Data General

Customer Documentation

Configuring Your ECLIPSE MV/9500™ Computer System

Configuring Your ECLIPSE MV/9500™ Computer System

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Notice

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Preface

This book describes the procedures for configuring the hardware options available for Data General's ECLIPSE MV/9500™ computer systems. It summarizes the basic system elements and options available, covers the rules and restrictions for adding these options, and includes examples of both initial configuration and system upgrades. This book also contains descriptions of the operation of the power supply and the interconnection of the system elements.

Organization of This Manual

Chapter 1 summarizes the basic system elements and illustrates the interconnection of these elements. This chapter also contains a basic physical description of the major components and gives system specifications.

Chapter 2 describes the operation of the power system. This includes a description of the power-up sequence.

Chapter 3 lists I/O controller options available and their corresponding hardware restrictions.

Chapter 4 describes a step-by-step procedure for configuring the system elements and I/O controller options.

Chapter 5 provides two examples of configuring systems, following the procedure described in Chapter 4. The first example describes configuring a system from scratch. The second example adds devices to the system from the first example.

Appendix A lists important data for configuring I/O controllers into a system. The information includes priority according to I/O latencies, current draw data, and operating system restrictions.

Appendix B provides forms to use in current draw calculations.

Appendix C describes the expansion chassis available for expanding the system's I/O. It includes physical description, slot organization, and accessing the expansion chassis.

Reader, Please Note:

In this manual we use the term *backplane* to mean the interconnecting printed-circuit board that passes bus and power signals to other boards. The backplane contains connectors into which the boards of the system are plugged. The backplane is the same thing as the *backpanel* in other documentation.

Related Manuals

This manual is one of a set of two technical reference manuals, designed to provide detailed technical information on the operation and configuration of the system hardware. This set is for persons with computer hardware background.

Additionally, the computer is supported by guides to its operation and its programmable features. An operator's reference manual provides basic information on operating system hardware for both nontechnical and technical audiences. Programmer's reference manuals provide a detailed description of ECLIPSE® MV/Family assembly language instructions for those with hardware and/or assembly language backgrounds.

The operator's reference, programmer's reference, and technical reference manuals are primarily concerned with the hardware aspects of the system. The following sections list these and other manuals related to system-specific hardware. Additional manuals are available for the software, operating systems, and peripherals. The procedure for ordering individual manuals or a complete list of all publications appears at the end of the Preface.

Operator's Reference Manuals

Starting ECLIPSE MV/9500™ Computer Systems, 014–001852

Describes the power–up and power–down sequences up to the point where the operating system is loaded. Lists diagnostic error codes and related messages.

Programmer's Reference Manuals

Using the ECLIPSE MV/9500™ System Control Program, 014–001854

Explains the relationship between the system control program and the rest of the computer. Tells how to operate the system control programs (SCP), run diagnostic programs, and troubleshoot system operation.

ECLIPSE/MV9500™ *System Principles of Operation Supplement,* 014–001855

Contains the assembly language programming information specific to the ECLIPSE™ MV/9500 computer. Supplements the *ECLIPSE® MV/Family (32–Bit) Systems Principles of Operation* manual.

ECLIPSE® MV/Family (32–Bit) Systems Principles of Operation, 014–001371

Explains the concepts, functions, and instruction sets of ECLIPSE MV/Family computers from an assembly language programming point of view.

ECLIPSE® MV/Family (32–Bit) Systems Instruction Dictionary, 014–001372

Explains the concepts, functions, and instruction sets of ECLIPSE MV/Family computers from an assembly language programming point of view.

ECLIPSE® MV/Family Instruction Reference Booklet, 014–000702

Pocket reference guide containing a brief summary of all ECLIPSE MV/Family assembly language instructions.

Technical Reference Manuals

Configuring Your ECLIPSE MV/9500™ Computer System, 014–001853

Describes the procedures for configuring the hardware options available for the system. It summarizes the basic system elements and options available, covers the rules and restrictions for adding these options, and includes examples of both an initial configuration and a system upgrade.

Designing Interfaces for the ECLIPSE® I/O Bus, 014–001185

Explains how to design a custom I/O interface to connect to an ECLIPSE I/O bus. Describes operation, timing constraints, and electrical characteristics of the burst multiplexor channel and I/O buses.

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Free telephone assistance is available with your warranty and with most Data General service options. Lines are open from 8:30 a.m. to 8:30 p.m., Eastern Time, Monday through Friday.

For telephone assistance outside the United States or Canada, ask your Data General sales representative for the appropriate telephone number.

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End of Preface

Contents

Chapter 1 - System Overview

Chapter 2 - Power System

Chapter 3 – I/O Hardware Options

Chapter 4 – Configuring a System

Chapter 5 – Examples of System Configurations

Appendix A – I/O Configuration Data

Appendix B – The Forms You Use

Appendix C – ECLIPSE I/O Expansion Chassis

Tables

Tables

Figures

Figure

Chapter 1
System Overview

This chapter describes the physical components and the computational elements of the ECLIPSE MV/9500™ computer system.

Physical Description

A standard-size, 10.5-inch, rack-mount chassis houses the basic computer. The chassis contains the logic cage that holds the printed circuit boards for the system and the power supply. A control panel on the front of the chassis contains the power and reset switches and some status LEDs. A voltage-nonregulated (VNR) unit on the rear of the chassis provides the initial, nonregulated input for the power supply board in the bottom of the logic cage. A fan module (containing six fans) on the left of the chassis provides cooling for the logic cage components.

Figure 1-1 illustrates the placement of the major components of the computer.

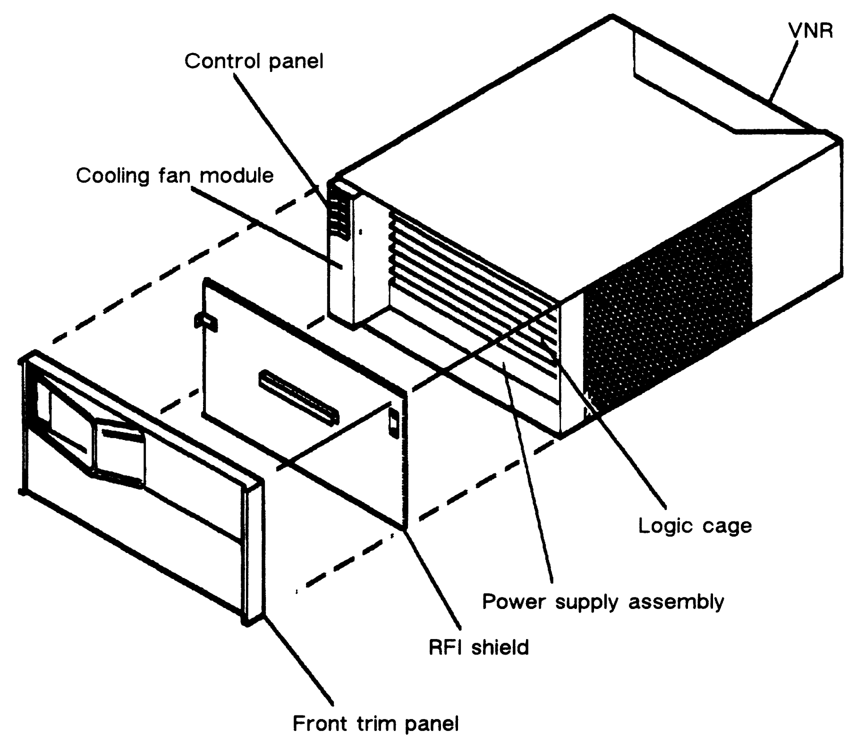

Figure 1-1 ECLIPSE MV/9500 Computer Chassis

The ECLIPSE MV/9500 computer can be mounted in any standard-size Data General cabinet. Figure 1-1 shows the main chassis without any cabinet. Figure 1-2 shows the system chassis mounted inside a cabinet.

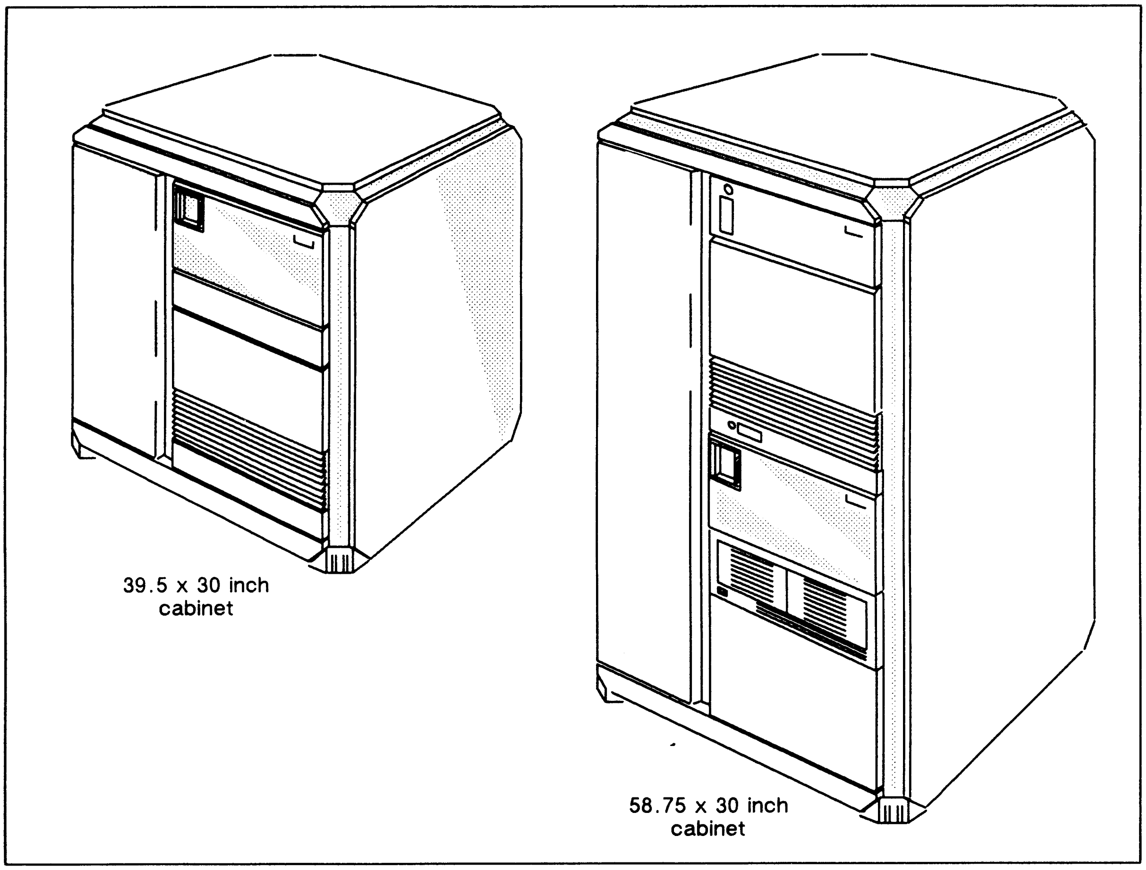

Figure 1–2 Cabinet Installation of ECLIPSE MV/9500 Computer Chassis

The physical specifications of the main chassis are listed in Table 1–1.

The Logic Cage

The logic cage is that part of the chassis that holds the logic boards. It consists of a series of horizontal slots into which the various printed circuit (PC) boards are inserted. The boards are inserted from the front of the machine and plug into connectors that distribute signals and power throughout the system. These connectors themselves reside on the backplane (backpanel), a printed circuit board running parallel to the back of the logic cage and containing the bus that interconnects the various boards.

The logic cage contains 20 pairs of horizontal slot guides. The bottom four slots (slots 1–4) are used by the power supply. Slot 5 is used for the system board. Slot 6 is not available. (The space for slot 6 is required by the system board.) The remaining 14 slots can be used for a variety of I/O controller boards.

Figure 1–3 shows the logic cage slot organization. Note that there are no slots for memory boards; the memory modules are inserted as daughter boards onto the system board and occupy space from slot 6.

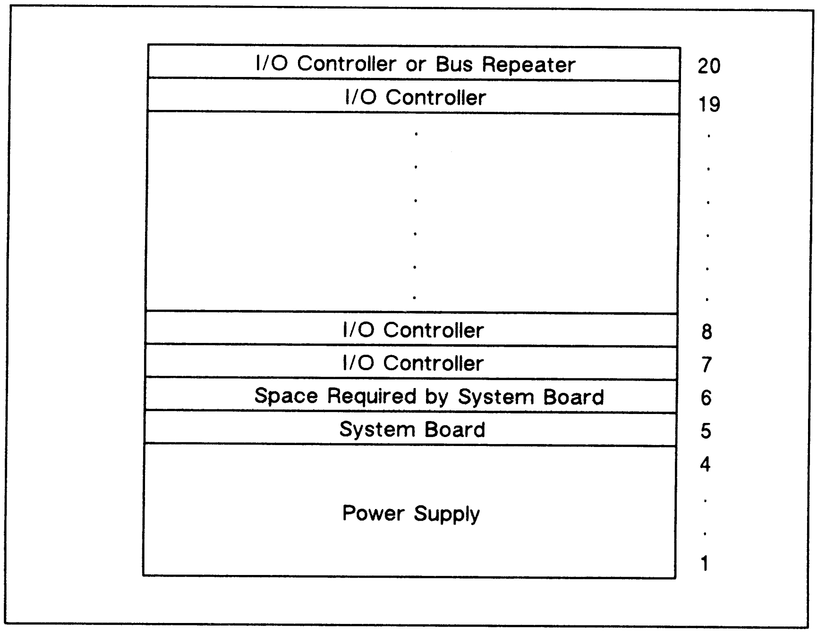

Figure 1–3 Logic Cage Slot Organization

Control Panel

The control panel contains several mechanically operated switches that control the operation of the computer. In addition to the main on–off power switch, there are other switches for system boot and reset, console reset, and lock. The front panel also has three discrete LEDs that supply status information. For detailed information on the operation of the front panel, refer to *Starting* ECLIPSE MV/9500™ *Computer Systems*.

Power Supply

The power supply contains all the hardware necessary to rectify, filter, and transform the single–phase ac input from the site power system to the dc voltages required by the system and I/O controller boards in the chassis. The power supply is controlled by an intelligent, universal power supply controller (UPSC) board inside the power supply unit.

VNR

The voltage non–regulated unit (VNR) is a separate component of the power system. Its primary function is to convert the single–phase ac input to nonregulated dc output, which is then further filtered and converted by the rest of the power system. The VNR also contains various sense and control circuitry that monitors the input status and sends this information back to the UPSC.

Cooling Fan Module

The cooling fan module mounts vertically in the chassis on the left side of the card cage (viewed from the front). It contains six box–type fans that provide airflow across the power supply, system board, and I/O controller boards.

System Console Terminal

The system console terminal (typically a basic character graphics display terminal or hard–copy console) connects directly (through pins on the backplane) to an asynchronous communications port on the diagnostic remote processor. The system console normally consists of a keyboard and either a CRT display or a character graphics printer.

The system console terminal is the operator's interface to the system. It provides a convenient way to enter commands that start, stop, and modify the system, as well as receive status and error messages. It is also the interface through which the operator implements the system control program.

System Organization

The computer, organized as a single–board assembly as shown in Figure 1–4, provides the 32–bit processing power of the ECLIPSE MV/Family architecture. The single 15 by 15 inch system board consists of a microMV processor, memory control unit (MCU), system cache, system clocks, input/output controller, and diagnostic remote processor (DRP). These subsystems are interconnected by the system bus.

microMV Processor

The microMV processor is a custom–design, high–density, CMOS VLSI microprocessor chip that provides the processing power for the computer system. The microMV runs at a 15–megahertz rate, giving a single–cycle instruction time of 66.67 nanoseconds. The microMV executes the standard ECLIPSE MV/Family 32–bit instruction set, generating the logical addresses, translating the logical addresses to physical addresses, and performing arithmetic and logical data manipulations. A 64–bit wide data bus provides the data link between microMV elements. A 32–bit wide address bus provides physical memory addressing up to 4.3 gigabytes. An internal 2–kilobyte cache provides fast–access interim storage, direct mapped, and with automatic write–through to system memory. The microMV has four inputs for receiving interrupts. Three of these inputs are maskable; the other is nonmaskable. The microMV also incorporates the time–slice timer portion of the system's architectural clocks.

System Memory

The system memory provides the physically addressed memory storage for the computer. It consists of a memory control unit (MCU) on the system board and up to four memory modules that connect to the system board.

Memory Control Unit (MCU)

The MCU provides timing, error checking and correction, dynamic RAM refresh and sniffing, and memory control. A single gate array implements the MCU functions. It controls addressing and data accesses to the dynamic memory arrays and also performs the error checking and correction for the 64–bit wide bus data. The ERCC facility corrects both single– and double–bit errors (except for double–bit soft errors).

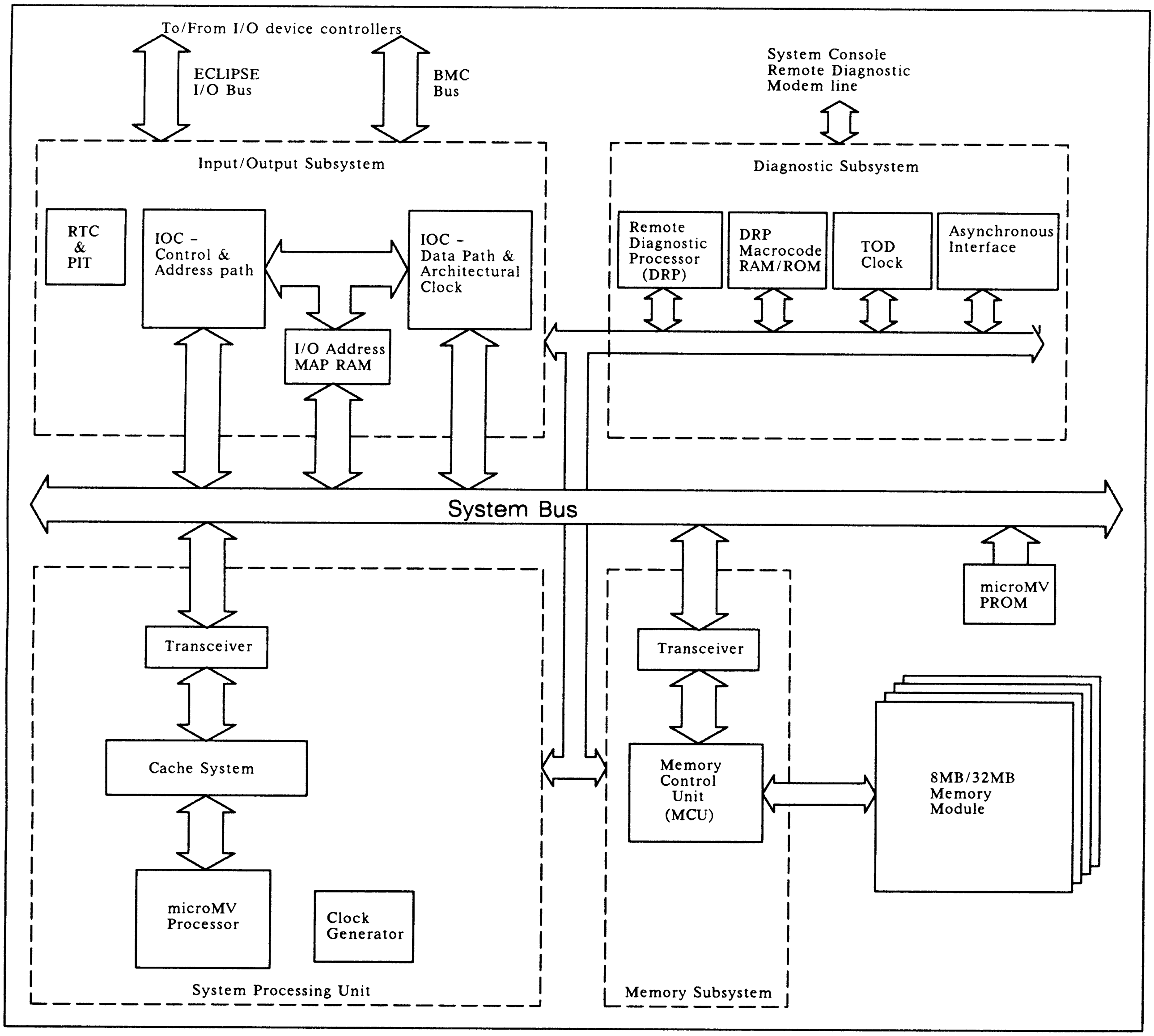

Figure 1–4 System Board Organization

The MCU can access memory in four ways: quad–word read, quad–word write, block read, and read–modify write.

Memory Modules

The memory modules are daughter boards that connect to the system board via connectors. The modules consists of arrays of dynamic RAMs controlled by the memory control unit (MCU). Functionally, the memory arrays connect to the system bus through a set of latches and transceivers associated with the MCU. Each memory module provides either 8 or 32 megabytes of physical memory depending on whether 1– or 4–megabit RAM chips are used. Both capacities of modules may be mixed in a system. With a maximum of four memory modules, the total memory capacity per system ranges from 32 to 128 megabytes, depending on the capacity of the RAM chips used. The memory cycle time for read/writes is 333.33 nanoseconds.

System Bus

The system bus is an address/data bus allowing communications between the main subsystems elements. The bus is internal to the system board and consists of a 32–bit, bidirectional address bus and a 64–bit data bus and associated control signals. The bus supports multiple requestors and an address space of up to 4.3 gigabytes. The maximum bandwidth for the bus is 60 megabytes per second.

Architectural Clocks

The term architectural clocks encompasses three clocks: a time–slice timer, an alarm clock, and a boot clock. The time–slice timer, implemented within the microMV, is a count–down timer that causes a time–slice fault to occur when a specified time slice expires. The alarm clock, implemented within the IOC circuits, is a time–of–day (TOD) clock with an alarm for generating an I/O interrupt. The boot clock, implemented by the DRP, can be read after powerup to provide the time in hours, minutes, seconds, day, date, and year. (Also see PIT and RTC.)

PIT and RTC

The system clocks are software accessable timers. The system programmer can select from the architectural clocks (see microMV processor) or a combination of the programmable interval timer (PIT) and the real time clock (RTC).

The PIT is an independent time base that is set to initiate program interrupts at fixed intervals. The RTC generates low–frequency I/O interrupts for performing time calculations independent of system timing. A gate array on the system board implements the PIT and RTC.

System Cache

The system cache is essentially 64–kilobytes of high–speed memory supporting the microMV processor's performance. It provides interim storage for 4K blocks (64–bits wide, two quad–words per cache block) of data copied from system memory. The cache provides fast–access interim storage, direct mapped and with automatic write–through to system memory. A 64–bit wide data bus and a 32–bit wide address bus (with physical addressing up to 4.3 gigabytes) provide the communications link between the cache and the microMV processor.

A cache update mechanism maintains cache coherency with system memory. It also works closely with the microMV processor's internal 2K cache. If another device writes data to a physical memory address, the system cache informs the microMV processor so that it can invalidate its entry. A write to system memory will overwrite the data in the system cache. The system cache has a 1 cycle (66.67 nanoseconds) read/write access time on a cache hit.

I/O Controller (IOC)

The I/O controller (IOC) subsystem acts as an intermediate I/O processor, handling data transfers between the I/O device controllers and the microMV or system memory. These communications take place over two separate I/O interface buses: the burst multiplexor channel (BMC) for high–speed block–oriented devices, and the I/O bus for medium–speed data channel devices and low–speed programmed I/O devices.

These buses connect to the various I/O controller cards in the card cage. The I/O subsystem also connects directly to the system bus.

Two gate arrays provide basic IOC functions, such as PIO decoding, addressing, parity checking, DCH and BMC bus generation, input/output buffering, data alignment, and upstream map loading. Additional circuits include the I/O map RAM, the alarm clock oscillator, external bus drivers/receivers, and an external PIO pulse decoder.

Diagnostic Remote Processor (DRP)

The diagnostic remote processor (DRP) is an 8-bit microprocessor that drives system powerup, initialization, and diagnosis of both hardware and software problems. It also generates the boot clock portion of the system's architectural clocks. The DRP is supported by ROM-based macrocode, power-up code, boot clock, and system control program (SCP). The DRP connects to the system bus through the I/O controller.

The DRP supports remote diagnostics that allow Data General's staff of system engineers to diagnose hardware and software system problems off site.

In addition to the system console facilities, the DRP provides two other asynchronous ports for diagnostic support. One of these is a modem interface, allowing remote access to the DRP. The full set of system console functions is available over the modem, as well as the ability to load each CPU's writable control store.

The other asynchronous port can connect to both a user terminal and an intelligent asynchronous controller, such as an IAC/16. This port enables the modem to communicate with the CPU through a standard IAC connection. It also allows individuals using the modem and the user terminal ports to send messages to each other.

In addition to the standard system console interface, the DRP and associated circuits provide a remote access console (RAC) facility for diagnostic support from a remote location. One of these is a modem interface, allowing remote access to the SCP processor. The full set of system console functions is available over the modem.

The SCP processor supports remote diagnostics that allow Data General's staff of system engineers to diagnose hardware and software system problems off site.

The RAC interface is available from an asynchronous port associated with the DRP and can connect to either a locally installed service console or via a modem to a remote service site.

System Specifications

Table 1-1 lists general specifications for the system. Additional information is provided within the individual chapters and appendices.

Table 1-1 System Specifications

Item	Description
System Board	
CPU	microMV processor chip
System clock period	66.67 ns
Instruction processing	Four-stage pipeline
microMV cache	2 Kbytes
System cache	64 Kbytes, direct-mapped, automatic write-through to system memory
I/O interface	IOC type implementing ECLIPSE I/O bus
Diagnostic facilities	Diagnostic remote processor (DRP) drives system powerup, initialization, and diagnosis.
Memory	
Physical structure	One to four modules connected to system board via SIMM connectors
Module capacities	8 Mbytes or 32 Mbytes depending on whether 1-Mbit or 4-Mbit DRAMS are used
Minimum configuration	One module, either 8 or 32 Mbytes
Maximum configuration	Four modules for a total of 128 Mbytes (using 32-Mbyte modules)
Memory control	Memory control unit (MCU) included on system board.
Error management	2-bit memory error detection and correction, when possible.
Bus Structures	
microMV internal data bus	64-bits wide.
ECLIPSE I/O bus	Single-channel, 14 internal slots (8 BMC), expandable to external expansion chassis.
Message-Based Reliable (MRC) Channel	External subsystem connected via BMC controller on ECLIPSE I/O bus.
Programming Architecture	
Instruction set	Standard 32-bit ECLIPSE instructions, including intrinsic and decimal instruction sets.
Instruction length	16 to 80 bits
Accumulators	
Fixed-point	Four 32-bit, two usable as index registers
Floating-point	Four 64-bit
Physical address space	4.3 Gbytes
System clocks	Architectural clocks (alarm clock; time-slice timer, and boot clock) Programmable interval timer (PIT) Real time clock (RTC)
Data Transfer Rates (maximum)	
Burst multiplex channel (BMC)	
Input	11.7 Mbytes/s
Output	10.9 Mbytes/s
Data channel (DCH)	
Input	2.31 Mbytes/s (1.67 Mbytes/s on slow DCH)
Output	1.43 Mbytes/s (1.0 Mbytes/s on slow DCH)

(Continued)

Table 1-1 System Specifications

Item	Description
Maximum Configurations	
Memory	128 Mbytes
I/O slots	14 in main chassis; 14 in expansion chassis
Disk storage	76.8 Gbytes via BMC
Tape units	8
Asynchronous lines	256 direct connected
Synchronous lines	16
Data channel printers	6
Operating Environment	
Temperature range	32 to 131° F (0 to 55° C)
Temperature change	18° F (10° C) per hour
Humidity range	10% to 90%, noncondensing
Altitude	8000 ft (2438 m) maximum
Heat output, fully-loaded chassis	3285 Btu/h
Watts	963 W
KVA rating	1.44 KVA
Physical Specifications	
Width	19.0 in (48.3 cm)
Depth	27.5 in (70.0 cm)
Height	10.5 in (26.6 cm)
Weight:	
Empty	67.5 lb (30.6 Kg)
Fully-loaded	102.5 lb (46.5 Kg)
AC Power Input Specifications	
Domestic Systems	
Voltage	120 +10/-15%
Frequency	47-63 Hz
Phase	1
Amperes (maximum)	14.1 (120V -15%)
Amperes, startup surge	20 (0.35 s maximum)
International Systems	
Voltage	220/240 +10/-15%
Frequency	47-63 Hz
Phase	1
Amperes (maximum)	7.1 (220V -15%, 240 V -15%)
Amperes, startup surge	39 (0.1 s maximum)
Japan	
Voltage	100 +/-10%
Frequency	47-63 Hz
Phase	1
Amperes (maximum)	15.6 (100V -10%)
Amperes, startup surge	16 (0.35 s maximum)
Voltage	200 +/-10%
Frequency	47-63 Hz
Phase	1
Amperes (maximum)	7.8 (200V -10%)
Amperes, startup surge	39 (0.1 s maximum)

(Concluded)

End of Chapter

Chapter 2
Power System

The power system consists of the following major components:

- Voltage nonregulated unit (VNR) – converts single-phase ac to nonregulated dc; provides auxiliary voltage for UPSC usage.
- Universal power system controller (UPSC) – monitors and controls power system; connects to the I/O subsystem via programmed I/O bus.
- Dc-to-dc regulator unit – converts nonregulated dc to +5 volt, +12 volt, -5 volt, and -12 volt regulated voltages for use by the system boards.
- Battery backup unit (BBU) (optional) – provides backup power for the main chassis in the event of a power failure. The BBU is contained within a separate chassis and connects to the main chassis via power and signal cables.

The organization of these elements is illustrated in Figure 2-1.

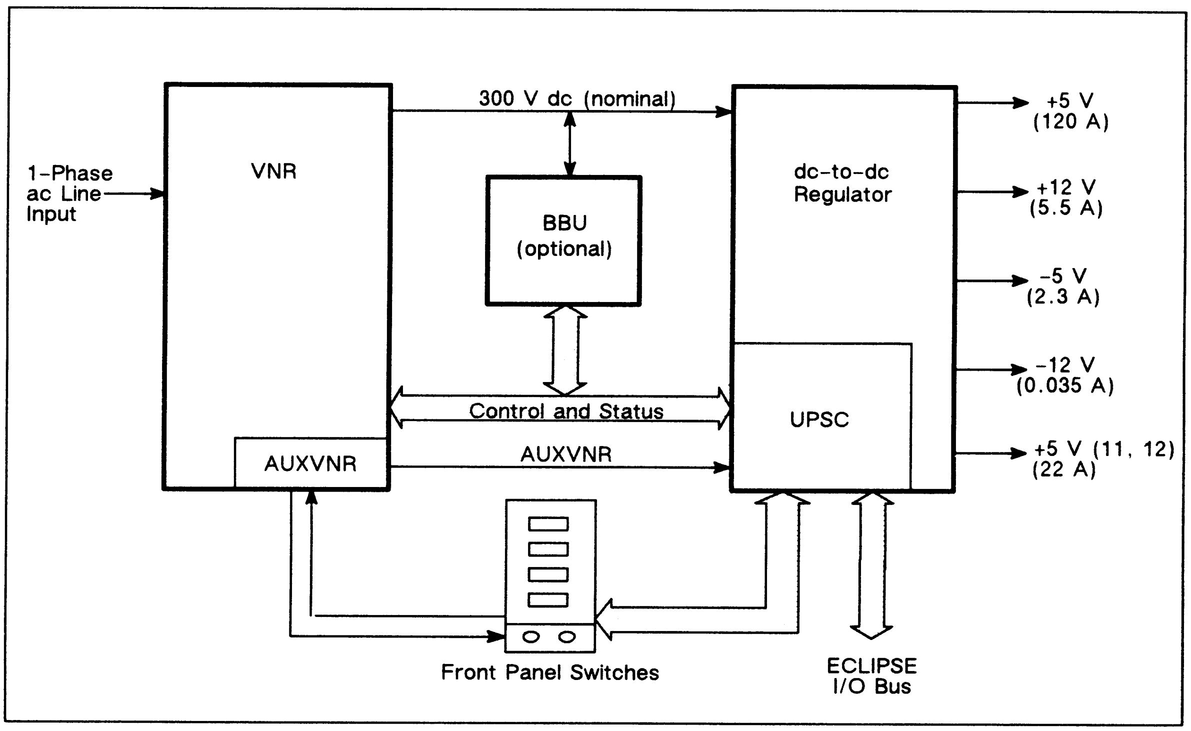

Figure 2-1 Power System Block Diagram

Power System Operation

The power first enters the system as single-phase ac input. The VNR can be configured to accommodate any one of several power transmission standards. Table 1-1 in Chapter 1 lists the input power options for the system.

The power enters the system through the VNR and first passes through a fuse and an EMI filter. The main portion of the VNR contains an array of relays, rectifiers, and capacitors that convert the ac input to a nonregulated dc output. This output is approximately 300 volts, nominal. The main VNR output supplies the dc-to-dc regulator unit.

The VNR contains various sense and control circuitry that monitors the input power status. The information collected by this circuitry is sent to the UPSC. The VNR also contains a transformer and a second set of rectifiers and capacitors used to produce a small amount of nonregulated auxiliary dc voltage (AUXVNR) that is used by the UPSC. This auxiliary voltage is highly load dependent and can be anywhere in the range of 23 to 43 volts. It is this auxiliary voltage that first powers the UPSC to enable it to bring up the rest of the system.

The dc-to-dc regulator unit takes the main output from the VNR and converts it into the appropriate voltages for use by the other boards in the main chassis. Table 2-1 lists the current and voltage outputs of the dc-to-dc regulator unit. The +5 V(11,12) is an output that supplies +5-volt power to just slots 11 and 12. The remainder of the system derives its +5-volt power from the other +5 V supply.

Table 2-1 Dc-to-dc Regulator Unit Outputs (Maximum)

Supply (V)	Output (A)
+5	120
+12	5.5
-5	2.3
+5(11,12)	22

In addition to these outputs, the dc-to-dc regulator produces a small amount of -12 volt power for use by the DRP.

For diagnostic purposes, each of the voltage outputs listed in Table 2-1 can be margined up or down to stress system components and isolate potential faulty elements. Table 2-2 lists the nominal range and margining percentage for each voltage, as measured at the power supply connector.

Table 2-2 Voltage And Margining Ranges

Supply (V)	Nominal range	Margining range (%)
+5	4.95 to 5.15	+ 2.5, -5.0
+12	11.70 to 12.30	+/- 8
-5	-4.70 to -5.20	+/- 8
+5 (11,12)	4.95 to 5.10	+/- 8

Universal Power Supply Controller

The UPSC is a microprocessor-based, intelligent power system controller that monitors and controls the activity of all the elements of the main chassis power system. Figure 2-2 shows the organization of the major elements of the UPSC.

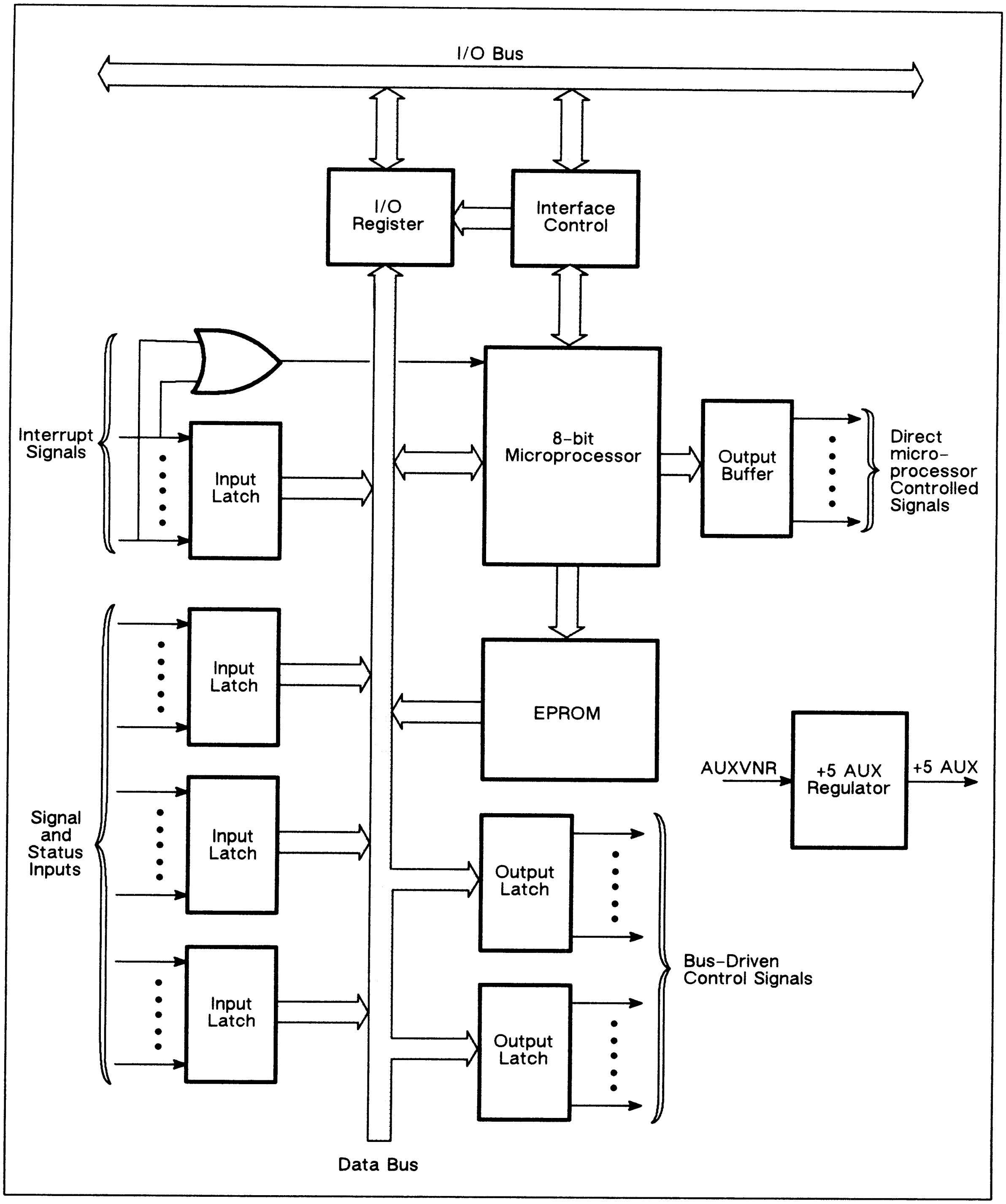

Figure 2-2 Universal Power Supply Controller Organization

The UPSC is responsible for the following major tasks:

- Turning on and off all parts of the power system.
- Monitoring and reacting to power system faults.
- Responding to communication from the microMV processor (through programmed I/O).
- Producing the system interface signals related to the power supply.

Power-Up Sequence

When the main power switch on the front panel is turned on, the AUXVNR transformer energizes the AUXVNR output, and +5 AUX is generated on the UPSC board. As soon as the +5 AUX output is within tolerance, a signal enables the UPSC. The UPSC first checks its own internal logic. If there are no internal logic problems, the UPSC closes the ac relay to the main VNR circuit.

When the ac relay is first closed, the capacitors in the VNR begin to charge up to the 300-volt VNR output level. These capacitors are charged through a current-limiting resistor to prevent the initial surge from exceeding the circuit breaker rating. When the capacitors are charged sufficiently within the VNR output tolerance, the UPSC sends a signal to short out the current-limiting resistor through a second relay.

Once the main output of the VNR is within tolerance, the UPSC turns on the dc-to-dc regulator unit. When all outputs of the dc-to-dc regulator are within tolerance, the UPSC sends a signal (PWROK) to the rest of the system indicating the power system is operational. The UPSC then derives its own power from the 12-volt main output instead of AUXVNR.

At this point, the microMV processor begins its own power-up sequence.

Power System Faults

After the power-up sequence is completed, the UPSC remains active monitoring the various power system elements for fault conditions. In most cases, if the UPSC determines that a fault condition exists, it will shut down main power. If the input ac voltage is lost, the UPSC first asserts the PWRFAIL and PWRFAIL1 signals which inform the rest of the system that the power will soon be lost (if no BBU).

Table 2-3 lists the fault conditions that cause the UPSC to shut down the power system (fatal faults).

Table 2-3 UPSC fatal fault conditions

Fault Condition
VNR output too high
VNR output too low
Power supply temperature too high
Chassis temperature too high
Fan failure
+5 V supply voltage too low
+5 V supply voltage too high
+5 V supply current too high
+12 V supply voltage too low
+12 V supply voltage too high
+12 V supply current too high
-5 V supply voltage too low
-5 V supply voltage too high
-5 V supply current too high

Communications with the microMV Processor

The UPSC is connected directly to the I/O bus of the I/O subsystem. The UPSC and the microMV processor can communicate through interrupts and programmed I/O commands. If the UPSC wants to communicate with the microMV processor, it uses the interrupt line on the I/O bus. If the interrupts are enabled, the microMV processor uses programmed I/O commands to interrogate the UPSC.

The microMV processor communicates with the UPSC to send control information or to receive status information. The UPSC can control the following functions:

Cut or Restore ac Power

The microMV processor can command the UPSC to open or close the main ac relays. If the BBU is present and functioning, it provides power to the system while the relays are open.

Alternate Power Fail Mode

When a power fail occurs, the UPSC usually alerts the rest of the system using two signal lines that indicate a power failure. One of these signals, ^PWRFAIL1, can be masked by turning on alternate power fail mode.

BBU Disable

The microMV processor can have the UPSC disable the BBU from functioning. If the BBU is running, the system loses power. If the BBU is not running, the system remains operational but is unprotected from power failures until the microMV processor re-enables the BBU.

Margining

The microMV processor can control the margining of the power supplies through programmed I/O commands.

Disable Power System Interrupts

The microMV processor can use this to prevent the UPSC from sending an interrupt.

Status

The UPSC responds with status when interrogated by the microMV processor. The microMV processor can read status bits indicating the following:

- Alternate power fail mode status
- Interrupts enabled/disabled
- BBU status
- Last fault detected by UPSC
- Margining status

System Signals Provided by the Power System

The power system provides several signals for the rest of the system. Their functions are described below.

LINECLK — The LINECLK signal is a buffered TTL–level signal that oscillates at ac line frequency. It is produced by the VNR and distributed across the backplane for use by the system boards.

PWROK — This signal is produced by the UPSC. When this TTL signal is high (true), it indicates that the power system is functioning. This signal is distributed on the backplane to the rest of the boards in the system.

^PWRFAIL — This TTL–level signal is produced by the UPSC. It is a low true signal. When low, it indicates that the UPSC has detected a loss of input power and the power system may shut down. This signal is available to the system boards through the backplane.

^PWRFAIL1 — This signal is identical in function to ^PWRFAIL. The only difference is that this signal is maskable through commands to the UPSC. If alternate power fail mode is disabled, this signal is always high. If alternate power fail mode is enabled, this signal is the same state as ^PWRFAIL. ^PWRFAIL1 is available to the I/O subsystem.

Battery Backup Unit Operation

The optional BBU is a separate chassis, which consists of two 48–volt battery packs, a power section, and a control section. It provides power to the associated chassis in the event of a loss of power at the main ac input. The power section converts the battery output to 260 volts dc to drive the VNR output and 240 volts RMS ac to power the fans in the chassis. The control section monitors and controls the BBU and communicates with the UPSC. There are two basic BBU models, one for a system with main chassis only, and one for a system with both main and expansion chassis.

During normal system operation, the BBU remains idle, drawing only enough current to maintain the battery packs at full charge. Circuitry in the BBU monitors the charge status. The BBU provides signals to the UPSC indicating that the BBU is fully operational.

When the main ac power input fails, both the VNR and AUXVNR outputs begin to drop. When the main VNR output gets below a certain voltage level, the UPSC sends a request to the BBU to provide power to the system. The BBU then provides enough power to sustain all boards in the main chassis, the UPSC, and the main chassis fans.

After 5 seconds, the UPSC disables the BBU and checks to see if the output stays above power fail level. If it does, the UPSC removes the power fail signals and the system resumes normal operation. If the VNR output falls below the power fail level, the UPSC requests the BBU to power the system and tries the procedure again after another 5 seconds. This continues for up to 2 minutes. If the ac power has not been restored after 2 minutes, the BBU shuts itself off.

The BBU has sensors that monitor internal status. If the sensors detect a fault, the BBU indicates this with a signal to the UPSC.

End of Chapter

Chapter 3
I/O Hardware Options

The system supports a number of ECLIPSE I/O controller boards that, in turn, support a wide variety of peripheral devices. This chapter briefly describes some of the ECLIPSE I/O controllers and interface boards that are available for the system. Each description is organized by function, I/O slot requirements, type of I/O bus interface (BMC, data channel, programmed I/O), model number(s) where applicable, and other general restrictions. Configuration data (current draw and operating system restrictions) for each board are listed in Appendix A.

The information here provides a guide for many of the currently available devices. It should not be viewed as an inclusive listing, as new devices are added from time to time, and some devices may be discontinued or replaced by others. Note also that some model numbers may change. For complete and up-to-date information, contact your Data General sales representative.

The controller descriptions are organized as follows:

- Disk Drives
    - High-speed disk subsystems controller
    - Rapid access mass storage (R.A.M.S.) controller
    - Rugged removable disk subsystems (RRDS) controller
    - 727-Mbyte disk subsystems controller
- Optical Disk Drives
- Tape Drives
    - High-speed disk subsystems controller
    - Medium-speed tape subsystems controller
    - Streaming tape subsystems controller
- Combined Storage Subsystems (CSS)
    - CSS disk/tape host adapter
    - CSS tape host adapter
- Communications and Networks
    - Intelligent asynchronous controllers (IAC/8, IAC/16, IAC/24)
    - Intelligent asynchronous multiplexor (IAM/16)
    - Bit-synchronous interface controllers (BSI/1, BSI/4)
    - Intelligent synchronous controller (ISC/2)
    - Data control unit (DCU/200)
    - IEEE-488 bus interface
    - Multiprocessor communications adapter (MCA)
    - Intelligent TermController (ITC/128)
    - Computer-PBX interface (CPI/24)
    - Intelligent LAN controller (ILC)
    - Intelligent broadband controller (IBC)
    - Intelligent ring controller (IRC)

Intelligent StarLAN controller (IDC)
Network bus system (NBS)

- Graphic display subsystems
- Printers
  - Line printer controller
  - Laser document printer controller
- Miscellaneous I/O Options
  - Bus repeater
  - Buffered card reader controller
  - Analog-to-digital and digital-to-analog converters
  - Array processor (ArrayPlus™ 2000)
  - ECLIPSE channel processor (MRC interface)
  - Voice mail controller (VMC/2)
  - General purpose interface boards

Disk Drives

The disk subsystems described in this section provide a wide range of capacities and performance for your selection.

High-Speed Disk Subsystems Controller

The high-speed disk subsystems controller controls as many as four high-speed, fixed-media disk drives. The controller transfers data through the ECLIPSE BMC bus.

Slot Requirements: 1

I/O Bus Interface: BMC

Other Restrictions: None

Model Number(s): 6238-B (see Table 3-1 for compatible disk drives).

Table 3-1 High-Speed Fixed Media Disk Subsystems (Note)

Model No.	Total Capacity (Mbytes)	No. of Drives	Capacity/ Drive (Mbytes)	Configuration*
6236	354	1	354	Rack-mounted
6236-A	354	1	354	Add-on drive only
6237	1062	3	354	Free-standing
6238-B		hosts 4		controller only
6239	592	1	592	Rack-mounted
6239-A	592	1	592	Add-on drive only
6240	1776	3	592	Free-standing
6290	1184	2	592	Free-standing
6357	862	1	862	Rack-mounted
6357-A	862	1	862	Add-on drive only
6398	1725	2	862	Free-standing
6399	2587	3	862	Free-standing
6400	5175	6	862	Free-standing

* Includes drive(s) and controller, unless stated otherwise. Note that these are models from an older product line. For increased performance, select drives from the R.A.M.S. and CSS product lines.

Rapid Access Mass Storage (R.A.M.S) Disk Subsystems Controller

The rapid access mass storage (R.A.M.S.) subsystems controller controls as many as eight R.A.M.S fixed–media disk drives. The controller provides interleaved BMC transfers of data, commands, and status in a high–level, intelligent interface. The controller supports as many as 64 concurrent requests, which can be optimized, queued, and processed for as many as 8 physical units and 24 mirrored groups.

Slot Requirements: 1

I/O Bus Interface: BMC

Other Restrictions: None

Model Number(s): 6580 (see Table 3–2 for compatible disk drives).

Table 3–2 R.A.M.S Disk Subsystems

ECLIPSE Model No.	Total Capacity	No. of Drives	Capacity/ Drive	Configuration*
6580		hosts 8		Controller only
6581	500 Mbytes	1	500 Mbytes	Rack–mounted
6581–A	500 Mbytes	1	500 Mbytes	Add–on drive
6582	1 Gbyte	2	500 Mbytes	Rack–mounted
6582–A	1 Gbyte	2	500 Mbytes	Add–on drives
6584	2 Gbytes	4	500 Mbytes	Free–standing
6585		space for 8		Cabinet only
6621	1.2 Gbytes	1	1.2 Gbytes	Free–standing
6621–A	1.2 Gbytes	1	1.2 Gbytes	Add–on drive
6622	2.4 Gbytes	2	1.2 Gbytes	Free–standing
6622	2.4 Gbytes	2	1.2 Gbytes	Add–on drives
6624	4.8 Gbytes	4	1.2 Gbytes	Free–standing

* Includes drive(s) and controllers, unless stated otherwise.

Rugged Removable Disk Subsystems (RRDS) Controller

The rugged removable disk subsystems (RRDS) controller controls as many as four removable–media disk drives in one or two rugged removable disk subsystem (RRDS) chassis. The controller transfers data through the BMC bus.

Slot Requirements: 1

I/O Bus Interface: BMC

Other Restrictions: None

Model Number(s): 6433 (see Table 3–3 for compatible disk drives).

Table 3–3 Rugged Removable Disk Subsystems (RRDS)

Model Number	Total Capacity (Mbytes)	No. of Drives	Capacity/ Drive (Mbytes)	Configuration*
6433			hosts 7	Controller
6458R	234	1	234	Includes RRDS chassis
6459R	234	1	234	Add-on drive only
6460R			space for 2	RRDS chassis only
6496R			space for 2	400 Hz (RRDS chassis only)

* Includes drive(s) and controllers, unless stated otherwise.

727–Mbyte Subsystems Controller

The 727–Mbyte subsystems host adaptor/controller controls as many as seven high–speed, 727–Mbyte, fixed–media disk drives. It provides interleaved BMC transfers of data, commands, and status in a high–level, intelligent interface. The controller supports as many as 24 concurrent requests, which can be optimized, queued, and processed for as many as seven physical units.

Slot Requirements: 1

I/O Bus Interface: BMC

Other Restrictions: None

Model Number(s): 6434 (see Table 3–4 for compatible drives).

Table 3–4 727–Mbyte Disk Subsystems

Model Number	Total Capacity (Mbytes)	No. of Drives	Capacity/ Drive (Mbytes)	Configuration
6434		hosts 7		Host adaptor
6492	727	1	727	Drive and controller
6492–A	727	1	727	Add–on drive plus mounting kit
6492–K	727	1	727	Add–on drive only
	5816	8	727	Maximum configuration; requires 2 host adaptors
6578	1454	2	727	2 drives and controller
6578–A	1454	2	727	2 drives only
6579	1908	4	727	4 drives, controller, cabinet
6585		space for 8		Free–standing cabinet

Optical Disk Drives

Optical Disk Controller

The optical disk subsystems provide write-once, read-many times (WORM) capability for large-scale archival applications. The subsystems employ nonerasable optical disk technology that uses lasers to write and read the disk data. Disk cartridges come in 1-, 2-, and 2.4 gigabyte capacities. An optical disk subsystem appears to the operating system just like a tape subsystem except that it can perform random-access reads.

Slot Requirements: 1

I/O Bus Interface: BMC

Other Restrictions: None

Model Number(s): 5070-D.

Tape Drives

Tri-Mode Tape Subsystems Controller

The tri-mode tape subsystem controller controls as many as four tape drives and transfers the data through the BMC bus. The controller is included as part of tape subsystem.

Slot Requirements: 1

I/O Bus Interface: BMC

Other Restrictions: None

Model Number(s): 4307 series (see Table 3-5).

Medium-Speed Tape Subsystems Controller

The medium-speed tape subsystems controller controls as many as eight reel-to-reel, vacuum-column tape drives and transfers the data through the data channel. The controller is included as part of the tape subsystem.

Slot Requirements: 1

I/O Bus Interface: Data channel

Other Restrictions: None

Model Number(s): 6026 series (see Table 3-5).

High-Speed Tape Subsystems Controller

The high-speed tape subsystem controller controls as many as three streaming tape drives and transfers the data through the BMC bus. The controller is included as part of tape subsystem.

Slot Requirements: 1

I/O Bus Interface: BMC

Other Restrictions: None

Model Number(s): 6299, 6300 (see Table 3-5).

Table 3-5 Tape Subsystems

Model Number	No. of Drives	Recording Density (bpi)	Tape Speed (ips)	Transport Method	Tape Capacity (Mbytes)	Model Configuration*
4307-H	1	1600, 6250	125	Vacuum column	140	Free-standing
4307-TL	1	800,1600, 6250	125	Vacuum column	140	Free-standing
4307-TA	1	800,1600, 6250	125	Vacuum column	140	Add-on drive only
6026	1	800,1600	75	Vacuum column		Rack-mounted
6026-A	1	800,1600	75	Vacuum column		Add-on drive only
6299	3	1600, 6250	50	Streaming	140	Rack-mounted
6300	3	1600, 6250	50	Streaming	140	Free-standing

* Includes drive(s) and controllers, unless stated otherwise.

Combined Storage Subsystems (CSS)

The combined storage subsystems (CSS) provides integrated support for disk and tape drives. The CSS is particularly effective in configurations with limited controller space or where cost effectivness is a concern.

Host Adaptor for Disk/Tape

The disk and tape model CSS host adaptor manages a full Combined Storage Subsystem (CSS) consisting of as many as a maximum of seven peripherals in any combination of one to seven disks and zero to four tapes. The model provides concurrent disk and/or tape operations, and transfers data through the BMC bus.

Slot Requirements: 1

I/O Bus Interface: BMC

Other Restrictions: None

Model Number(s): 6433 (see Table 3-6).

Host Adaptor for Tape

The tape model CSS host adaptor handles as many as four tape drives of the CSS type. It transfers the data through the BMC bus.

Slot Requirements: 1

I/O Bus Interface: BMC

Other Restrictions: None

Model Number(s): 6435 (see Table 3-6).

Table 3-6 Combined Storage Subsystems (CSS)

Model Number	Total Capacity	No. of Drives	Capacity/ Drive	Configuration*
6429	234 Mbytes	1	234 Mbytes	Rack-mounted disk plus 6433
6429-A	234 Mbytes	1	234 Mbytes	Add-on disk drive/chassis
6446-M	234 Mbytes	1	234 Mbytes	Add-on disk drive
6433		Hosts 7		Hosts both tape and disks
6435		Hosts 4		Tape only controller
6443	322 Mbytes	1	322 Mbytes	Rack-mounted disk plus 6433
6443-A	322 Mbytes	1	322 Mbytes	Add-on disk drive/chassis
6491-M	322 Mbytes	1	322 Mbytes	Add-on disk drive
6461	130 Mbytes	1	130 Mbytes	Rack-mounted tape plus 6435
6461-A	130 Mbytes	1	130 Mbytes	Add-on tape drive/chassis
6352-M	130 Mbytes	1	130 Mbytes	Add-on tape drive
6463	21 Mbytes	1	21 Mbytes	Rack-mounted tape plus 6435
6463-A	21 Mbytes	1	21 Mbytes	Add-on tape drive
6590	2 Gbytes	1	2 Gbytes	Rack-mounted tape plus 6435
6590-A	2 Gbytes	1	2 Gbytes	Add-on tape drive/chassis
6590-M	2 Gbytes	1	2 Gbytes	Add-on tape drive
6593	662 Mbytes	1	662 Mbytes	Rack-mounted disk plus 6433
6593-A	662 Mbytes	1	662 Mbytes	Add-on disk drive/chassis
6554-M	662 Mbytes	1	662 Mbytes	Add-on disk drive
6586		1		1600 bpi reel-to-reel tape drive, rack-mount
6587		1		1600 bpi reel-to-reel tape drive, table-top unit

* Includes drive(s) and controllers, unless stated otherwise

Communications and Networks

The following described controllers provide system interface to a variety of communications and networking devices.

Intelligent Asynchronous Controllers (IAC/8, IAC/16, IAC/24)

The intelligent asynchronous controllers (IAC/8, IAC/16, and IAC/24) provide a microprocessor controlled interface for multiple asynchronous lines. These controllers support full-duplex operation.

Slot Requirements: 1

I/O Bus Interface: Data channel

Other Restrictions: None

Model Number(s): See Table 3-7.

Table 3-7 Intelligent Asynchronous Controllers

Model Number	Mnemonic	Number of Lines	Transmission Line Interface	Modem Support
4367-A	IAC/8	8	RS232-C, RS422	Yes
4368	IAC/16	16	RS232-C, 20 mA current loop	No
4368-A	IAC/16	16	RS422, 20 mA current loop	No
4369-A	IAC/8	8	RS232-C, RS422	Yes
4370	IAC/16	16	RS232-C, 20 mA current loop	No
4370-A	IAC/16	16	RS422, 20 mA current loop	No
4622, 4623	IAC/24	24	RS232-C, RS422	No
4624, 4625	IAC/8	8	RS232-C, RS422	Yes

Intelligent Asynchronous Multiplexor (IAM/16)

The intelligent asynchronous multiplexor provides a processor controlled interface for 16 asynchronous lines (4 with modem control). This multiplexor supports full-duplex operation.

Slot Requirements: 1

I/O Bus Interface: I/O bus connection

Other Restrictions: None

Model Number(s): 5916

Bit–Synchronous Interface (BSI/1, BSI/4)

The bit–synchronous interfaces (BSI/1 and BSI/4) provide an interface for one or four bit–synchronous communications lines (depending on model). These interfaces are compatible with most bit–synchronous devices.

Slot Requirements: 1

I/O Bus Interface: Programmed I/O

Other Restrictions: None

Model Number(s): 4348 (BSI/1 one–line), 4349 (BSI/4 four–line)

Intelligent Synchronous Controller (ISC/2)

The intelligent sysnchronous controller (ISC/2) is a microprocessor–controlled two–channel interface for synchronous lines. The controller is compatible with most synchronous terminals and modems.

Slot Requirements: 1

I/O Bus Interface: Data channel

Other Restrictions: None

Model Number(s): 4380

Data Control Unit (DCU/200)

The DCU/200 provides a high–performance data channel interface for as many as four communications chassis to off–load all of the character interrupt processing from the host processor. The DCU/200 enhances system performance by handling the character level processing. Character level processing includes control of the line multiplexers, code translation, special control character handling, and buffer maintenance. The DCU/200 supports a maximum of 256 lines.

Slot Requirements: 1

I/O Bus Interface: I/O bus connection

Other Restrictions: None

Model Number(s): 4254

IEEE–488 Bus Interface

The IEEE–488 bus interface provides a high–performance interface between the ECLIPSE I/O bus and the General Purpose Interface Bus (GPIB) defined by the IEEE 488 standard. The GPIB interface provides a standardized connection to programmable and nonprogrammable electronic measurement devices, instrument systems, and computers.

Slot Requirements: 1

I/O Bus Interface: I/O bus connection

Other Restrictions: None

Model Number(s): 4517–A

Multiprocessor Communications Adapter (MCA)

The multiprocessor communications adapter (MCA) provides an interface to a high-bandwidth interprocessor bus that connects as many as 15 DGC computers together. With a maximum throughput of 500,000 16-bit words per second, the bus provides effective interprocessor communications for short distances (less than 140 feet total bus length).

Slot Requirements: 1

I/O Bus Interface: Data channel

Other Restrictions: None

Model Number(s): 4206

Intelligent TermController (ITC/128)

The intelligent TermController (ITC/128) provides terminal services for as many as 128 terminals (64 terminals with concurrent usage) on a TermServing network. The asynchronous terminals connect to an Ethernet LAN via TermServers, which provide LAN-connection services. Each TermServer connects as many as 10 asynchronous terminals and supports as many as 40 concurrent terminal sessions. An independent TermManager provides access control and network management services for the terminal serving network. The TermServing network's software can establish a communications session between two terminals, between a terminal and a host, or between two hosts.

Slot Requirements 1

I/O Bus Interface: Data channel

Other Restrictions: None

Model Number(s): 4586 (TermController), 4608 - 4611 (TermServers), and 4607 (TermManager).

Intelligent LAN Controller (ILC)

The intelligent LAN controller (ILC) is a microprocessor-controlled LAN interface conforming to IEEE 802.3 baseband standard. The ILC transfers data at a 10 megabits per second rate, is Ethernet compatible, and provides medium distance interprocessor communications for a maximum of 2500 meters total LAN length. You can configure a maximum of 1024 processors to a LAN.

Slot Requirements: 1

I/O Bus Interface: Data channel

Other Restrictions: None

Model Number(s): 4532-A

Intelligent Ring Controller (IRC)

The intelligent ring controller (IRC) is a microprocessor-controlled interface to PC*I token ring networks. It is also compatible at the physical and data link layers with IBM token ring networks. The IDC transfers data at a 1 megabit per second rate. Each node in the star network can be located up to 800 feet from a HUB unit. Although, technically as many as 1024 nodes are allowed per network, 64 nodes is the maximum recommended number .

Slot Requirements: 1

I/O Bus Interface: Data channel

Other Restrictions: None

Model Number(s): 4630

Intelligent StarLAN Controller (IDC)

The intelligent StarLAN controller (IDC) is a microprocessor-controlled LAN interface conforming to Draft C of the IEEE 802.3 1BASE5 standard using low-cost, voice-grade, twisted-pair communications lines. The IDC transfers data at a 1 megabit per second rate. Each node in the star network can be located up to 800 feet from a HUB unit. Although, technically as many as 1024 nodes are allowed per network, 64 nodes is the maximum recommended number .

Slot Requirements: 1

I/O Bus Interface: Data channel

Other Restrictions: None

Model Number(s): 4581

Network Bus System (NBS)

The network bus system (NBS) provides serial-baseband interprocessor communications. The NBS transmits and receives over a single coaxial cable up to 1 mile at a 2 megabits per second rate. As many as 32 CPUs can participate in the local network.

Slot Requirements: 1

I/O Bus Interface: Data channel

Other Restrictions: None

Model Number(s): 4460, 4461, 4462

Graphic Display Subsystems

The graphics display subsystems consist of controllers (GDC) and associated memory boards that provide high–resolution, high–performance color graphics. A GDC/1000 is a two board set, consisting of a graphics processor and an image memory board that give a 1280 by 1024 by 8 pixel display (256 colors). A GDC/2400 is a four–board set, consisting of a graphics processor and three image memory boards that give a 1280 by 1024 by 24 bits per pixel display (16.7 million colors).

Slot Requirements: 1 slot per board (2 or 4 boards, depending on model)

I/O Bus interface: Data channel (controller)

Other Restrictions: Memory boards must occupy contiguous slots with the corresponding controller board.

Model Number(s): See Table 3–8.

Table 3–8 Graphic Display Subsystems

Model Number	Graphic System
8810	GDC/1000 graphic display controller (2 boards)
8824	GDC/2400 graphic display controller (4 boards)
8812	Expansion memory for 8810 multihead applications
8812–A	Expansion memory for 8810 double buffer/overlay applications
8812–B	Dual expansion memory for 8810 double buffer/overlay applications
8812–M	Expansion memory for 8810 to provide 24–bit graphic system

Printers

Line Printer Controller

The line printer controller controls one text laser printer or one medium- or high-speed line printer.

Slot Requirements: 1

I/O Bus Interface: Data channel

Other Restrictions: None

Model Number(s): 4393 (see Table 3-9).

Table 3-9 Data Channel Subsystems*

Model Number	Print Speed	Character Set	Print Method
4595-D	300 LPM	98 ASCII (upper/lower)	Band printer
4596-D	600 LPM	98 ASCII (upper/lower)	Band printer
4597-D	1200 LPM	98 ASCII (upper/lower)	Band printer
4598-D	1500 LPM	96 ASCII (upper/lower)	Band printer
4599-D	2000 LPM	96 ASCII (upper/lower)	Band printer
4603-D	1500 LPM **	98 ASCII (upper/lower)	Band printer
4604-D	2000 LPM**	98 ASCII (upper/lower)	Band printer
6216-C	180 chars/s	-----	Dot matrix
6479P	26 pages/min		Text laser printer without controller

* Includes 4393 data channel controller unless stated otherwise.
** DIN-compliant model.

Laser Document Printer Controller

The laser document printer controller controls one laser document printer.

Slot Requirements: 1

I/O Bus Interface: Data channel

Other Restrictions: None

Model Number(s): 4425

Miscellaneous I/O Options

Buffered Card Reader Controller

The buffered card reader controller provides a programmed I/O interface between the ECLIPSE I/O bus and a series 4016 card reader. It has a 96-character buffer for buffering read data. It is software compatible with the model 4016 card reader controller.

Slot Requirements: 1

I/O Bus Interface: Programmed I/O

Other Restrictions: None

Model Number(s): 4306MV

Bus Repeater

The bus repeater provides continuation of I/O bus signals from an ECLIPSE I/O chassis to an expansion chassis.

Slot Requirements: 1

I/O Bus Interface: Slow data channel

Other Restrictions: Limited to those slots designated to support bus repeaters; one bus repeater cannot provide signals to another bus repeater.

Model Number(s): 8992-N

ECLIPSE Channel Processor (MRC) Interface

The ECLIPSE channel processor board provides the interface between the ECLIPSE I/O bus and message-base channel (MRC) subsystems. It is available with either copper or fiber-optic interface.

Slot Requirements: 2 (because of board thickness)

I/O Bus Interface: BMC

Other Restrictions: None

Model Number(s): 80021 and 80022 (fiber-optic interface)

General Purpose Interface Boards

Allows users to build semicustom interfaces to connect to any ECLIPSE I/O bus slot; includes programmed I/O Busy, Done, And Interrupt logic; input and output registers; data channel logic; space for user defined logic with wire wrap pins; user-defined ribbon cable; socket connectors.

Slot Requirements: 1

I/O Bus Interface: I/O bus connection

Other Restrictions: None

Model Number(s): 4040-A and 4190-A

End of Chapter

Chapter 4
Configuring a System

This chapter discusses the following system configuration activities:

- Determining what you need
  - System peripheral requirements
  - I/O controller requirements
  - Operating system
  - Memory requirements
- Configuring memory
- Configuring system I/O
  - Configuring channels
  - Allocating slots
- Configuring an ECLIPSE I/O expansion chassis
- Checking power requirements
- Checking operating system restrictions
- Checking site and environment.

If you follow the approach outlined in this chapter, you will have a functional system with a valid configuration, but not necessarily one with optimum performance. You may need to fine tune the system for your particular application. How you optimize system performance depends on the particular hardware and software configurations. In most cases, the system will perform adequately if you take care to balance the system hardware and software so that there is no overloading of any one section of the system.

You should refer to the applicable programmer's reference manuals for the equipment you configure; often the manuals describe techniques for changing system parameters to tailor the system for given applications. Data General also has a service that provides highly competent systems engineers trained in diagnosing system performance problems. Armed with a variety of performance monitoring and diagnosis tools, these specialists can prescribe the necessary hardware and software solutions for your performance problem. Your Data General sales representative can provide further information on this service.

Once you have completed a particular configuration topic, continue with the next topic. Do not consider any topic unnecessary; they are all essential in evolving a valid and satisfactory system configuration.

Determining What You Need

You must clearly define what you want your system to do. For example, if you are configuring an upgrade to an existing system, is your goal to increase the efficiency of your current applications, to expand to other applications, to add users, or all of these? This definition is essential as requirements beyond the basic system vary greatly with applications and system load. Except for configurations that require more I/O controllers than one chassis can support, any configuration of basic I/O hardware and software components can operate on a minimum system.

The first step in configuring your system is to determine what components you need in your system. You may devise your own approach to determing this, or you may use the following outline. The outline consists of four steps that can help you in any configuration task, whether it be the initial system design, an upgrade to the system, or the design or addition of customized hardware or software. The steps are as follows:

1. Determine what specific hardware peripherals you need to handle your workload, your number of users, and your application requirements.
2. Determine the type and quantity of controllers required by the peripherals.
3. Determine which operating system you want to use.
4. Determine how much memory you need to handle your workload, considering your number of users and and your application requirements.

These steps, described in the paragraphs that follow, define the basic components that your system requires and that you must incorporate into the final configured system. In most cases, these components will be well within the boundaries of the system parameters, and system configuration activities can be performed with minimal concern. Only when the configuration requires a very large number of I/O devices, customized hardware, or additions to heavily loaded systems do the limitations of system parameters constrict and challenge the configuration.

In some cases you may need to consult other sections of this manual, including the appendices, for information assisting your effort. Use the index to locate specific information.

Determining System Peripheral Requirements

To determine system peripheral requirements, first start with the items that are obvious: the number of users that you want to add, or the number and storage requirement of new application programs that you want to run. From this information, you can calculate the number of new terminals, the amount of disk space required, and therefore the number and capacity of new disk controllers.

NOTE: Keep in mind when planning for disks that several disks and controllers may provide more bandwidth, and therefore better performance than a single drive and a single controller, regardless of the disk's capacity.

Also, keep in mind that the number of tape drives you use for backup must be appropriate for the amount of disk storage, and that the number of tape drives for backup should increase with any significant increase in disk capacity. Similarly, a significant increase in the number of users increases the number of printers you need.

Take into consideration any expansion of communications facilities that you want to make. If necessary, consult with your Data General sales representative.

Determining I/O Controller Requirements

To determine the I/O controller requirements, evalutate the type and number of controllers required by the peripherals. You may also want to expand your communications facilities and therefore need controllers for that purpose. Refer to Chapter 3 for a summary of common peripheral controllers available from Data General for the ECLIPSE I/O system. If you do not find what you need in Chapter 3, consult with your Data General sales representative about other controllers that may be available.

If your expansion needs are only for additional controller slots, you can add an expansion chassis. When connecting an expansion chassis, you must install a bus repeater board in the channel's last slots within the main system chassis. The last slot is designated for slow data channel operation and is the only slot that supports bus repeater board operation. With the maximum system I/O configuration, 27 controller slots are available (you may be limited in how many controllers you can configure due to power requirements for the controllers).

Determining the Operating System

You can choose from four Data General operating systems: AOS/VS, AOS/VS II, AOS/RT32, and DG/RDOS. Consult with your Data General sales representative for help in choosing which system is best for your needs.

Determining Memory Requirements

The performance of your system depends on how well you match the amount of memory in your system against the operational needs of your system.

NOTE: Do not be influenced by the memory capacities that you have had in the past. A processor with increased performance capability requires increased memory capacity to achieve the full potential of the processor. (Performance is lost if the processor has to wait for the memory to swap pages.)

If you are adding a significant number of users or increasing the number or size of your applications, you will need to add memory capacity. To determine the proper amount of memory for your system, consult your Data General sales representative.

Configuring Memory

Once you know how much memory you need, you can configure the required number of modules into the system. A basic system can operate with a minimum of one memory module (with capacity of either 8 Mbytes or 32 Mbytes). If the system requires more main memory, you can add up to three additional modules of either 8 or 32 Mbytes each. Also, when you have 8-Mbyte modules, you can upgrade them to 32-Mbyte modules through Data General's Continuing Products Division upgrade program. A full configuration of four 32-Mbyte modules provides the maximum memory capacity of 128 Mbytes.

None of the memory modules require any board jumpers, backplane jumpers, or cables. Any capacity board can occupy any of the four connectors on the system board designated for memory. The system automatically checks each location for the presence of a module and determines its size in megabytes. However, for consistency, you should install modules in consecutive connectors.

Configuring System I/O

Once you have determined the number and type of I/O controllers as described in the previous sections, you are ready to configure them. The remainder of this chapter deals primarily with configuring device controllers into your system.

Allocating Slots

The allocation of slots involves determining three things: the number of slots, the type of slots required, and the appropriate slot priority. Attention to these items will assist you in configuring a channel that operates efficiently and without I/O bandwidth saturation.

Determining Number of Slots

The number of slots required is the total number of I/O controller boards. If the number of boards exceeds the number of available slots in the main chassis, you will need an expansion chassis. Note that a bus repeater board also uses an I/O slot. There are 14 I/O slots in the main system chassis and 14 I/O slots in an expansion chassis. Since one of the slots in the main chassis is used for a bus repeater, the total number of I/O slots available is 27.

Determining Slot Type

Slot type determines the kind of bus connection that a device requires: BMC, fast data channel, or slow data channel. The BMC signals flow through cables that run across the front of the logic chassis and connect only to the desired boards. The fast and slow data channel signals flow through the connectors on the backplane. The last slot of the main system chassis is a slow data channel slot, the only slot used for a bus repeater board. You must determine the type of slot each controller board requires to know how to allocate boards to their appropriate location.

In the main system chassis, the BMC bus is available for the first eight I/O slots.

The connectors on the BMC cables have enough separation to allow three non–BMC boards between any two BMC connections. However, we recommend that you do not separate BMC controllers with non–BMC boards unless those boards are part of a BMC controller board set (such as a controller that requires two boards). The I/O interface connector requirements for currently available I/O controllers are listed in the controller descriptions in Chapter 3.

Each BMC bus requires a bus terminator plug. The last BMC device (highest slot number, also farthest from the system board) on the I/O channel must have one of these terminator plugs. Your initial system will come with the bus terminators already installed. When you expand your system, your Data General field service representative will install the required bus terminators along with the other expansion items.

Each ECLIPSE I/O slot has a data channel connection. This connection can be either fast data channel or slow data channel, depending on its physical location on the channel. The only functional difference between the two types of data channels is the speed of data transfer. The slow data channel is designed for ECLIPSE I/O expansion chassis communications. The slow data channel provides an extended data transfer cycle to accommodate for the distance the signals must travel to and from the expansion slots. The last slot on the main system chassis is designated as a slow data channel slot, used either for a controller board or for a bus repeater extending the ECLIPSE I/O bus to an ECLIPSE expansion chassis. All remaining slots in the main chassis are fast data channel slots exclusively.

Determining Priority

All device controllers will have some priority on their respective channels. Priority relates to the slot position and thus servicing priority that a controller has on a channel's priority chain. (The physical and functional linking of priority is referred to as the priority chain.) Each slot's physical position is in respect to the IOC controlling the channel, in this case the system board. The closer the controller is to the system board, the greater the service priority the controller will have in respect to the other controllers on the chain. Table 4–1 list the slot priority order for the main system chassis and the expansion chassis.

There are two priority chains that should be considered when configuring a channel: the interrupt priority and the data channel request priority.

Table 4–1 Slot Priorities

Configuration	Priority, highest to lowest
Main system chassis	7,8,9,10,11,12,13,14,15,16,17,18,19,20
Expansion chassis	6,7,8,9,10,11,12,13,14,15,16,17,18,19

Interrupt Priority

Every device controller, whether in the main chassis or an expansion chassis, must be able to communicate with the CPU, to start or terminate a data transfer, or to report a status condition. The interrupt facility provides this capability.

Each ECLIPSE I/O channel has its own single interrupt line that follows a chain through all the controller boards under control of the channel's IOC (on the system board). If a device controller needs to communicate with the CPU, it uses this interrupt request line, which is passed on by the IOC to the CPU. When the CPU acknowledges an interrupt, the interrupting device responds to the CPU's acknowledgement and "breaks" the chain, preventing devices further down the chain from also responding. Devices not requesting an interrupt pass the acknowledgment along the chain until the first interrupting device receives it.

Data Channel Request Priority

Each device that uses the data channel (excluding BMC devices) has a physical and functional position in the priority chain for data channel requests. The IOC also has a priority chain for data channel requests that links from slot to slot for all the devices under its control.

If a device is ready for a data channel transfer, it uses the data channel request line to notify the IOC on the system board. When the IOC is ready for the transfer, it signals the device requesting the transfer. The device responds by "breaking" the chain, preventing devices further down the chain from also responding. Devices that do not use the data channel (such as BMC devices) and devices not ready for a data channel transfer pass the chain along unbroken.

Data Channel Latency

Unlike BMC devices and bus repeaters, any data channel device can go into any slot. Due to the priority scheme, some devices can monopolize the data channel, if the priority is not set appropriately, and block access by others. No device inherently monopolizes the data channel because bus requirements are dependent on the use of the device at any given instant. However, some devices can tolerate longer delays between accesses due to more local intelligence and greater onboard memory.

The amount of delay a device can tolerate between the time when it makes a data channel request to access memory and the time when that request must be acknowledged is called data channel latency. Data channel latency varies with the type of controller. As a general rule, you should assign slots with the highest priorities to the controllers with the lowest data channel latency. Table A-2 in Appendix A lists the slot priority order for various I/O controllers.

An additional consideration is the device controller used for loading diagnostics. Every system must have a diagnostic load device. This is usually a tape drive. If this tape drive is a non-BMC device, you should assign it to the highest priority slot after the BMC devices have been configured.

Distributing Load

You may want to consider ways to distribute the load from the I/O controllers. Slot priorities particularly apply, as does individual device loading. For example, the usage level of a device connected to a particular controller can negatively affect the performance of other devices on the same controller. The effect of highly used terminals, asynchronous printers, or heavily used asynchronous communications lines may be lessened by distributing these devices and lines across different communication controllers.

Because bandwidth usage is dependent on the number and types of operations performed at any given instant you cannot always balance the load in advance for all conditions. Therefore, even after following the previous guidelines, it may be necessary to rearrange controller boards to tailor a system to a specific set of applications.

Configuring an ECLIPSE I/O Expansion Chassis

The ECLIPSE I/O expansion chassis provides an extension to the individual ECLIPSE I/O channels. It connects to a bus repeater board in the last slot of computer chassis via an external I/O cable. The expansion chassis is a self-contained rack-mounted unit, installed within a separate peripheral cabinet. It has its own power supply, backpanel, cooling fan, and peripheral device connector panel. The expansion chassis provides 20 slots, 6 of which are taken up by a power supply, a load board, and an I/O bus terminator. The remaining 14 slots, numbered 6 through 19, are available for I/O controllers. A stand-alone BBU is required when configuring a chassis with the system.

The allocation of slots within the expansion chassis is relatively simple: all slots are of the same type, slow data channel. Therefore your primary concern is to allocate boards according to the same priority and latency requirements as outlined previously for the main subsystem chassis I/O slots. Power considerations are based on the expansion chassis' own independent power supply.

For further description of the ECLIPSE I/O expansion chassis, refer to Appendix C.

Configuring Battery Backup

You can configure your system with a battery backup unit (BBU), which senses any interruption of power and shuts the system down in an orderly manner. This shutdown includes saving important processor information in main memory just before the system shuts down. The BBU then maintains power for the entire CPU and expansion chassis (if present) for as long as the batteries are able to supply power. When the input power comes back on, the system automatically restarts as long as the system is still on battery power. The restart occurs at the point where the power interruption occurred.

BBU models are available for individual chassis, such as the main computer chassis or the expansion chassis, and also a model that connects to the main computer chassis that powers both the main chassis and an attached expansion chassis.

Checking Power Requirements

Power requirements are determined by adding up the individual power draws for the individual logic components and comparing the totals with the maximum available power outputs. If a total exceeds the maximum value of the basic computer chassis, you will have to reassign some boards to an expansion chassis.

Most of the power used within the computer chassis goes to the I/O controller boards. However, there are several other components that draw small amounts of power. The terminator resistors for buses in the system draw small amounts of +5 volt power. The system data and address buses, each BMC bus, and each I/O bus have separate terminators that add small but finite amounts to the power requirements. The front panel also draws a small amount of +5 volt power.

If there is a battery backup unit (BBU) for the chassis, it draws a small amount of both +5 volt and +12 volt power during normal power conditions. However, after a power failure, the amount of VNR power the BBU uses increases significantly (to recharge the batteries).

Table A–2 in Appendix A lists the current draw values of the controller boards that draw power from the main regulator outputs. To determine the total power requirements of your configured subsystem, you must add the power requirements of all the controller boards in each chassis you have configured.

You also need to consider the reed relays that monitor the amount of +5 volt current distributed to various slot groups in the main chassis. Each relay allows up to a total of 50 amperes of +5 volt current for all the boards in its group. If too much +5 volt current is used by any one group, a power system fault will be generated. Table 4–2 lists the reed–relay slot groupings for the main chassis. Table C–5 in Appendix C lists the reed–relay slot groupings for the ECLIPSE I/O expansion chassis.

Table 4–2 Reed relay slot groupings

Group	Slots	Maximum Current (A)
1	7,8,9,10	50
2	11,12	22
3	13,14,15,16	50
4	17,18,19,20	50

Appendix B provides configuration worksheets to help you determine if your proposed configurations are within the power limitations of the individual chassis. In these worksheets, the current draw values of basis system boards are pre–entered for you and the +5 volt fill–in spaces are allocated according to the reed relay slot groupings. The total available current specifications for each power supply voltage are also listed to compare with the figures that you derive.

Checking Operating System Restrictions

You should verify that your configuration is fully supported by the operating system you intend to use. This section explains how to check the restrictions for the following operating systems:

- AOS/VS and AOS/VS II
- AOS/RT32
- DG/RDOS

AOS/VS and AOS/VS II Operating Systems

Both the AOS/VS and AOS/VS II operating systems may restrict the number of certain controllers that you can have in a system. Appendix A lists the controllers available for ECLIPSE I/O systems along with any limitations imposed by the operating system.

Device codes are also a concern. The operating system can put various limits on the number and type of devices used in a system. In general, controllers that the operating system uses directly will be assigned at startup. The system will be "told" which controllers it has available by having unique numerical device codes assigned to each controller. These device codes are used to address the device when communicating through an I/O channel.

Each channel has its own set of 64 device codes. In some cases, jumpers or switches on the I/O controller boards determine which device code the controller responds to. Certain device codes are usually reserved for specific controllers. These device codes have mnemonics associated with them that the assembler recognizes and translates to the appropriate code. For example, the system console interface is usually assigned device code 10 for input from the keyboard and 11 for the output to the display. The assembler recognizes the mnemonics TTI for input and TTO for output and translates them to 10 and 11 respectively. If a device has a reserved device code, you should use that code. If there is no specific device code, any unused codes will suffice.

Controllers not recognized by the operating system require additional software for interface handling routines, which may pose their own limits. Certain software packages contain their own interface handling routines. The operating systems also provide system calls that allow users to define their own routines for special or customized controllers. Appendix A lists the operating system limits for the various controllers. For more information, consult your Data General sales representative.

AOS/RT32 Operating System

The AOS/RT32 operating system has its own restriction on devices that it recognizes. Controllers not recognized by the AOS/RT32 operating system require additional software for interface handling routines, which may pose their own limits. Certain software packages contain their own interface handling routines. As with AOS/VS and AOS/VS II, AOS/RT32 also provides system calls that allow users to define their own routines for special or customized controllers. Table A–15 in Appendix A lists the operating system limits for the various controllers. Consult with your Data General sales representative for further information on the AOS/RT32 operating system.

DG/RDOS Operating System

DG/RDOS is a real–time operating system supporting foreground/background processing, multitasking, and memory mapping. Even though the ECLIPSE MV/9500 is a 32–bit system, DG/RDOS running on it supports only 16–bit programs with a maximum of 64–Kbytes of address space. For additional information, along with a list of controllers and device codes compatible with the DG/RDOS operating system, consult with your Data General sales representative.

Checking Site and Environment

You must consider a variety of environmental factors when you configure a system for the first time or if you are adding peripherals. These factors include the following:

- Air conditioning
- Total available ac power
- Space requirements
- Acoustics
- Electrical interference.

You should consult with your Data General field service representative for assistance on site and environmental planning.

End of Chapter

Chapter 5
Examples of Configuring a System

This chapter gives two examples showing how to configure an ECLIPSE 9500 system. The first example shows you how to configure an initial system, using the steps defined in Chapter 4; the second example shows you how to expand upon that initial system using the same steps.

Example 1: Configuring an Initial System

In this example we are configuring an ECLIPSE 9500 system for an initial installation. The steps we use are as follows:

- Determining what we need.
- Configuring memory.
- Configuring system I/O.
- Configuring battery backup.
- Checking power requirements.
- Checking operating system restrictions.
- Checking site and environment.

Determining What We Need

We know that our system has a system board with at least one memory module.

The initial step then in our configuration task is to determine what additional items are required. Using the approach outlined in Chapter 4, we perform that task as follows:

1. First we decide what we want for peripherals, based on the projected number of users, the applications being used, and the physical distribution of the users.
2. From the peripheral requirements, we determine what we will need for I/O controller boards.
3. Based on the applications we want to run, the number of users on the system, and the peripherals we want on the system, we select the operating system.
4. Based on the applications we want to run, the number of users on the system, and the peripherals we want on the system, we determine how much memory we should have.

Determining System Peripherals

In assessing what we want for peripherals, we decide on the following:

- 60 user terminals plus one system console terminal.
- One serial–interface letter–quality printer.
- One parallel–interface line printer.
- Two 500–Mbyte R.A.M.S. disk drives.
- One high–speed tape drive.
- Two synchronous modems.

Determining I/O Controllers

From the above list, we simply calculate how many IAC boards it will take to support the 60 terminals and the letter–quality printer. We then list the controller boards required for the other peripherals. Although two IAC/24 boards and one IAC/16 board would provide for the number of users that we want now, there would be only three lines available for users to be added as needed. So we opt for three IAC/24 boards, giving us a load balancing and expansion potential of 11 more asynchronous lines. Since the system console is handled off of the system board, no additional consideration has to be made for the system console. Table 5–1 lists the I/O controller boards that we need and their I/O type:

Table 5–1 Example 1: I/O Controllers

Quantity	Controller	Type of I/O
3	4622 IAC/24s	data channel
1	4599 Line printer controllers	data channel
1	6580 series disk controller	burst multiplex
1	6300 tape drive controller	burst multiplex
1	4380 ISC/2	data channel

NOTE: The controllers listed in Table 5–1 are all single board controllers, thus requiring one slot per controller.

Determining the Operating System

Data General provides four operating systems for us to choose from: AOS/VS, AOS/VS II, AOS/RT32, and DG/RDOS. We consult with our Data General sales representative to determine which operating system we should use. From this consultation and based on our applications, we select the AOS/VS II operating system as best serving our needs.

Determining Memory Requirements

As advised in Chapter 4, we consult with our Data General sales representative to determine how much memory we need for our system. The memory requirement takes into account the AOS/VS II operating system, the applications being used, and the number of users on the system. From this consultation with the sales representative, we decide that we want an additional 8–Mbyte memory module in addition to the basic 8–Mbyte memory module that is standard for the system.

Configuring Memory

The memory modules will be installed on the system board and are electrically connected via mating connectors. The memory modules do not require any jumper or switch configuring.

Configuring System I/O

Now that we have determined the number and type of I/O controllers, the operating system, and the amount of memory, we are ready to configure the logic chassis by allocating slots according to the requirements of the individual controllers.

Allocating Slots

The allocation of slots requires that we know the number and type of individual controller boards. In our example, we have already determined that our configuration requires seven I/O controller boards, two of which use the BMC interface and the remaining five of which use the standard data channel interface. Therefore, to allocate slots, we need to determine where each board should be installed for optimal system operation.

The BMC boards are easy. The rule states that BMC boards should be installed in slots nearest to the I/O controller (on the system board). Therefore, we assign the fixed–disk controller board to slot 7 and the tape drive controller board to slot 8.

To determine the priority ordering of the remaining boards, we consult Table A–1 in Appendix A.

From the table we see that the intelligent synchronous controller board (ISC/2) would have the highest priority among the boards we are using. Alternatively, it could be placed after the IACs and before the printer controllers. For our purposes, we assign the ISC/2 to slot 11, the three IACs to slots 12 through 14, and the printer controller board to slot 15. Figure 5–1 shows the slot assignments for this configuration.

In taking the above approach of placing the ISC/2 in slot 11, we are leaving two slots open to allow the addition of a couple of BMC type controllers at some future time.

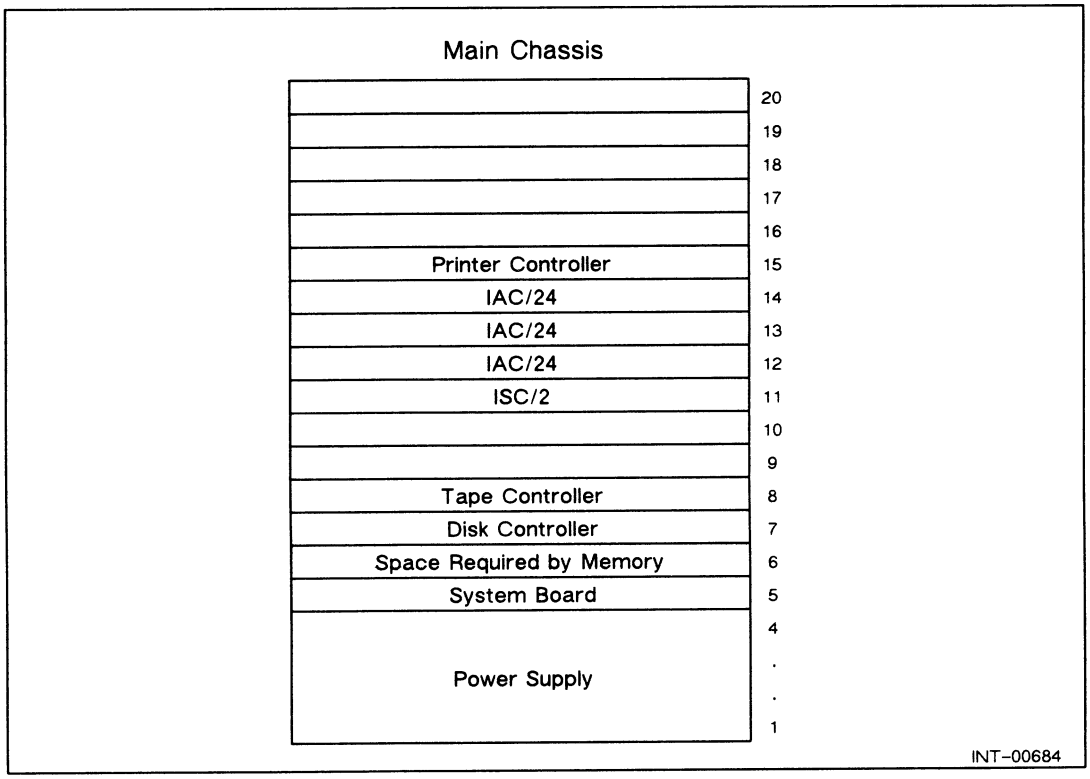

Figure 5-1 Example 1: Slot Assignments

Configuring Battery Backup

To protect against power interruptions, we decide to configure a battery backup unit. We can select from either a BBU that supports one chassis or a BBU that supports two chassis (the main chassis and an expansion chassis). Since we can upgrade the BBU when we add an expansion chassis, we decide to go with the single-chassis model BBU (8746-A) at this time.

Checking Power Requirements

For determining the power requirements of the boards in our configuration, we first add the current draws of all the boards. For this we use the worksheets in Appendix B, filling in the current draw values for each controller, taking care that the +5 volt values are entered under the correct reed relay slot groupings (for controller current values, refer to Table A-2 in Appendix A). Note that on the worksheet, we crossed out the BBU model not being used.

To check that we are not exceeding the overall power rating of the system we must calculate the total power draw in watts. To calculate watts, we multiply the voltage value by the current value (in amperes). On our worksheet, we add the -5 volt and +5 volt currents and then multiply by 5 to give the total 5-volt power in watts. Similarly, we add the +12 volt current draws and multiply by 12 to give the total 12-volt power in watts. We then add the 5-volt and 12-volt watt totals to obtain the total number of watts required by our system. We then must compare this value, the total power requirement, against the total power available value (in our case 596 watts, as we are using a BBU).

Figure 5–2 shows the completed worksheet. By comparing the total required power draw (350.6 watts) against the listed power available when using a BBU (596 watts) we can see that our configuration is within the power specifications for the main system chassis.

Checking Operating System Restrictions

As previously stated, we elect to use the AOS/VS II operating system. Checking our I/O board set against Table A–3 in Appendix A, we see that we do not exceed any of the AOS/VS II operating system restrictions.

Checking Site and Environment

Following the recommendation given in Chapter 4, we discuss our planned system configuration with our Data General field service representative to determine if there is any problem in respect to site and operating environment.

Computer Chassis Power Calculation Worksheet

Slot	Device	Current Draw (A)					
		+5 V Reed Relay Group Used				+12 V	-5 V
		1	3	4	2		
	Computer Chassis Boards:						
5	System board with 1 memory module	12.4				0.25	0.1
	Each added memory module, add 0.4 →	0.4					
6	Slot not available						
7	6238-B disk drive controller	13.9					
8	6300 tape drive controller	7.3					
9							
10							
11	4380 ISC/2				4.20	0.260	0.12
12	4622 IAC/24				6.66	0.178	
13	4622 IAC/24		6.66			0.178	
14	4622 IAC/24		6.66			0.178	
15	4393 DCH printer controller		3.00				
16							
17							
18							
19							
20							
	Miscellaneous:						
	8746-A BBU (computer chassis only)	2.8				1.1	
	~~8745-A BBU (computer, expans. chassis)~~	~~5.6~~				~~2.0~~	
	I/O bus terminators			1.0			

Current Draw Limits:	Total Groups 1, 3, 4	1	3	4	2	+12 V	-5 V
Total current required	54.12 ← =	36.8	+ 16.32	+ 1.0	10.86	2.144	0.22
Total current available (A)	**120.0**	**50**	**50**	**50**	**22**	**5.5**	**2.3**

Power Calculations (watts = V x A): — **Watts**

Total 5 V power required = total of +5 and -5 V currents: 65.0 x 5 = 325.0

Total 12 V power required = total of +12 V current: 2.144 x 12 = 25.7

Total power required (sum of 5 and 12 V power totals) = 350.7 *

Total power available with BBU: = **596**

Total power available without BBU: = **655**

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* Compare **total power required** with appropriate **power available** value.

Figure 5-2 Example 1: Power Calculations

Example 2: Expanding an Existing System

In this example we are planning an expansion to the system that we configured in example 1. We want to add another 500–Mbyte disk drive, another high–speed tape drive, voice/mail capabilities, another data channel printer, connection to a local area network (LAN), connection to a network bus system, connection to a StarLAN, and an increase in the number of user terminals from 60 to 120. In planning this expansion, we use the same step–by–step approach we used in example 1.

Determining What We Need

The first step is to determine what additional items we need, using the approach outlined in Chapter 4. We perform that task as follows:

1. First we decide what we want for peripherals, based on the projected number of users, the applications being used, and the physical distribution of the users.
2. From the peripheral requirements, we determine what we need for I/O controller boards.
3. Normally, at this step in our planning, we would select what operating system we want to use. Since we already have an operating system, we ignore this step.
4. Based on the applications we will be running, the number of users on the system, and the peripherals we want, we determine how much memory is needed.

Determining System Peripherals

In assessing what peripherals we want to add, we decide on the following:

- One LAN controller.
- One IRC controller.
- One additional ISC/2 controller.
- 60 additional user terminals.
- One additional 600–Mbyte R.A.M.S. disk drive (to support the additional users).
- One additional tape drive (to provide additional disk backup capabilities).
- One laser printer.
- Three additional DCH line printers (to support the additional users).

Determining I/O Controllers

From the list above, we calculate how many additional IAC boards it will take to support the additional 60 terminals. We will connect the additional disk and tape drives to our current controllers (the current controllers will handle eight disk drives and four tape drives). Since the DCH printer controller supports one printer, three printer controllers are needed. The ILC, IRC, and ISC/2 each require a controller. Table 5–2 lists the I/O controller boards that we have selected to add and their I/O types. These controllers are all single–board controllers, requiring one slot per controller.

Table 5–2 Example 2: Additional I/O Controllers

Quantity	Controller	Type of I/O
3	4622 IAC/24s (RS-422)	data channel
1	4532-A Intelligent LAN controller (ILC)	data channel
1	4380 Intelligent synchronous controller (ISC/2)	data channel
3	4393 DCH line printer controllers	data channel
1	4630 Intelligent ring controller (IRC)	data channel

From the controller listing in Table 5–2, we see that nine additional controllers are needed. Since each controller uses one I/O slot, we need nine additional I/O slots to accommodate our expansion. In checking to see how many unused I/O slots we have available, we find that there are seven unused slots in the main system chassis, so we need two additional slots to accommodate the new controllers. We can gain slots in two ways: we can change our disk and tape subsystems to the combined storage subsystems (CSS) type, thus one controller can handle both the disks and tape drives; or we can connect an ECLIPSE expansion chassis to the internal I/O channel. We choose to go with the expansion chassis, as we may need to add more controllers at some later date.

To connect the expansion chassis, we need to add a bus repeater board in the main system chassis, displacing one I/O controller from the main system chassis and creating the need for another I/O slot to accommodate our expansion. Thus a total of 10 additional I/O slots are required.

Determining the Operating System

Since we will continue with the AOS/VS II operating system, this step doesn't apply in our expansion.

Determining Memory Size

Since we are significantly increasing the number of users, we also need to expand the size of memory. As advised in Chapter 4, we consult with our Data General sales representative to determine how much memory we need to add. From this consultation we determine that we should add another 16–Mbytes. We can add memory capacity either by adding a 32–Mbyte memory module (giving 16 Mbytes of extra capacity for future expansion) or by installing two additional 8–Mbyte memory modules (the system board has connnections for up to four modules of either 8–Mbyte or 32–Mbyte capacity, or any mix thereof).

Configuring Memory

For the additional 16 Mbytes of memory, we choose to add two more 8–Mbyte modules. Again, the memory modules do not require any jumper or switch configuring.

Configuring System I/O

Now that we have determined the number and type of I/O controllers, and the amount of memory, we are ready to allocate controllers in the main system chassis and the expansion chassis, according to the requirements of the individual controllers.

Allocating Slots

The allocation of I/O slots requires that we know the number and type of boards we are adding. In our example, we have already determined that our configuration requires nine additional I/O controller boards. All use the standard data channel interface. We also determined that we need a bus repeater board. Therefore, allocation consists of determining in which slots the added boards should be installed for optimal system operation. In our case, since we are adding another chassis, we are going to reconfigure the existing slot assignments also.

We configure the main system chassis first. Again, we consult Table A–1 (Appendix A) to determine the priority ordering for the controllers. We start by reassigning the ISC/2s to slots 9 and 10 and assigning the IAC/24s to slots 11 through 16. Then we reassign the printer controllers to slots 17 through 19. The bus repeater board for connecting the expansion chassis goes in slot 20.

The expansion chassis is easy to configure. We assign the remaining controllers, the ILC and IRC to slots 6 and 7. The remaining 12 slots of the chassis are available for future expansion.

In assigning slots, we have attempted to distribute the I/O loading according to the priority indicated in Table A–1, Appendix A. Figure 5–3 shows our slot assignments for this configuration.

If necessary, after observing system operation, we can adjust assignments to further equalize the loading, moving some controllers downward in the priority chain and others upward. Also, if at some future time we need to configure some higher priority controllers into the system, we can move some of the controllers from the main system chassis into the expansion chassis.

Main Chassis	Slot	Expansion Chassis	Slot
Bus Repeater	20	I/O Bus Terminators	20
Printer Controller	19		19
Printer Controller	18		18
Printer Controller	17		17
IAC/24	16		16
IAC/24	15		15
IAC/24	14		14
IAC/24	13		13
IAC/24	12		12
IAC/24	11		11
ISC/2	10		10
ISC/2	9		9
Tape Controller	8		8
Disk Controller	7	IRC	7
Spacc Required by Memory	6	ILC	6
System Board	5	Load Board	5
Power Supply	4 . . 1	Power Supply	4 . . 1

INT-00684

Figure 5-3 Example 2: Slot Assignments

Configuring Battery Backup

Since we have added an expansion chassis to our system configuration, we have to decide how we want to provide backup power support. We can either add a single chassis BBU to the expansion chassis or we can upgrade the BBU on the computer chassis to handle both chassis. We elect to change from our existing BBU, a model 8746-A, to a model 8745-A BBU, capable of handling both chassis.

Checking Power Requirements

For determining the power requirements of our expanded configuration, we again use the worksheets, as we did in example 1. Figures 5-4 and 5-5 show our worksheets for example 2. Note that we crossed out the BBU on the worksheet for the expansion chassis, since we changed the BBU on the computer chassis to handle both chassis. Again, on the computer chassis worksheet, we crossed out the BBU model not being used.

In looking at the worksheets and comparing the total required current and power draw sums against the listed available values, we can see that our configuration is within the current and power specifications for both the computer chassis and the expansion chassis.

Computer Chassis Power Calculation Worksheet

Slot	Device	Current Draw (A): +5 V Reed Relay Group Used 1	3	4	2	+12 V	-5 V
	Computer Chassis Boards:						
5	System board with 1 memory module	12.4				0.25	0.1
	Each added memory module, add 0.4 →	1.2					
6	Slot not available						
7	6238-B disk drive controller	13.9					
8	6300 tape drive controller	7.3					
9	4380 ISC/2	4.2				0.260	0.12
10	4380 ISC/2	4.2				0.260	0.12
11	4622 IAC/24				6.66	0.178	
12	4622 IAC/24				6.66	0.178	
13	4622 IAC/24		6.66			0.178	
14	4622 IAC/24		6.66			0.178	
15	4622 IAC/24		6.66			0.178	
16	4622 IAC/24		6.66			0.178	
17	4393 DCH printer controller			3.00			
18	4393 DCH printer controller			3.00			
19	4393 DCH printer controller			3.00			
20	8706-N Bus Repeater			1.05			
	Miscellaneous:						
	~~8746-A BBU (computer chassis only)~~	~~2.8~~				~~1.1~~	
	8745-A BBU (computer, expans. chassis)	5.6				2.0	
	I/O bus terminators			1.0			

Current Draw Limits:	**Total Groups 1, 3, 4**	1	3	4	2	+12 V	-5 V
Total current required	86.57 ←	= 48.8	+ 26.64	+ 11.05	13.32	3.838	0.34
Total current available (A)	120.0	50	50	50	22	5.5	2.3

Power Calculations (watts = V x A): **Watts**

Total 5 V power required = total of +5 and -5 V currents: 99.9 x 5 = 499.5

Total 12 V power required = total of +12 V current: 3.84 x 12 = 46.1

Total power required (sum of 5 and 12 V power totals) = 545.6 *

Total power available with BBU: = **596**

Total power available without BBU: = **655**

INT-02142

* Compare **total power required** with appropriate **power available** value.

Figure 5-4 Example 2: Main Chassis Worksheet

Expansion Chassis Power Calculation Worksheet

Slot	Devices	Current Draw (A)						
		+5 V Reed Relay Group Used					+12 V	-5 V
		1	2	3	4	5		
	Expansion Chassis Boards:							
5	Load board	6.0 †						
6	4532-A ILC	7.04					0.625	
7	4630 IRC		6.0				0.200	
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20	I/O bus terminators (slot not available)					1.0		
	Miscellaneous:							
	~~8746 Battery Backup Unit (if used)~~	~~2.8~~					~~1.1~~	

Current Draw Limits:	**+5 V Total** (Groups 1-5)							
Total current required	20.04 ← =	13.04 +	6.0 +	+	+	1.0	0.825	
Total current available (A)	**120.0 ‡**	50	50	50	50	50	**12.5**	**3.0 §**

Power Calculations (Watts = V x A): **Watts**

Total 5 V power required = total of +5 and -5 V currents: 20.04 x 5 = 100.2

Total 12 V power required = total of +12 V current: .825 x 12 = 9.9

Total power required (sum of 5 and 12 V power totals) = 110.1 *

Total power available with BBU: = **545**

Total power available without BBU: = **597**

INT-02141

* Compare **total power required** with appropriate **power available** value.

† 10 A if configured for -5 V boost.

‡ 100 A under some load conditions; contact your field service representative if exceeding 100 A.

§ 6A if load board is configured for -5 V boost.

Figure 5-6 Example 2: Expansion Chassis Worksheet

Checking Operating System Restrictions

As previously stated, we are using the AOS/VS II operating system. Checking our I/O board set against the Table A–3 in Appendix A, we see that we do not exceed any of the AOS/VS II operating system restrictions.

Checking Site and Environment

Following the recommendation given in Chapter 4, we discuss our planned system configuration with our Data General field service representative to determine if there is any problem in respect to site and operating environment.

End of Chapter

Appendix A
I/O Configuration Data

Tables A–1 through A–3 list the priority ordering according to I/O latencies, current draw specifications, and operating system restrictions for ECLIPSE I/O controllers. For more detailed description of a specific controller, refer to Chapter 3.

Table A–1 Priority Ordering of I/O Controllers by I/O Latencies

Priority (Relative)	Controller
Highest	ArrayPlus™ 2000
	A/D or D/A
	Non-BMC tape drive controller
	Buffered card reader controller
	BSI/1, BSI/4,
	DCU 200
	MCP-1, IAM/16
	ISC/2*
	IAC/8, IAC/16, IAC/24, ITC/128
	CPI/24
	NBS
	MCA
	VMC/2
	Printer controller
	ILC, IBC, IDC, IRC
	IEEE-488
Lowest	GDC

* The ISC/2 has the potential for using a large portion of the data channel bandwidth and effectively locking out devices of lower priority. This may require that you lower the ISC in the priority order. If you do, place the ISC just after the CPI/24.

Table A-2 Current Draw for I/O Controllers

DGC Part Number	Description	Power Requirements (Amperes) +5 V	+12 V	-5 V
4040/4190	General purpose interface boards	1.00		
4206	Multiprocessor communications adapter (MCA)	3.50		
4244/4245	Data channel line printer controller	3.00		
4254	Data Control Unit (DCU 200)	8.00		
4306MV	Buffered card reader controller	1.50	0.100	
*	Medium-speed tape drive subsystem	6.60		0.125
*	High-speed tape drive subsystem	7.30		
4330	Analog-to-digital and digital-to-analog converters	5.20		
4348	Bit synchronous interface, one-line (BSI/1)	2.80		
4349	Bit synchronous interface, four-line (BSI/4)	4.00		
4367-A	Intelligent asynchronous controller, RS232/RS422(IAC 2/8)	8.64	0.215	0.100
4368	Intelligent asynchronous controller, RS232/20ma (IAC/16)	8.00	0.200	0.050
4368-A	Intelligent asynchronous controller, RS422/20ma (IAC 2/16)	9.60		0.165
4369	Intelligent asynchronous controller, RS232/RS422 (IAC/8)	8.00	0.900	0.360
4370	Intelligent asynchronous controller, RS232/20ma (IAC/16)	8.80	0.200	0.290
4370-A	Intelligent asynchronous controller, RS422/20ma (IAC/16)	9.60		0.165
4380	Intelligent synchronous controller (ISC/2)	4.20	0.260	0.120
4398	Computer-PBX Interface (CPI/24)	8.17	0.205	0.030
4425	Laser document printer controller	3.00		
4460	Network bus system controller(NBS)	5.20		
4517-A	IEEE-488 bus interface	2.25		
4532-A	Intelligent LAN controller(ILC)	7.04	0.625	
4543	Multicommunications processor (MCP-1)	9.53	0.310	0.105
4550	Voice mail controller, two-line (VMC/2)	6.07	0.190	0.050
4555	Intelligent broadband LAN controller (IBC)	7.90	0.850	
4581	Intelligent StarLAN controller(IDC)	7.14	0.160	
4586	Intelligent TermController (ITC/128)	13.55	0.500	
4622/23	Intelligent asysnchronous controller, RS232/RS422 (IAC/24)	6.66	0.178	
4624/25	Intelligent asynchronous controller, RS232/RS422 (IAC/8)	3.83	0.173	
4630	Intelligent ring controller	6.00	0.200	
5070-D	Optical disk controller	8.70		
5520-A	ArrayPlus™ 2000 array processor	20.00		
5916	Intelligent asynchronous multiplexor (AIM)	7.00	0.300	0.100
6238-B	High-speed disk drive controller	13.90		
6299/6300	Streaming tape drive subsystem	7.30		
6580	R.A.M.S. disk drive controller	9.40		
6433	Combined storage subsystem host adaptor, disk/tape	9.63	0.310	
6433	Rugged removable disk drive controller	9.63	0.310	
6434	727-Mbyte disk drive host adaptor	10.00		
6435	Combined storage subsystem host adaptor, tape only	9.00		
8810	GDC/1000 graphics display controller (2 boards)	30.20		
8812	Expansion memory for 8810 multihead	15.20		
8812-A	Expansion memory for 8810 double buffer/overlay	15.20		
8812-B	Dual expansion memory for 8810 double buffer/overlay (2 boards)	30.40		
8812-M	Expansion memory for 8810 24-bit graphic system (2 boards)	30.40		
8824	GDC/2400 graphics display controller (4 boards)	60.60		
8706-N	Bus repeater	1.05		
80021/22	ECLIPSE channel processor (MRC interface)	15.00		

* See Table 3-5 in Chapter 3.

Table A-3 Operating System Limits on I/O Controllers*

Model No.	Controller	AOS/VS	AOS/VS II	AOS/RT32
4040/4190	General purpose interface boards	user ‡	user ‡	user ‡
4206	Multiprocessor communications adapter (MCA)	2	2 per channel †	2
4244/4245	Data channel line printer controller	8	No limit	8
4307	Medium-speed tape drive subsystem	4	No limit	2
4306MV	Buffered card reader controller	2	user ‡	user ‡
4348	Bit synchronous interface, one-line (BSI/1)	16	16	user ‡
4349	Bit synchronous interface, four-line (BSI/4)	4	4	user ‡
4367-A	Intelligent asynchronous controller, RS232/RS422(IAC/8)	64	Line limited §	64
4368	Intelligent asynchronous controller, RS232/20ma (IAC/16)	64	Line limited §	64
4368-A	Intelligent asynchronous controller, RS422/20ma (IAC/16)	64	Line limited §	64
4369-A	Intelligent asynchronous controller, RS232/RS422 (IAC/8)	64	Line limited §	64
4370	Intelligent asynchronous controller, RS232/20ma (IAC/16)	64	Line limited §	64
4370-A	Intelligent asynchronous controller, RS422/20ma (IAC/16)	64	Line limited §	64
4380	Intelligent synchronous controller (ISC/2)	16	16	user ‡
4398	Computer-PBX interface (CPI/24)	16	Line limited §	user ‡
4425	Laser document printer controller	8	No limit	8
4460	Network bus system controller(NBS)	2 ¶	2 ‡	2 ‡
4517-A	IEEE-488 bus interface	user ‡	user ‡	user ‡
4532-A	Intelligent LAN controller(ILC)	4 ¶	4 ¶	4 ‡
4550	Voice mail controller, two-line (VMC/2)	2 ¶	2 ¶	user ‡
4555	Intelligent broadband LAN controller (IBC)	4 ‡	4 ¶	4 ¶
4581	Intelligent StarLAN controller(IDC)	4 ¶	4 ¶	4 ‡
4586	Intelligent TermController (ITC/128)	16	Line limited §	user ‡
4622/23	Intelligent asynchronous controller, RS232/RS422 (IAC/24)	64	Line limited §	64
4624/25	Intelligent asynchronous controller, RS232/RS422 (IAC/8)	64	Line limited §	64
4630	Intelligent ring controller (IRC)	4 ¶	4 ¶	4 ¶
5070	Optical disk controller	4 ¶	4 ¶	4 ¶
5520	ArrayPlus™ 2000 array processor	user ‡	user ‡	user ‡
5916	Intelligent asynchronous multiplexor (IAM/16)	8	Line limited §	8
6026	High-speed tape drive subsystem	4	No limit	2
6238-B	High-speed disk drive controller	8	No limit	16
6299/6300	Streaming tape drive subsystem	4	No limit	4
6433	CSS/rugged removable host adaptor, disk/tape	8	No limit	8
6434	727-Mbyte disk drive host adaptor	8	No limit	8
6435	Combined storage subsystem (CSS) host adaptor, tape only	8	No limit	8
6580	R.A.M.S. disk drive controller	8	No limit	8
8810	GDC/1000 graphics display controller (2 boards)	1	1	1
8824	GDC/2400 graphics display controller (4 boards)	1	1	1

* Hardware limitation: BMC controllers can not exceed 8 per ECLIPSE channel
† Hardware limitation: 2 per ECLIPSE channel.
‡ User must supply the OS/driver interface (via ?IDEF system call).
§ Controllers are not limited. However, total number of asynchronous lines must not exceed 1360 excluding PCs (AOS/VS II Rev. 1.10).
¶ Software is extra, e.g. ILC drivers come with XTS or TCP/IP.

End of Appendix

Appendix B
The Forms You Use

This appendix contains two formatted worksheets, one for each type of chassis that you can configure. Use these worksheets to help you configure within the available power limits of the chassis. First, make copies of the worksheets, and then use the copies to calculate your configuration.

The following steps tell you how to use the worksheets.

1. Enter all the boards that you are configuring into the column under the heading **Devices**. Make sure that each board is entered at the appropriate slot number. Note that system boards and BBU models have already been entered for you.
2. Refer to Table A–2 in Appendix A and fill in the current draw values for each board, taking care to enter the information into the appropriate voltage columns. Observe that the +5 V entry is subdivided into power groupings, according to the reed relays that protect the slots against current overload. Note that you need to cross out BBUs that are not being used.
3. Add each column's entrys and enter the sum at the bottom on the line. Add the +5 V group totals and enter that sum to the left of the arrow on the same line.
4. Compare the **Total current required** value for each reed relay group with the values immediately below on the **Total current available** line. If all the required values do not exceed the total available values, then your configuration is within the current draw specifications for the reed relay groups. However, if any of the required values do exceed the current available values, then you must move some of the controller boards around until you have a configuration that satisfies both current draw limits and the other configuration concerns.
5. Compare the **Total current required** value for the **+5 V** (value to left of arrow), **+12 V, and –5 V** with the values immediately below on the **Total current available** line. If the total required values do not exceed the total available values, your configuration is within the current draw specifications for the chassis. However, if any of the required values exceed the current available values, then you must add an I/O expansion chassis to your system.

NOTE: When using the computer chassis worksheet, note that the +5 V current draw total for group 2 must not be included in the total at left of the arrow.

6. To check that you are not exceeding the overall power rating of the chassis you must calculate the total power draw in watts. To calculate watts, multiply the voltage value by the current value (in amperes). On the worksheet, you add the –5 and +5 volt currents, and then multiply by 5 to give the total 5–volt power in watts. Similarly, add the +12 volt current draws and multiply by 12 to give the total 12–volt power in watts. Then add the 5–volt and 12–volt watt totals to obtain the total number of watts required by your system. You must then compare the total power requirement against the appropriate total power available value, selecting the value with or without BBU, as your case may be. Your configuration must not exceed the total available power specifications for the chassis.

Computer Chassis Power Calculation Worksheet

Slot	Device	Current Draw (A) +5 V Reed Relay Group Used 1	3	4	2	+12 V	-5 V
	Computer Chassis Boards:						
5	System board with 1 memory module	12.4				0.25	0.1
	Each added memory module, add 0.4 --->	____					
6	Slot not available						
7	____	____				____	____
8	____	____				____	____
9	____	____				____	____
10	____	____				____	____
11	____				____		____
12	____				____		____
13	____		____			____	____
14	____		____			____	____
15	____		____			____	____
16	____		____			____	____
17	____			____		____	____
18	____			____		____	____
19	____			____		____	____
20	____			____		____	____
	Miscellaneous:						
	8746-A BBU (computer chassis only)	2.8				1.1	
	8745-A BBU (computer, expans. chassis)	5.6				2.0	
	I/O bus terminators			1.0			

Current Draw Limits:	Total, Groups 1, 3, 4 ←	1	3	4	2	+12 V	-5 V
Total current required	____	= ____	+ ____	+ ____	____	____	____
Total current available (A)	120.0	50	50	50	22	5.5	2.3

Power Calculations (watts = V x A): **Watts**

Total 5 V power required = total of +5 and -5 V currents: ____ x 5 = ____

Total 12 V power required = total of +12 V current: ____ x 12 = ____

Total power required (sum of 5 and 12 V power totals) = ____ *

Total power available with BBU: = **596**

Total power available without BBU: = **655**

INT-02142

* Compare **total power required** with appropriate **power available** value.

Expansion Chassis Power Calculation Worksheet

Slot	Devices	Current Draw (A) +5 V Reed Relay Group Used 1	2	3	4	5	+12 V	-5 V
	Expansion Chassis Boards:							
5	Load board	6.0 †						
6	______	______					______	______
7	______		______				______	______
8	______		______				______	______
9	______			______			______	______
10	______			______			______	______
11	______			______			______	______
12	______			______			______	______
13	______				______		______	______
14	______				______		______	______
15	______				______		______	______
16	______				______		______	______
17	______					______	______	______
18	______					______	______	______
19	______					______	______	______
20	I/O bus terminators (slot not available)					1.0		
	Miscellaneous:							
	8746 Battery Backup Unit (if used)	2.8					1.1	

Current Draw Limits:	**+5 V Total** (Groups 1-5)								
Total current required	______ ⟵	= ______	+ ______	+ ______	+ ______	+ ______	______	______
Total current available (A)	120.0 ‡	50	50	50	50	50	12.5	3.0 §

Power Calculations (Watts = V x A): **Watts**

Total 5 V power required = total of +5 and -5 V currents: ______ x 5 = ______

Total 12 V power required = total of +12 V current ______ x 12 = ______

Total power required (sum of 5 and 12 V power totals) = ______ *

Total power available with BBU: = **545**

Total power available without BBU: = **597**

INT-02141

* Compare **total power required** with appropriate **power available** value.
† 10 A if configured for -5 V boost.
‡ 100 A under some load conditions; contact your field service representative if exceeding 100 A.
§ 6A if load board is configured for -5 V boost.

End of Appendix

Appendix C

ECLIPSE I/O Expansion Chassis

The ECLIPSE I/O expansion chassis provides an extension to the data channel on an individual ECLIPSE I/O channel. It connects to a bus repeater board in the main chassis via an external I/O cable. The expansion chassis is a self-contained rack-mounted unit, installed within a separate peripheral cabinet. It has its own power supply, backplane, cooling fans, and peripheral device connector panel. There are 20 slots on the backplane, 6 of which are taken up by a power supply, a load board, and an I/O bus terminator. The remaining 14 slots, numbered 6 through 19, are available for data channel (DCH) I/O controllers. Backup power is normally configured from the host chassis BBU, or you can connect a BBU directly to the expansion chassis. Figure C-1 shows the location of various assemblies comprising the expansion chassis. The ECLIPSE I/O expansion chassis consists of the following components:

- Chassis
- backplane
- Chassis connector panel
- Front control panel and fan assembly
- Power supply and distribution system
- Load board configuration
- Chassis slot assignments

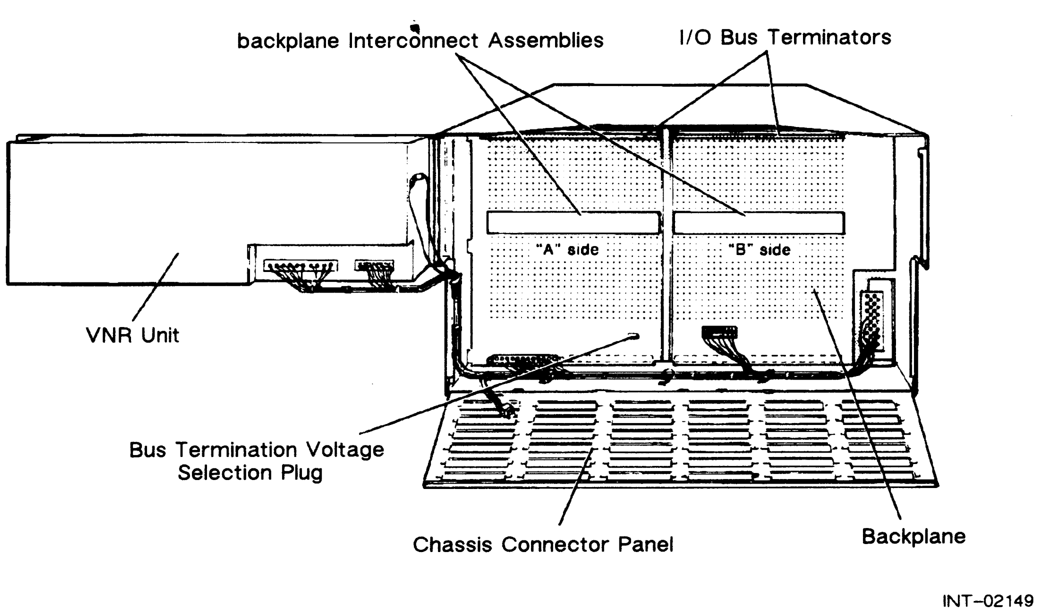

Figure C-1 Expansion Chassis Internal Rear View

Chassis Description

Tables C–1 and C–2 list the physical and environmental specifications of the expansion chassis.

Table C–1 Expansion Chassis Physical Specifications

Item	Dimension	Metric Equivalent
Height	10.48 in.	26.6 cm
Width	19.00 in.	48.3 cm
Depth	27.54 in.	70.0 cm
Weight (empty)	67.5 lb	30.6 kg
Weight (fully loaded*)	102.5 lb	46.5 kg

* Includes 14 I/O controller boards

Table C–2 Expansion Chassis Environmental Specifications

Item	Specification	Metric Equivalent
Operating environment		
Temperature range	32 to 131°F	0 to 55°C
Relative humidity range	10 to 90%	
Altitude range	-1000 to 8000 ft	-305 to 2438 m
Storage environment		
Temperature range	-20 to 149°F	-40 to 65°C
Relative humidity range	10 to 90%	
Altitude range	0 to 25,000 ft	0 to 7620 m

Backplane Description

The expansion chassis has its own backplane printed circuit board with connectors for the load board and other I/O controller boards. Sheet metal guide slots guide the boards into the backplane connectors. The I/O and load boards, as well as the plug–in power supply, go into the appropriate slots from the front of the chassis. You can access these slots by first removing the plastic front panel attached to the cabinet, and then removing the front radio frequency interference shield.

The interior surface of the backplane PC board contains thirty–three 100–pin connectors. The A and B connectors of the I/O controllers, load, and power supply PC boards plug into these connectors. The pins of all these connectors are brought through the backplane to the exterior. Some pins hold internal cable connectors, while others are available as test points.

The expansion chassis backplane contains two backplane interconnection assemblies. These press onto the pins of slots 12 and 13, linking the two portions of the backplane. These interconnection assemblies are factory installed on the standard expansion chassis.

Two I/O bus terminators (one for the A side and one for the B side) provide I/O bus termination for the backplane. Both the A and B terminators press onto the backplane pins of slot 20. The I/O bus terminators are factory installed with the standard expansion chassis. (See Figure C–1.)

A bus termination voltage selection plug on J36 of the backplane allows voltage either from the main chassis or the expansion chassis to power the I/O bus terminators.

The I/O bus is carried from the main computer chassis backplane to the expansion chassis via

- An internal cable assembly from the main subsystem chassis backplane pins of the slot containing the bus repeater to the main chassis connector panel.
- External cables between the main subsystem and expansion chassis connector panels.
- An internal cable from the expansion chassis connector panel to the expansion chassis backplane pins of slot 5.

Expansion chassis interconnections on the I/O bus are made via the backplane etching. Internal device cables plugged onto the backplane pins that contact the A and B connectors of the expansion chassis PC boards make the connections to external I/O devices. These connections are brought out to the connector panel located at the rear of the chassis.

Chassis Connector Panel

I/O cabling exits from the rear of the expansion chassis via the chassis connector panel. This chassis connector panel supports as many as thirty–six 25–, 37–, or 50–pin sub–D connectors. The 37– and 50–pin connectors fit in the openings provided, while the 25–pin connectors first mount to an adapter plate. Any unused openings are covered by removable cover plates.

Standard length internal I/O cables, with connectors that push onto backplane pins at one end and a sub–D connector at the other end, bring the I/O signals from the backplane connection pins to the chassis connector panel. These internal cables are attached to the side of the chassis and allow the chassis connector panel to hinge open for servicing. As Figure C–2 shows, the device cables from all peripherals plug directly into the sub–D connectors at the chassis connector panel.

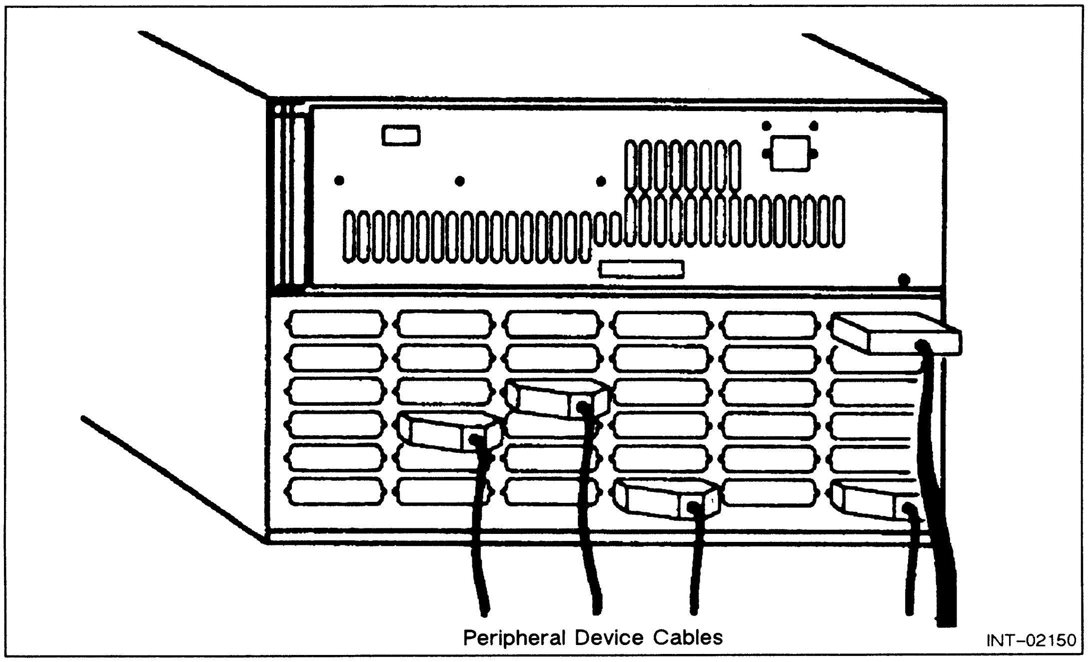

Figure C-2 Peripheral Device Cables

Front Control Panel and Fan Assembly

The fan assembly includes four fans and a front control panel assembly. The fan assembly resides on the left side of the chassis and slides into the chassis from the front. The fans draw air from outside the chassis and force air through the chassis. Figure C-3 shows a front view of the expansion chassis, including the location of the fan and front control panel assembly.

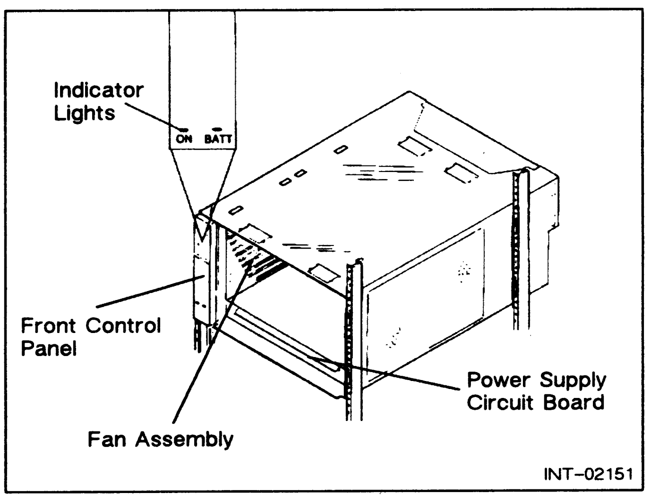

Figure C-3 Expansion Chassis Front View

The front control panel PC board assembly mounts behind the front of the fan assembly frame. As Figure C-3 shows, the front control panel of the expansion chassis consists of two indicator lights: ON and BATT. The ON light illuminates when the expansion chassis is powered up and the power supply voltages are within operating specifications. The BATT light is on when the BBU is active.

Power Supply and Distribution System

The power supply and distribution system consists of a voltage-nonregulated (VNR) unit, which hinge-mounts vertically on the rear of the chassis, and a power supply PC board, which inserts into slots 1 through 4 of the chassis. A power cord, which plugs into a connector located on the back of the VNR unit, supplies ac power to the VNR unit.

The VNR unit converts power from the ac supply line into nonregulated dc power, which it supplies to the power supply board via the internal power cable assembly. This internal power cable assembly also

- Carries ac power from the VSR unit to the fan assembly.
- Connects the ON indicator light to the backplane via an internal cable in the fan assembly.
- Connects the ac power to the VNR unit remotely, via an internal power cable assembly in the fan assembly and a low voltage relay contained on the front control panel PCB.

A relay on the front control panel PC board allows the main chassis to control the expansion chassis during powerup procedures. In other words, to power up or power down the expansion chassis, you only need to powet up or power down the main chassis.

Table C-3 lists the ac power input requirements of the expansion chassis.

Table C-3 Expansion Chassis AC Power Requirements

	Item	Specification
Domestic		
	Voltage	120 V -15% +10%
	Frequency	60 Hz
	Current (max)	14.1 A (120V -15%)
	Startup surge (max)	17 A for 350 ms
Japan		
	Voltage	100 V +/- 10%
	Frequency	50 or 60 Hz
	Current (max)	15.6 A (100V -10%)
	Startup surge (max)	14 A for 350 ms
Other export		
	Voltage	220/240 V -15% +10%
	Frequency	50 Hz
	Current (max)	7.7 A,(220V -15%), 7.1 A (240V -15%)
	Startup surge (max)	34 A for 100 ms

The power supply PC board converts the nonregulated high-voltage dc power from the VNR unit to the low dc voltages required by the system. These low dc voltages are regulated by the power supply PC board and supplied to the remainder of the chassis via the etching on the backplane.

Table C-4 lists the voltage output specifications of the expansion chassis supplies.

Table C-4 Expansion Chassis Voltage Output Specifications

Supply (V)	Output (A)
+5	120.0*
+12	12.5
-5	3.0*

* Under certain loading of the +12 V and -5 V outputs, the +5 V rating should not exceed a maximum of 100 A. Check first with your Data General service representative before loading +5 V above 100 A. The load board also has the potential, when configured for -5 V boost, to supply an additional 3 A of -5 V, for a total -5 V rating of 6 A.

Load Board Configuration

The –5 volt load board in slot 5 comes with every expansion chassis and is required whenever power is applied to the chassis. The load board is configured as a 6 ampere load on the power supply's +5 volt output, but may be reconfigured to supply an additional 3 amperes of current on the –5 volt output should the controller board configuration require additional –5 volt current. Note that when supplying the additional 3 amperes of –5 volt current, the load board draws 10 amperes of +5 volt current.

Chassis Slot Assignments

Figure C–4 shows the chassis slot assignments. Essentially, there are 20 slots total, but the first 5 slots are used by the power supply and load board. Slot 20 is used for I/O bus terminators. The remaining 14 slots, numbered 6 through 19, are available for I/O controllers.

The allocation of slots within the expansion chassis is relatively simple: all slots are of the same type, slow data channel. The primary concern is to allocate according to priority and latency requirements as previously outlined in Chapter 2. Power considerations are based on the chassis' own independent power supply.

The slots are grouped together for power distribution such that any grouping can handle up to 50 amperes of +5 volt current. The groupings are show in Table C–5.

Table C-5 Slot Groupings According to Power

Group	Slots
A	5,6
B	7,8
C	9,10,11,12
D	13,14,15,16
E	17,18,19,20

If your configuration exceeds any of these limits you will have to redistribute some of the boards, possibly requiring another expansion chassis. Remember this also means you will need another bus repeater board in the main chassis.

Slot 20 is reserved for the I/O bus terminators on the backplane, which draw 1 ampere of +5 volt current. Table C–4 lists the expansion chassis current ratings for the various power supply output voltages.

The expansion chassis can also have an external BBU providing the boards within the chassis with power in the event of a power failure. BBUs come in two sizes: a full-size BBU that is able to power two chassis under emergency conditions and a half-size BBU that powers a single chassis. During normal recharge conditions, a full BBU draws 5.6 amperes of +5 volt current and 2 amperes of +12 volt current; a half-size BBU draws 2.8 amperes of +5 volt current and 1.1 ampere of +12 volt current. Under a shared condition where two chassis are connected to a common BBU, the hosting chassis generally provides the recharge power.

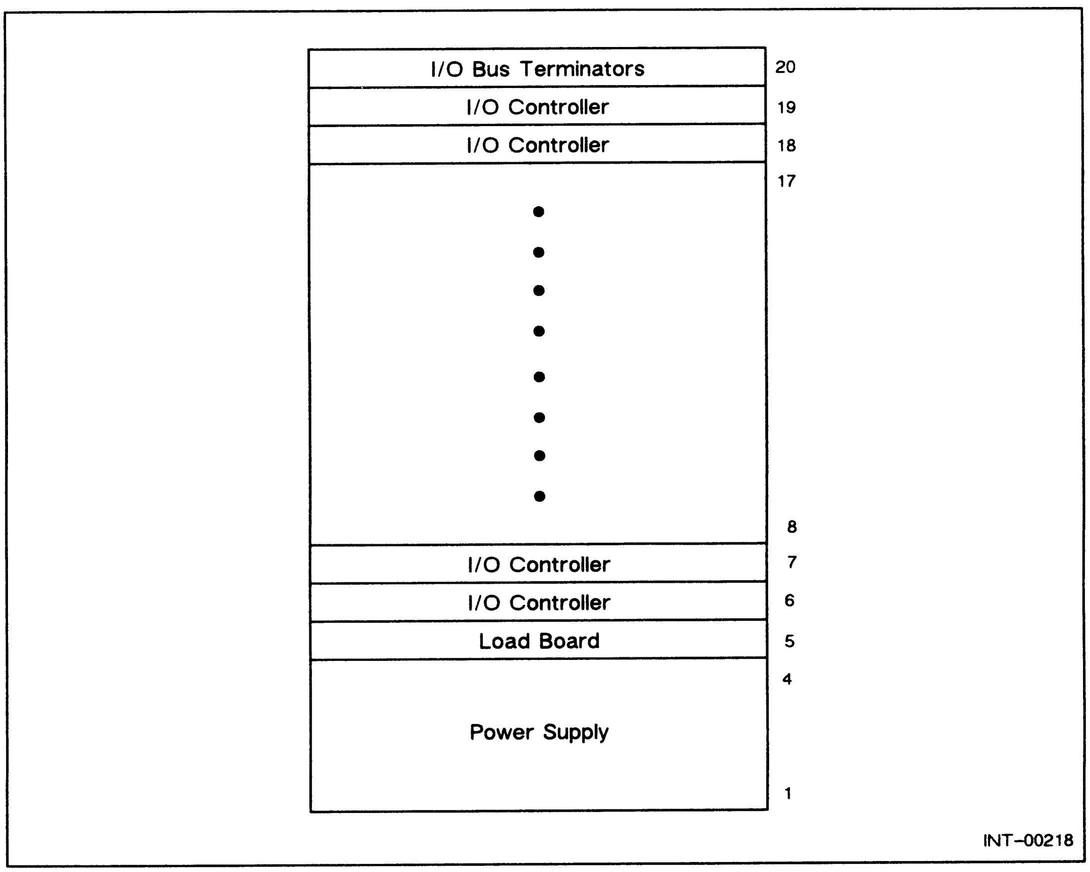

Figure C–4 Expansion Chassis Slot Assignments

End of Appendix

Index

G

I

L

M

N

O

P

R

S

T

U

V

W

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      4400 Computer Drive
      Westboro, MA 01581–9973

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