| Detailed Design | 9/16/88 | 10/21/88 | – |
| Development/Code | 12/23/88 | 12/5/88 | – |
| Unit Test | 1/27/89 | 1/13/89 | – |
| Integration Testing | 4/21/89 | 3/15/89 | – |
| Integration w/HW | 4/21/89 | 5/22/89 | – |

| Milestones | Projected Dates | Revised Dates | Actual Dates |
|---|---|---|---|
| Functional Specification | 3/15/88 | – | 3/15/88 |
| Top Level Design | 7/8/88 | 8/12/88 | – |
| Detailed Design | 9/16/88 | 10/21/88 | – |
| Code & Unit Test | 12/2/88 | 1/6/89 | – |
| Integration Testing | 2/3/89 | 2/17/89 | – |
| System Testing | 2/3/89 | 3/17/89 | – |
| Alpha Testing | 3/3/89 | 4/7/89 | – |
| Beta Testing | 3/24/89 | 5/8/89 | – |
| First Revenue Shipping | 4/17/89 | 5/15/89 | – |

**Milestones to be Scheduled:**

- Acceptance Test Plan
- Acceptance Test Procedure
- Final Acceptance Test Date
- Draft Documentation (by type)
- Final Documentation (by type)



## 7.6 Directory

Additions to the following list will be made as the names, locations, and phone numbers of all the engineers and support staff are made available.

| Name | Location | DTN |
|---|---|---|
| Tarpley Adams | UHO | 264-6246 |
| Paul Amsden | UHO | 264-4914 |
| Art Bolton | HJO | 342-1988 |
| Bonnie Burke | HJO | 342-1909 |
| Ashish Chatterjee | TTB | 264-0527 |
| Steve Fan | HJO | 342-1970 |
| Kathleen Giesting | CSS::GIESTING | 264-3519 |
| John Groh | KYO | 323-4362 |
| Praveen Khullar | KYO | 323-4334 |
| Bruce King | UHO | 264-6588 |
| Siu Lo | HJO | 342-1961 |
| Van Luong Nyguyen | CSS::LUONG | 264-6560 |
| Bob Rock | UHO | 264-2919 |
| Bernie Rozmovits | UHO | 264-6191 |
| Carole Siniawer | KY0 | 323-4365 |
| Gary Smetana | UHO | 264-6332 |
| Joann Strathmeyer | UHO | 264-6542 |
| Steve Weller | HJO | 342-1912 |