Cabrillo-C Chassis
Technical Product Specification

Revision 1.0

May 1999

REVISION HISTORY

Date	Rev	Modifications
11/08/98	0.1	First Draft
1/10/98	0.5	Updates on Power Supplies, Front Panel, figures
1/20/99	0.9	Updated cable descriptions and Serviceability section
4/02/99	0.91	Updated errors
5/04/99	1.0	Added Front Panel information

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1. INTRODUCTION

The Cabrillo-C system hardware product specification details the functional hardware features of the Cabrillo-C pedestal/rack chassis. Low cost, time to market, modularity and utilization for multiple configurations are primary considerations in the design. This chassis has user-friendly features, is accessible and is easily serviced. Also key in this product is the ability for the system to be customizable for an OEM's unique look.
The Cabrillo-C system chassis incorporates features for high availability servers. This includes a redundant power system, hot swap power supplies, a cooling system with easily replaceable fans, and a mass storage system with hot-pluggable hard drives. These are key components for increasing the availability of the server. Typically, power supplies have low MTBF specifications. Redundancy of these components permits the system to continue to operate within specification even with a failed power supply and continue to operate, for a limited time, while replacing the failed unit. With the use of RAID technology the system can continue to operate with hard drive failures. Hard disk drive hot plug-ability permits a failed drive to be replaced while the system continues to operate.

This product specification details the following:

- Chassis
- Power system
- Chassis cooling
- Peripheral bays
- Front panel
- Server board
- I/O and interconnects
- System configuration
- System certifications
- Environmental limits
- Reliability, serviceability, and availability

2.0 CHASSIS

2.1 Chassis Features

The chassis is 12.25 inches wide, 18.06 inches high and 25.25 inches deep in the pedestal configuration. The chassis is designed to be modular with a base unit and two easily removable subassemblies. One contains the front panel and drive bays (C-tilt) and one contains the Server-board and I/O (E-bay). The base section is U shaped and contains the power supplies and power share board. The E-bay rotates in at the rear of the base unit and the C-tilt rotates in from the front. Both the C-tilt and the E-bay are fastened to the base unit with two screws. The fans are contained in an EPAC (expanded polypropylene) carrier and installed above the drives and in front of the E-bay. Three bays are supplied at the rear of the chassis base unit for power supplies.

The system can be configured as a Pedestal system by adding two cosmetic sheet metal covers, a plastic bezel assembly (frame and door) and plastic stabilizing feet that can be ordered as an optional kit and installed in the appropriate locations on the base chassis configuration.

The system can be configured as a Rack system by adding a plastic bezel assembly (frame and door) rack handles, and rack slides available as an optional kit. These components must be mounted directly to the base unit before the system can be installed into a standard 19 inch rack as a 7U-rack unit.

2.2 System Color

The primary exterior system color is Dusty Beige Intel color matches plastics and paint to General Electric BR7026. The cosmetic plastic components are molded in color and the sheet metal skins are powder coated in color. OEM color matching is available for all cosmetic components.

2.3 Front Bezel Features

The front bezel is a multiple-part plastic molding. There is a one key lockable door covering the drive bays and push button power and reset switches. The front panel LED's, power switch and reset switch are located in the upper right for pedestal mode and in upper left for rack mount.

Customized bezels for OEM customers can be easily designed starting with the standard bezel design.

2.4 Security

At the system level a variety of security options are provided. A three position key lock on the bezel door is used to limit access to buttons and drive bays. A chassis intrusion

switch located in the EBAY detects if the access cover is open. A lock pawl is also provided to secure the Hot Swap drives bay door by adding a simple pad lock.

2.5 I/O panel

All input/output connectors are accessible at the back of the chassis. The built-in interfaces on the baseboard are mapped in the figure below.

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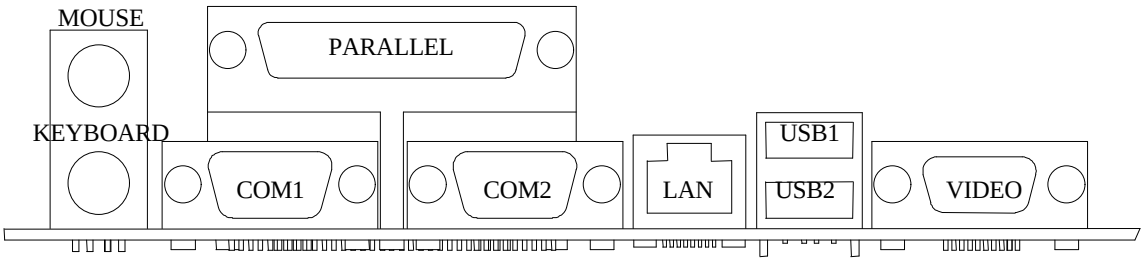

Figure 1. I/O Connectors

2.6 Chassis Dimensions

Configuration	Pedestal	Rack
Height	18.06 inches with feet	7U
Width	12.25 inches	19” rack
Depth	25.25 inches	25.25 inches
Clearance Front	12 inches	6 inches
Clearance Rear	12 inches	6 inches
Clearance Side	0 inches	NA
Weight	90 lbs. when fully configured	90 lbs. when fully configured

Table 1 System Dimensions

2.7 Chassis View

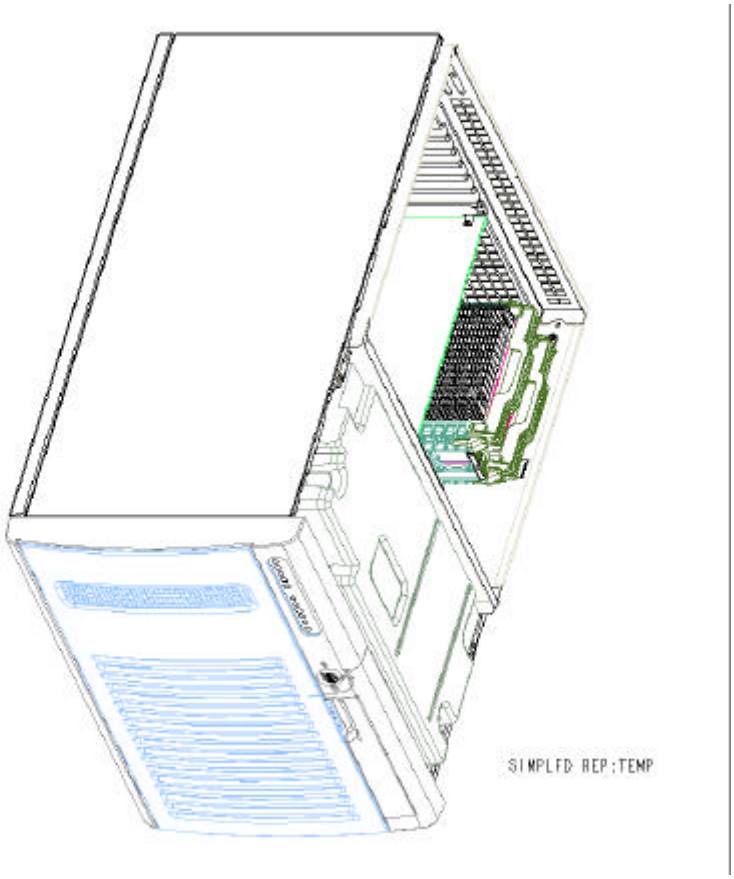

Figure 2 CABRILLO-C
(Shown with Access cover removed and Optional Pedestal Kit cosmetic pieces installed)

3.0 SYSTEM POWER

The system will be configured with three power supplies. The system has a 2+1 redundant power system that utilizes a power share board.

For systems fully configured with processors, memory, drives, and add-in cards, the loss of one power supply will not affect the operation of the system. The failed power supply can be replaced with the system operating. The power supplies easily slide in and out of chassis from the rear of the base unit. Each power supply is held in place with four screws and has its own power cord with an inter-lock feature that prevents removal or insertion while the power cord is plugged into the power supply. All supplies should be connected to the same AC main branch circuit.

Because multiple power supplies are utilized, a power share board is used to implement the redundant power distribution system. This power share board also implements the server power management features which, via I^2C, reports the quantity, location, and operational status of power supplies installed. Power sensing in the power share board shuts down the entire power system if any single output from the power distribution back plane exceeds 240VA. The parts of the power share board that have greater than 240VA are protected from operator contact by a shield that cannot be removed with power present. This feature enables the system to meet CSA Level 3 operator accessibility without interlocks.

In the event a power supply fails, the Power Supply Failure LED on the front panel is turned on.

DC Power	+3.3VDC at 36A Max.*
	+5 VDC at 24A Max.*
	+12 VDC at 18.0A with 19.0A <10ms peak
	+24 VDC at 0.05A
	-12 VDC at 0.30A, if the minimum loading of +5.0V is above 2A, then –12V max. loading is 0.50A.
	5V Standby 1.5A
	*Total combined output power of 3.3v and +5v shall not exceed 195 W
AC Line voltage	PFC: auto sense100-120VAC, 200-240VAC
AC Line Frequency	50 / 60 Hz

Table 2 400-Watt Power Supply Output Summary (per supply)

3.1 Mechanical Dimensions

The approximate dimensions of the power supply can are 7.5 inches deep X 5.1 inches high X 4.25 inches wide. The mounting flange extends 0.12 inches top and bottom and 0.35 inches each side. The supply is equipped with handles formed into the rear flange and a floating connector for easy slide in, slide out removal.

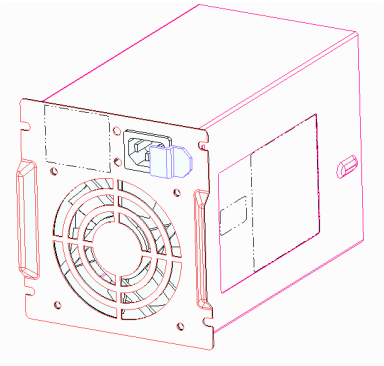

Figure 3 Power Supply

3.2 Power Supply Fan Requirements

The power supply incorporates a 92mm low acoustic noise fan that also exhausts air from the peripheral bay. These fans have thermal sensors for speed control and incorporate tachometer output.

3.3 AC Power Line

The system is specified to operate from 100-120VAC, 200-240VAC, at 50 or 60Hz. The power supply incorporates Power Factor Correction (PFC) as a standard feature. The system is tested to meet these line voltages. It has been tested (but not specified) at +10% and -10% of the voltage ranges and similarly ± 3Hz on the line input frequency.

The system is specified to operate without error with line source interruptions not to exceed 20 milliseconds at nominal line conditions and at full power supply output load.

The system is not damaged by AC surge ring wave to 3.0kV/500A. This ring wave is a 100kHz damped oscillatory wave with a specified rise-time for the linear portion of the initial half-cycle of 0.5µsec. Additionally, the system will not be damaged by a unidirectional surge wave form of 2.0kV /3000A, with a 1.2µsec rise time and 50µsec duration. Further details on these wave forms can be obtained in ANSI/IEEE STD C62.45-1987.

3.4 System Power Share Board

The power share board provides current sharing between supplies allowing 2+1 redundant power, “hot swapping” of supplies, and also enables power subsystem server management functions.

4.0 SYSTEM COOLING

Two 40mm fans incorporated into the processor retention mechanism and two system fans at the front of the Ebay provide cooling for the processors and add-in cards. Two cross flow fans at the front of the system plus the three power supply fans provide cooling for the hard drives and redundant cooling for the power supplies. All system fans provide a fault signal if the fan fails. The Server-board senses this signal and turns on a Fan Failure LED found on the front panel. This signal is also available for server management functions. Removal of the access cover provides access to the fans. Failed fans are easily changed after the system has been shut down.

5.0 SYSTEM PERIPHERAL BAYS

5.1 3.5" Floppy Drive Bay

The system ships from the factory without a floppy drive installed. A cable to connect a Floppy drive to the Server-board is supplied in the chassis hardware kit. Access for the installation or replacement of a floppy drive is achieved through removal of the Access Cover.

5.2 5.25" Drive Bays

The system design includes three 5.25" half height peripheral bays designed for peripherals with removable media (e.g. floppy disk, CD-ROM or tape drive). Two bays will have removable filler panels installed assuming that the customer will be adding a device of their choice. It is assumed that a CD-ROM will be installed in the lower position of this drive bay (gasket present) to comply with FCC-B. If no device is added and a third filler is not installed (upgrade P/N CBFILLPNL, available in April 1999), this chassis may not meet FCC-B limits.

Any two adjacent 5.25" bays are convertible to a single full height bay. The cable from the on-board narrow SCSI controller allows two 5.25” half height narrow SCSI devices to be installed in these bays. The 5.25" peripherals are removable directly from the front of the chassis. IDE drives are fully supported in the 5.25” drive bay with the appropriate adapters.

5.2 Internal 3.5" Hard Drive Bays with SCSI Hot Swap Back plane

The product features a hot swap back plane that will accommodate six 3.5" one inch high hard drives that are accessed from the front of the system. The back plane is designed for LVDS SCSI devices using the Industry Standard 80 pin SCSI II SCA2 connector. The maximum power per drive is 19 watts.

As part of the hot swap implementation a drive carrier is required. The 3.5” compatible carrier design integrates a heat sink into the carrier base to cool high power drives. Drives are mounted directly to the carrier with four fasteners. The carrier slides smoothly into the chassis allowing the drive to mate directly to the hot swap backplane.

A single metal EMI door and the plastic bezel door cover the drive bays.

6. FRONT PANEL

The front panel board is located in the upper portion of the right side of the system. The front panel board contains four momentary switches, one switch for Power On/Off, one non supported switch, one switch for System Reset, and one switch for NMI (Non-Maskable Interrupt).

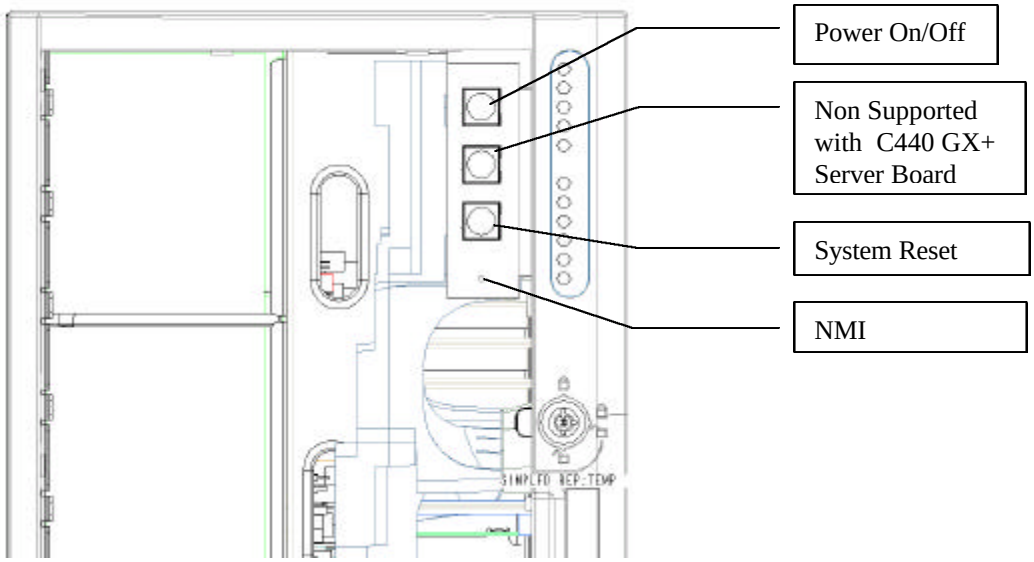

Figure 4 Bezel (Shown w/door removed)

These switches are behind the front plastic door of the bezel. The NMI switch is only accessible when the bezel is installed though the small hole below the System Reset button by using a special tool. The front panel contains 11 LEDs (function order): a green Power On LED that is on/off/ blink, one non supported LED, a green Hard Drive Activity LED a

yellow Power Supply Failure LED, a yellow Fan Failure LED, and six (6) yellow Hard Drive Failure LEDs. These LEDs are visible at the front of the bezel.

There is a loudspeaker mounted on the front panel.

Table 3: Cabrillo LED current

SIGNAL NAME	RECOMMENDED SERIES R VALUE	CURRENT	LED COLOR
PWR_LED_L	150 ohms	20 mA	GREEN
CLUSTER_LED_L	150 ohms	20 mA	GREEN
HD_ACT_L	150 ohms	20 mA	GREEN
POWER_FAULT_L	150 ohms	20 mA	YELLOW
FAN_FAILED_L	150 ohms	20 mA	YELLOW
HD0..5_FAULT_L	150 ohms	20 mA	YELLOW

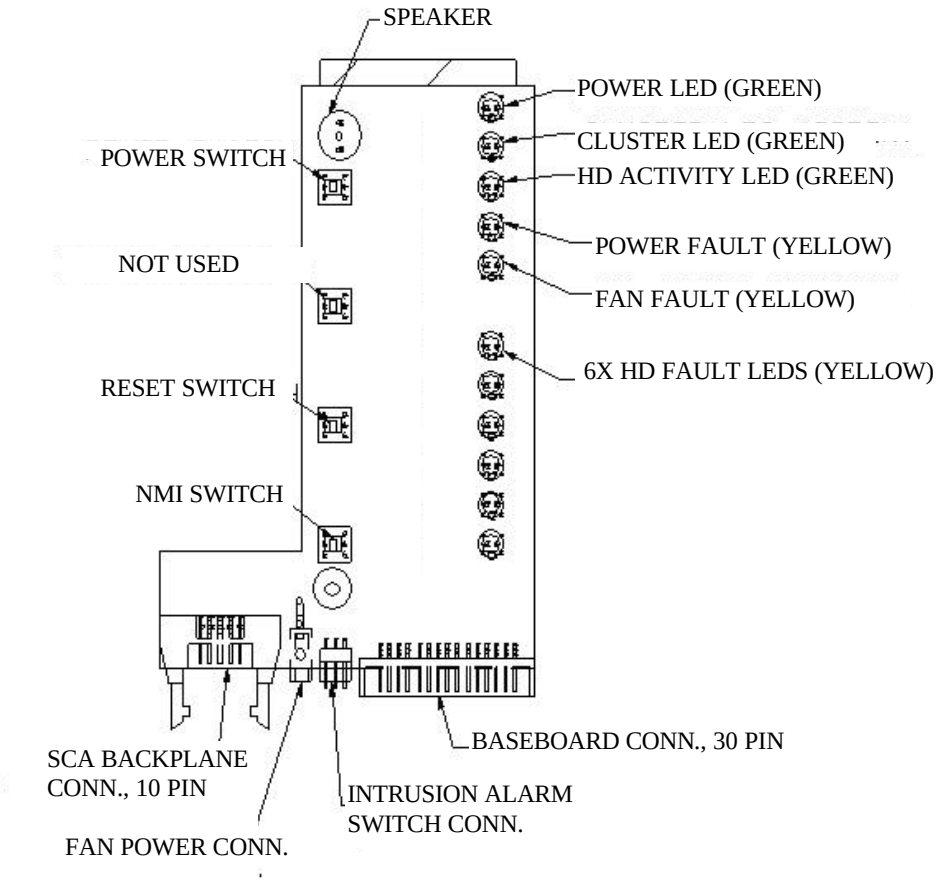

Figure 6: Cabrillo-C Server Front Panel

7.0 SYSTEM BASEBOARD

7.1 C440GX+

The E-bay for the Cabrillo-C chassis was designed to accommodate the C440GX+ Server board and any combination of following:

- One to two Pentium II/III Xeon processor modules
- 1-4 DIMM modules

C440GX+ supports 1 to 2 identical (clock speed, revision and L2 cache size) processor modules. The memory subsystem supports up to 2.0 GB of system memory using SDRAM DIMMs. The baseboard provides connector slots for the processor modules and a PC-AT-compatible and PCI I/O system including the following:

- Dual PCI high-performance I/O segments - PCI-A and PCI-B both via host bridge.
- 7 PCI and 1 ISA add-in card slots.
- PC-compatible I/O controls (2 serial, parallel, keyboard/mouse, NIC, VGA, and USB).
- Onboard PCI bus master, 2 SCSI channels (1-LVDS Ultra2 and 1-Ultra SCSI), and IDE subsystems.
- Server Management features support via onboard micro-controllers.
- The electronics bay fans receive their power from the baseboard and return their tachometer signals directly to the baseboard.

8.0 SYSTEM INTERCONNECTION

8.1 Signal Definitions

The pin out on the connectors referred to in this section are defined in the C440GX+ TPS.

8.2 System Internal Cables

- Baseboard to Front Panel/Power Share Board - 2X15 connectors with 30 wire cable on Serverboard side and 2x7 at the Front Panel and 2x8 at the PSB
- Baseboard to SCSI devices – 68 pin Wide SCSI cable to the hot swap back plane.
- (1) 68 pin LVD SCSI cable to the rear panel (optional).
- (2) Baseboard to IDE devices - 2X20 connector for IDE cable to support a 5.25” IDE CD-ROM or HDD (2nd cable not included)
- Serverboard to Floppy device - 2X17 connector for floppy cable for a 3.5” Floppy drive.
- Three connector cable from the Serverboard (2X15) to both the Power Share Board (2X7) and the Front Panel (2X8).
- Three connector cable from the Serverboard (2X12) to both power connectors on the Power Share Board (2X10).

- Front Panel to Hot Swap SCSI Back Plane – (1) 2X5 connector for cabling front panel to hot swap SCSI back plane
- Front Panel Chassis Intrusion Cable - 2 wire cable from chassis intrusion micro-switch to front panel
- Fan Connectors – (4) 3 pin connectors on the Serverboard and one 3 pin connector on Power Share Board (not ATX). Two 3 pin fan connectors are also located near the processor retention module. All fan locations support tachometer fans.

8.3 Interconnect Diagram

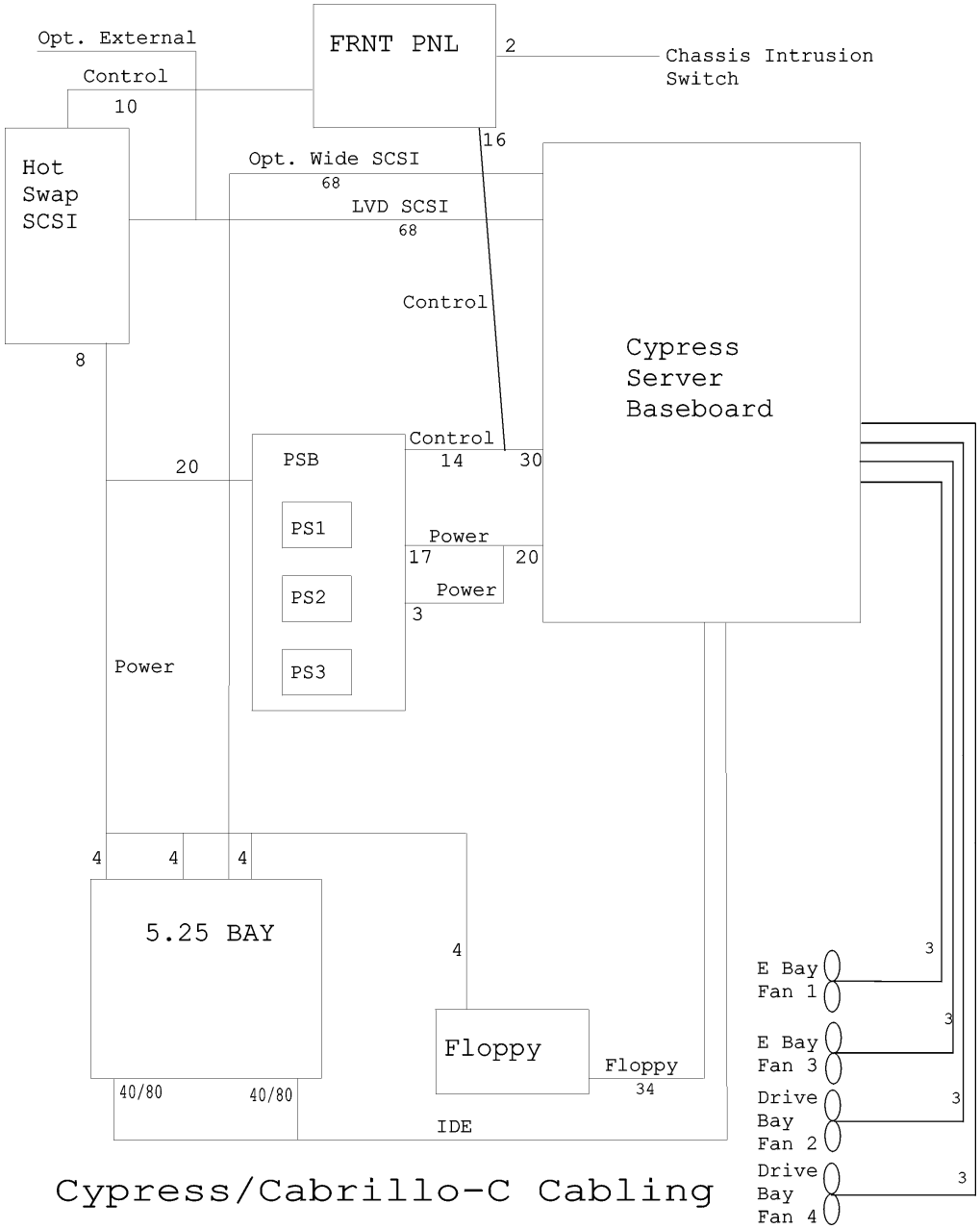

Figure 5 System Signal Interconnect

Note: Headers have been provided on the Serverboard for Secondary IDE and Single Ended Ultra SCSI. Cables to use these features are not provided.

8.4 I/O Panel Connectors

- PS/2 keyboard connector
- PS/2 mouse connector
- Two 9-pin serial ports
- 25-pin parallel port
- 15-pin video port
- One NIC port
- Two USB connectors

See the C440GX+ TPS for connector pin-outs

9.0 SYSTEM CONFIGURATION

9.1 Standard Configuration

Features	Standard system configuration
Redundant	Yes
Standard Chassis	1
Std Bezel	1 (via Pedestal or Rack kit)
Front Panel	1
3.5" Floppy	0
400 W Power Supply	3
Standard Cable Set	1
Power Share Board	1
Drive Bay Fan	2
Electronics Bay Fans	2
Drive Carriers	6
Hot Swap Drive Backplane	1
Baseboard (C440GX+)	0 (must purchase C440 GX+ box board kit)
Processor Module	0 (must purchase boxed processors)
CD ROM	0

Table 3: Standard System Configuration

9.2 Option Kits

Option Kit	Features
Pedestal Kit	Contains two cosmetic skins, plastic feet, and cosmetic Bezel for floor mount use
Rack Kit	Contains cosmetic Bezel, slide rails, and associated hardware to mount the system in a standard 19” EIA rack.
C440GX+ Boxed Board	Server board
External SCSI Cable	Two connector SCSI cable for external access to SCSI peripherals

Table 4: Option Kits

10.0 Certification

10.1 Safety

10.1.1 USA
The system is UL listed to UL 1950, 3rd Edition.

10.1.2 Canada
The system is certified by UL (cUL) to meet the requirements of CSA C22.2 No. 950-M93. The product will bear the cUL mark.

10.1.3 Europe
The system is certified to meet the requirements of EN 60 950 with amendments by TUV (GS License).

10.1.4 International
The system is certified by NEMKO to meet the requirements of EN 60 950 with amendments and Nordic deviations, and IEC 950 with amendments.

10.2 Electro-Magnetic Compatibility

10.2.1 USA
The system is certified to FCC CFR 47 Part 15, Class B

10.2.2 Canada
The system complies with the Limits for Radio Noise Emissions from Class B Digital Apparatus as required by Industry Canada (IC).

10.2.3 Europe

The system complies with the EU EMC directive (89/336/EEC) via EN 55022, Class B and EN 50082-2. The product will carry the CE mark. The system is tested to the following immunity standards and maintains normal performance within these specification limits:

IEC 801-2	ESD Susceptibility (level 2 contact discharge, level 3 air discharge)
IEC 801-3	Radiated Immunity (level 2)
IEC 801-4	Electrical fast transient (level 2)

10.2.4 International

The system is compliant with CISPR 22 class B

10.2.5 Japan

The system is registered with VCCI and complies with VCCI Class 2 limits (CISPR 22 B Limit).

11.0 ENVIRONMENTAL LIMITS

11.1 System Office Environment

Operating Temperature	+10°C to +35°C De-rated 0.5°C/1000ft. Altitude to 10,000 ft. Max. Maximum rate of change of 10°C per hour.
Non-Operating Temperature	-40°C to +70°C
Humidity - Non Operating	Relative Humidity 50%-95% non condensing (at temperatures of 25°C to 30°C)
Acoustic noise	< 50 dBA with three power supplies @28 °C
Operating Shock	No errors with a half sine wave shock of 2G (with 11 millisecond duration).
Package Shock	Operational after a 30 inch free fall, although cosmetic damage may be present
ESD	20kV per Intel Environmental test specification

Table 5 System Office Environment Summary

11.2 System Environmental Testing

The system will be tested per Environmental & Reliability Board and System Validation Test Handbook, Intel Doc.#662394 Rev-03. These tests shall include:

Temperature Operating
Shock-Packaged
Vibration-Packaged and Unpackaged
AC Voltage, Freq. & Source Interrupt
AC Surge
Acoustics
ESD
EMI

12. RELIABILITY, SERVICEABILITY AND AVAILABILITY

12.1 MTBF

The system MTBF as shipped from the factory has yet to be calculated.

12.2 Serviceability

The system is designed to be serviced by technically qualified personnel only.
The desired MTTR of the system is 30 minutes including diagnosis of the system problem. To meet this goal, the system enclosure and hardware have been designed to minimize the MTTR.

Following are the maximum times that a trained field service technician should take to perform the listed system maintenance procedures, after diagnosis of the system.

Remove cover	2	minutes
Remove and replace disk drive	1	minute
Remove and replace power supply	3	minutes
Remove and replace fan	5	minutes
Remove and replace add-in board	2	minutes
Remove and replace front panel board	10	minutes
Remove and replace baseboard (with no add-in boards)	15	minutes
Remove and replace power back plane	10	minutes
Remove and replace SCSI back plane	10	minutes
Replace/add DIMMs	2	minutes
Replace/add processor	5	minutes
Overall MTTR	20	minutes