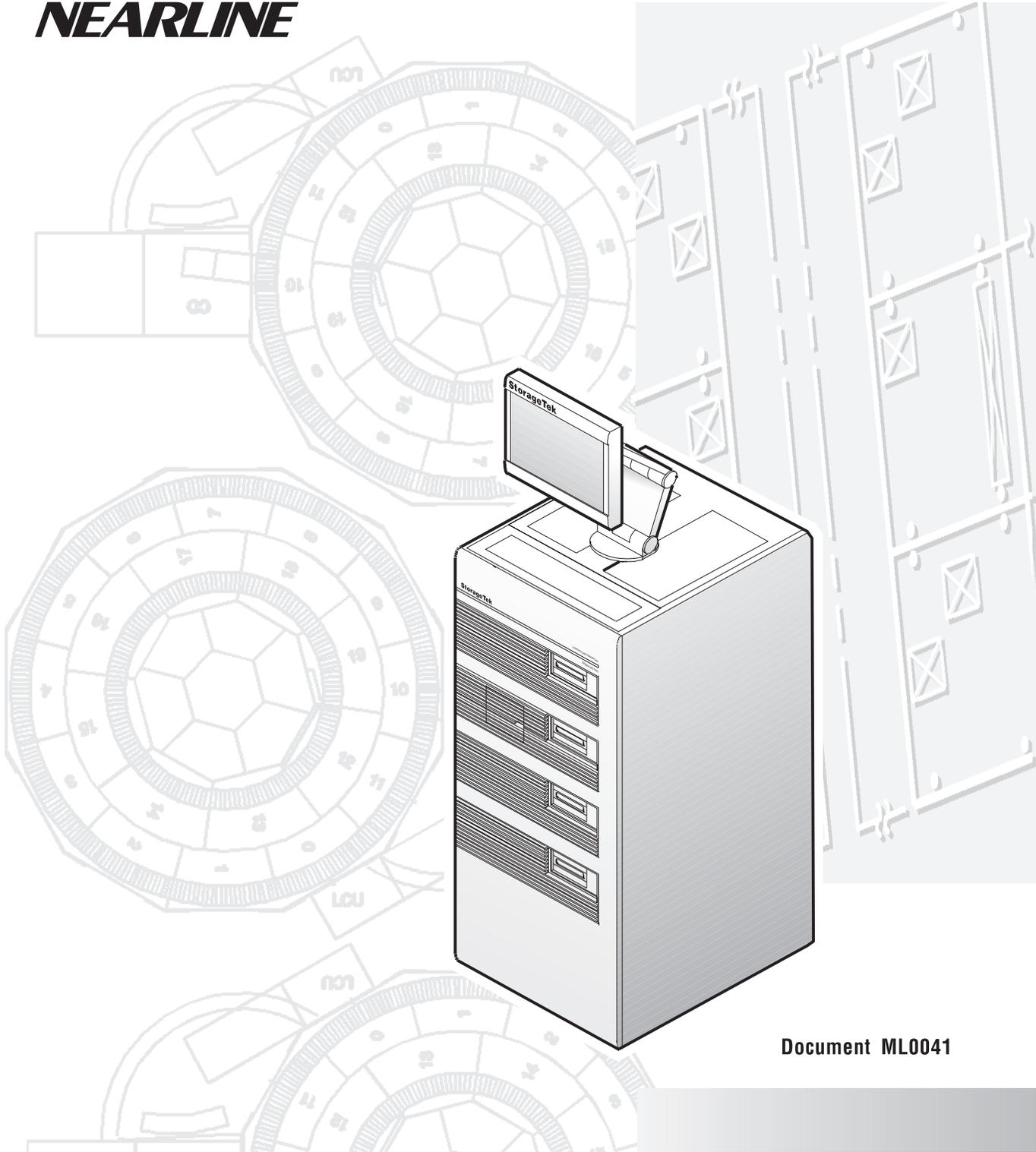


# StorageTek

## PHYSICAL PLANNING GUIDE

### ***NEARLINE***



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ii thru xii		
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2-1 thru 2-20		
3-1 thru 3-26		
4-1 thru 4-4		
A-1 thru A-14		
X-1 thru X-6		
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# Contents

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<b>List of Effective Pages</b> .....	<b>iii</b>
<b>About This Guide</b> .....	<b>ix</b>
Organization .....	ix
Trademarks .....	x
Related Publications .....	x
Ordering Publications .....	xi
<b>Preinstallation Planning</b> .....	<b>1-1</b>
Installation Planning Schedule .....	1-1
Subsystem Layout .....	1-2
Priority .....	1-3
Cable Length .....	1-3
Service Clearances .....	1-3
I/O Cables .....	1-4
Site Requirements .....	1-4
Floor Loading .....	1-4
Operating Temperature .....	1-5
Static Electricity .....	1-5
Electrical Power and Grounding .....	1-6
Storage Areas .....	1-12
Wiring Comments Site Survey .....	1-14
Fire Precautions .....	1-15
Site Planning Checklist .....	1-16
<b>Automated Cartridge Systems</b> .....	<b>2-1</b>
Overview .....	2-1
Large Libraries .....	2-2
External Cables .....	2-4
Local Area Network Cables .....	2-5
Cables .....	2-14
Local Area Network Cables .....	2-15
Configuration Restrictions .....	2-19
<b>Cartridge Tape Subsystems</b> .....	<b>3-1</b>
4480/4780/4781/4490/4791 Cartridge Subsystems .....	3-2
Subsystem Specifications .....	3-3
Cables .....	3-4
Optional Features .....	3-6
Structure Kits .....	3-6
9490 Cartridge Subsystem .....	3-9
Specifications .....	3-10
Model M44 .....	3-14
SD-3 Cartridge Subsystem .....	3-15
Specifications .....	3-16

9490 and SD-3 Caster Locations .....	3-19
LAN Cables .....	3-20
ESCON Cables .....	3-21
SCSI Cables .....	3-22
Connecting to an IBM AS/400 .....	3-23
Connecting to an IBM RS-6000 .....	3-23
9490 and SD-3 Configuration Features .....	3-24
9490 and SD-3 Interface Adapters .....	3-24
9490 and SD-3 Power Cables .....	3-25
9490 and SD-3 Structure Kits .....	3-25
<b>Remote Maintenance .....</b>	<b>4-1</b>
Central Support Remote Center .....	4-1
MARS+ Specifications .....	4-2
Modem Specifications .....	4-2
<b>Planning Templates .....</b>	<b>A-1</b>
<b>Index .....</b>	<b>X-1</b>

# Figures

Figure 1-1. Transient Grounding Plate .....	1-9
Figure 1-2. Electrical Power and Grounding .....	1-13
Figure 2-1. Floor-Space Requirements – 44xx/93xx .....	2-6
Figure 2-2. Floor Cutouts – 44xx/93xx (Part 1 of 3) .....	2-7
Figure 2-3. Leveling Pad Locations – 44xx/93xx (Part 1 of 4) .....	2-9
Figure 2-4. Floor-Space Requirements – 9312/9315/9360 .....	2-16
Figure 2-5. Small Library Floor Cutouts .....	2-17
Figure 2-6. Leveling Pad Locations – 9312/9315/9360 .....	2-18
Figure 2-7. 4410/9310 Attachment Restrictions .....	2-20
Figure 3-1. Version 1 Floor-space Requirements .....	3-7
Figure 3-2. Version 2 Floor-space Requirements .....	3-8
Figure 3-3. 9490 Cartridge Subsystem Floor-space Requirements .....	3-13
Figure 3-4. M44 Front View showing CSL Locations .....	3-14
Figure 3-5. SD-3 Cartridge Subsystem Floor-space Requirements .....	3-18
Figure 3-6. 9490 Cartridge Subsystem Caster Locations .....	3-19
Figure 3-7. SD-3 Cartridge Subsystem Caster Locations .....	3-19
Figure 3-8. Cartridge Subsystem Local Area Network .....	3-20
Figure 3-9. ESCON Jumper Cable Connectors .....	3-21
Figure 4-1. Local Configuration Terminal Attachment to MARS+ .....	4-3
Figure A-1. 4410/9310 Template (Metric) .....	1-2
Figure A-2. 4410/9310 Template (English) .....	1-3
Figure A-3. 4410/9310 with PTP Template (Metric) .....	1-4
Figure A-4. 4410/9310 with PTP Template (English) .....	1-5
Figure A-5. PTP, 4430 LMU, CU Template (Metric) .....	1-6
Figure A-6. PTP, 4430 LMU, CU Template (English) .....	1-7
Figure A-7. Small Library Template (Metric) .....	1-8
Figure A-8. Small Library Template (English) .....	1-9
Figure A-9. 9330 LMU Template (Metric) .....	1-10
Figure A-10. Large Library Drive Panel Template (English) .....	1-11
Figure A-11. 9330 LMU Template (Metric) .....	1-12
Figure A-12. Large Library Drive Panel Template (English) .....	1-13

## Tables

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Table 1-1. Voltage and Frequency Limits .....	1-7
Table 2-1. Physical Specifications: 44xx/93xx .....	2-2
Table 2-2. Electrical Specifications: 44xx/93xx .....	2-3
Table 2-3. Environmental Limits: 4410/4411/4430 .....	2-4
Table 2-4. External Cable Requirements: 4430/4411 .....	2-4
Table 2-5. LMU to LSM LAN Cables .....	2-5
Table 2-6. LMU to UNIX-based Workstation Cables .....	2-5
Table 2-7. Physical Specifications: 9330/9312/9315/9360 .....	2-12
Table 2-8. Electrical Specifications: 9330/9312/9315/9360 .....	2-13
Table 2-9. Environmental Limits: 9330/9312/9315/9360 .....	2-13
Table 2-10. Detachable Power Cord: 9330/9312/9315 .....	2-14
Table 2-11. External Cables: 9330/9312/9315 .....	2-15
Table 2-12. LMU to LSM LAN Cables .....	2-15
Table 3-1. Cartridge Subsystem Models .....	3-2
Table 3-2. Physical Specifications .....	3-3
Table 3-3. Electrical Specifications .....	3-3
Table 3-4. Environmental Specifications: 4480/4780/4490 .....	3-4
Table 3-5. Subsystem Cables .....	3-5
Table 3-6. SCSI Cables .....	3-5
Table 3-7. Features .....	3-6
Table 3-8. Structure Kits .....	3-6
Table 3-9. Cartridge Drive Specifications .....	3-10
Table 3-10. Transport Specifications .....	3-11
Table 3-11. Power Specifications .....	3-11
Table 3-12. Environmental Specifications .....	3-12
Table 3-13. Cartridge Tape Specifications .....	3-12
Table 3-14. Physical Specifications: SD-3 .....	3-16
Table 3-15. Electrical Specifications: SD-3 .....	3-17
Table 3-16. Environmental Specifications: SD-3 .....	3-17
Table 3-17. Cartridge Subsystem LAN Cables .....	3-20
Table 3-18. ESCON Cable Part Numbers .....	3-21
Table 3-19. SCSI-2 Daisy-Chain Cables .....	3-22
Table 3-20. SCSI External Interface Cables .....	3-22
Table 3-21. AS/400 Unique Interface Cables .....	3-23
Table 3-22. RS-6000 Unique Interface Cables .....	3-23
Table 3-23. Configuration Features .....	3-24
Table 3-24. Interface Adapter Feature Codes and Part Numbers .....	3-25
Table 3-25. Power Cable Accessories .....	3-25
Table 3-26. Structure Kits: 9490 .....	3-26
Table 3-27. Structure Kits: SD-3 .....	3-26
Table 4-1. Remote Support Hardware and Cables .....	4-1

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## About This Guide

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This guide is for StorageTek customers, marketing representatives, and customer services engineers, as well as independent consultants and service representatives, who are planning the physical installation of StorageTek's Nearline products, including:

- 44xx/93xx (Powderhorn) Automated Cartridge Systems
- 9360 (WolfCreek) Automated Cartridge Systems
  
- 4480/4780 Cartridge Subsystems (18-track, FIPS and ESCON)
- 4781/4791 Cartridge Subsystems (18- and 36-track, SCSI-1)
- 4490 Cartridge Subsystem (36-track, FIPS and ESCON)
- 9490 Cartridge Subsystem (36-track, ESCON and SCSI-2)
- SD-3 Cartridge Subsystem (helical-scan, ESCON and SCSI-2)

Some of these products weigh more than previous StorageTek products; site requirements, subsystem specifications, and cabling information are included for each device.

## Organization

This guide has four chapters and one appendix and is organized as follows:

- Chapter 1, "Preinstallation Planning" contains a basic installation planning schedule, identifies items to consider when planning the subsystem layout, identifies typical site requirements, and provides a site planning checklist.
- Chapter 2, "Automated Cartridge Systems" provides physical, electrical, and environmental specifications; cable part numbers and descriptions; locations of air ducts, casters and leveling pads; and configuration restrictions for ACS devices.
- Chapter 3, "Cartridge Tape Subsystems" provides physical, electrical, and environmental specifications; cable part numbers; and diagrams showing configurations, cable cutouts, and leveler pad locations for each subsystem product.
- Chapter 4, "Remote Maintenance" lists part numbers and specifications for the equipment required to remotely maintain StorageTek products.
- Appendix A, "Templates for Planning ACS Installations" contains templates for each device that can be connected into an Automated Cartridge System configuration.

A Reader's Comment Form at the back of the guide is for communicating suggestions or requests for change.

We encourage and appreciate your comments and suggestions.

**Note:** The information herein may also be used to complete the forms available in the applicable *System Assurance Guide* .

## Trademarks

StorageTek is a registered trademark of Storage Technology Corporation. All other trademarks and features mentioned in this publication are either trademarks of Storage Technology Corporation or other corporations.

## Related Publications

The following publications contain information related to installation planning.

<b>StorageTek Titles</b>	<b>Number</b>
<i>4400 Automated Cartridge System Assembly and Installation Manual</i>	99606
<i>4400 Automated Cartridge System Description Manual</i>	ML0500-x
<i>4480/4780 Cartridge Subsystem Installation Manual</i>	95689
<i>4480/4490/4780/4781/4791 Cartridge Subsystem System Assurance Guide</i>	ML0037-x
<i>4490 Cartridge Subsystem Installation Manual</i>	9601
<i>4490 Cartridge Subsystem Planning and Migration Guide</i>	ML0800-x
<i>9312/9315 Electronics Module, 9330 Library Management Unit, and 9360 Library Storage Module Installation Manual</i>	308625701
<i>9490 Cartridge Subsystem General Information Manual</i>	MT4001-x
<i>9490 Cartridge Subsystem Installation Manual</i>	9636
<i>9490 Cartridge Subsystem System Assurance Guide</i>	ML0040-x
<i>9490 Cartridge Subsystem Technical Reference Manual</i>	9638
<i>Central Support Remote Communication Installation Manual</i>	9483
<i>Fiber Optics User's Guide</i>	411224501
<i>Nearline SCSI-2 Reference Manual</i>	9793
<i>Nearline System Assurance Guide</i>	ML6500-x
<i>Reference Guide to IBM Manuals: ESCON Support</i>	310402101
<i>SD-3 Cartridge Subsystem General Information Manual</i>	ML0515-x
<i>SD-3 Cartridge Subsystem Installation Manual</i>	9791
<i>SD-3 Cartridge Subsystem Planning and Migration Guide</i>	ML0526-x
<i>SD-3 Cartridge Subsystem System Assurance Guide</i>	ML0527-x
<i>SD-3 Cartridge Subsystem Technical Reference Manual</i>	9792
<i>Small Computer System Interface (SCSI) for 9490 and SD-3</i>	Technical Paper

**IBM Titles**

<i>Care and Handling of the IBM Magnetic Tape Cartridge</i>	GA32-0047
<i>ESCON I/O Interface</i>	SA22-7202
<i>Introducing IBM Enterprise Systems Connectivity</i>	GA23-0383

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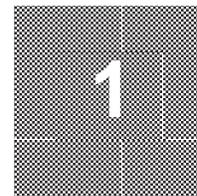
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# Preinstallation Planning



Installing a subsystem requires careful planning to make sure that the required space, facilities, and time are available when the equipment arrives. StorageTek marketing representatives are available to help customers plan for the installation.

## ■ Installation Planning Schedule

Because each installation is unique, a rigid schedule cannot guarantee a smooth installation. The following suggested schedule provides sufficient lead time for the major events that should occur before the installation.

1. Three months before delivery:
  - Plan the physical layout of the equipment using the physical planning templates ( $\frac{1}{4}$  inch = 1 foot) and  $\frac{1}{4}$ -inch grid paper. The templates are located in Appendix A. A copy of the physical layout should accompany the sales order.
  - Determine if I/O cables will need to run outside the computer room. If so, special cables with an improved nonflammability rating should be used (refer to the information under “I/O Cables”).
  - Review floor loading requirements (refer to the information under “Floor Loading”).
  - Complete and submit the sales order.
  - Make sure that equipment power requirements and specified receptacles will be available.
  - Order and arrange for installation of software upgrades.
2. Two months before delivery:
  - Order the required spare parts.
  - Make sure that trained personnel will be available at delivery.
3. Four weeks before delivery:
  - Review the planned physical layout and power requirements.
  - Survey the installation site for specific requirements for moving the equipment from the delivery platform to the installation area.
  - Notify the factory of any special shipping requirements.
  - Confirm the scheduled delivery date with the factory.

4. Two weeks before delivery:
  - Establish an installation time schedule. Allow sufficient system time to check out online operations.
  - Make sure that all parts and bills of material are on hand to accomplish conversions and feature changes to presently installed equipment.
  - Reconfirm the scheduled delivery date with the factory.
5. One week before delivery:
  - Make sure that the required power outlets have been installed.

## ■ Subsystem Layout

Space and layout requirements differ for each system and depend upon the intended applications as well as the physical area available. In general, consider the following points:

- Priority assignments, cable lengths, and service clearance requirements are the limiting considerations regarding the operational requirements of the subsystem.
- Subsystem layout is determined by the combination of equipment components, the plans for future expansion, the procedures for using auxiliary I/O equipment, operator convenience, visibility from the console, and other physical requirements.
- Space should be provided within the computer room for the temporary storage of tapes, printouts, and other data processing materials. All materials should be stored in properly designed and protected storage areas.
- Space should also be planned for office equipment, storage cabinets, files, tables, desks, and communication equipment.
- Work flow between the computer room and other areas should be carefully considered when planning aisles and intermediate storage areas.

Because each customer has different requirements, an accurate drawing of any proposed layout should be made. Physical planning templates, scaled at  $\frac{1}{4}$  inch to the foot, are available for this purpose. These templates show the clearances required for operator and engineer servicing and test equipment, the swing radii of access panels, and the cable hole locations. Use of these templates simplifies the design of the subsystem layout.

## Priority

Priority is the sequence in which I/O devices are attached to the channels. The assignment of priorities is application and program sensitive and affects the capabilities of the channels. The following guidelines are generally used in assigning priorities:

1. When attaching control units to a multiplex channel, assign the highest priority to the device with the highest data rate.
2. When attaching control units to selector channels, attach the device with the highest data rates to the lowest-numbered channel.

## Cable Length

Cable length is the center-to-center distance between cable entry holes as measured along the cable route. For best performance, all cable lengths should be as short as possible. Locate subsystem components so that the maximum cable lengths given in the equipment specifications are not exceeded. Standard cable lengths should be ordered.

The following should be considered before ordering cables:

- The control units assigned to each channel
- Priority
- Unit features
- Physical and logical sequence of control units on each channel
- Number of I/O features attached to each control unit
- Whether the I/O cables are to be run outside the computer room (refer to the information under “I/O Cables”)

## Service Clearances

Servicing usually requires accessibility to both the front and rear of the equipment. There should be adequate space (or the ability to make space) for panel openings, test equipment, and for a customer services engineer to work. In addition, consider the following:

- Serviceability will be improved if the distances between the control unit and its I/O devices are as short as possible.
- The service panel should be visible from the associated I/O devices.
- When the equipment has no convenience outlets, make sure that there are sufficient outlets in the room for test equipment and tools.

## I/O Cables

I/O cables that are run outside a raised floor computer room installation are required by the National Electrical Code to have a flammability rating of CL2 or CL2P depending upon where they are to be used. Exceptions to this requirement occur when the cables are:

- Enclosed in a raceway
- Enclosed in noncombustible (metal) tubing
- Less than 3.05 meters (10 feet) long (exposed length)

If the I/O cables are run in a vertical shaft or if they are located in ducts, plenums, or other air-handling spaces (not including the raised computer room floor), they must be Type CL2P, which has the better nonflammability rating of the two.

If the I/O cables are run elsewhere outside the computer room, they must be *at least* Type CL2. If CL2 cables meet all the requirements for nonflammability, avoid using the CL2P cables as they are approximately four times more costly.

## ■ Site Requirements

Consideration should be given to the following site specifications before the subsystem arrives:

- Floor loading
- Air conditioning
- Static electricity
- Power
- Storage areas
- Fire precautions

These points should already have been considered before the initial installation of the computer system; *however*, any time components are added to a system, the site requirements should be reviewed to ensure proper installation.

## Floor Loading

Some of these products are heavier per square foot than other products with which you may be familiar. The floor loading information provided *must* be reviewed carefully. Consult with a structural engineer if necessary. Failure to comply with the floor load rating and service clearance requirements may result in compromised structural integrity or structure collapse causing property damage or personal injury.

*Strict compliance with ratings and weight distribution clearance is critical.*

The average structural floor loading decreases as additional clearance is provided around each unit. While a variety of configurations will exist, equipment loading from the adjacent floor area must be considered in the evaluation of the total floor loading.

The rating and condition of the raised floor panels and pedestals should be evaluated. Consult a structural engineer for a specific loading analysis and determination of floor capacity.

## Operating Temperature

Most StorageTek equipment is designed to operate over a temperature range of 15.5 to 32.2°C (60 to 90°F). Some equipment may have more or less restrictive conditions or may have special cooling requirements.

You can size your cooling system's requirements by referring to the environmental limits tables for the Btus per hour generated by each StorageTek device.

The life of your StorageTek equipment can be increased by keeping its environment as cool as possible. Avoid locating it near hot air exhausts, heat exchangers or other heat generating devices. Most StorageTek equipment is protected against overheating by internal thermal sensors that will shut the equipment down in the event of high temperature conditions. For maximum reliability, it is recommended that you maintain the room temperature where the StorageTek equipment is located at  $21.1^{\circ}\text{C} \pm 2.7^{\circ}$  ( $70^{\circ}\text{F} \pm 5^{\circ}$ ).

## Static Electricity

Static electricity can be built up by the movement of people, furniture, and equipment. In addition to causing discomfort to personnel, a static discharge can generate a machine malfunction. It is possible for a static discharge to destroy discrete components on logic cards, change information on magnetic media, or cause other problems.

Special attention should be given to floor paneling and floor covering. Panels should be made with nonconducting cores for high resistance. Antistatic carpets and other floor coverings should be used.

Other sources of static electricity include furniture, tape carts, casters, vacuum cleaners, and plastic access panels. The resistance between furniture and the flooring it touches should be at least  $10^9$  ohms. Static buildup on portable rolling tape carts can be controlled by using conductive casters or a conductive beaded grounded drag chain.

Every possible precaution should be taken to minimize static discharge. This can be accomplished by providing a conductive path from raised floors to ground and maintaining the computer room humidity within the listed control parameters.

## Electrical Power and Grounding

StorageTek equipment operates best with a reliable power source that is free from interference or disturbance. Power supplied by local power companies is generally of sufficient quality. The following literature provides the means and specifications that will meet the requirements of the equipment. Your StorageTek equipment will yield reliable operation when supplied by a properly installed power system. Qualified personnel must make sure that the voltage measured at the power receptacle is within the specified tolerance for the machine. In addition to power for your StorageTek products, a separate power feeder is required for such items as lighting, air conditioning and other electrical systems.

A low impedance grounding means and lightning protection must be considered when planning and installing an electrical system. Your electrical contractor should meet local and national code requirements. Electrical power for the building is normally derived from a three-phase power distribution system. Single phase power outlets (receptacles) are normally provided in general office areas. Data processing rooms are normally provided with three-phase power.

The following conditions apply to power supplied to the equipment. Some StorageTek machines require three-phase power while other machines require single phase power. Typical voltage limits and frequency limits are described in Table 1-1.

The part number of the Russellstoll® or HUBBELL® power connectors provided for 60-Hz applications are given in the product specifications as well as the compatible mating connector (which is not provided).

Power connectors for 50-Hz applications are normally not provided.

### Power Quality

StorageTek equipment is designed to operate within most expected, but unpredictable, power line disturbances. The quality of incoming power, however, can make a substantial difference in the performance of the equipment. Power disturbances or transients can cause equipment power failures or errors. Electrostatic discharge (ESD) from personnel to the equipment can cause equipment errors. Power transients can come into the site on the power company lines, but (with the exception of lightning) are more often caused by electrical equipment installed within the building. For example, power transients can be caused by welders, cranes, motors, induction heaters, elevators, copy machines and other office equipment. The best way to prevent problems caused by power disturbances is to have transient-producing equipment on a separate power service than that which supplies power to the StorageTek equipment. ESD can be controlled by proper anti-static floor coverings and control of the computer room's humidity.

## Grounding

For reasons of personnel safety as well as ESD, a machine must be properly grounded. It is required that an insulated green or green/yellow wire ground, the same size as the phase wire, be installed between the branch circuit panel and the receptacle. This is not a neutral.

Good bonding techniques such as bared metal and inside/outside star washers should be used. It is not sufficient to provide ground paths through anodized material or hinges. Sheet metal screws should never be used as a means of attaching a ground.

For personnel safety, the ground should have sufficient low impedance to limit the voltage to ground and to facilitate the operation of circuit protective devices. For example, the ground path shall not exceed one ohm for 120 volt, 20 ampere branch circuit devices. This will yield a maximum machine voltage of 20 volts in the event of internal shorts.

## Power Specifications

Most StorageTek equipment is designed to operate at the following voltages for the indicated frequencies.

<b>Phase</b>	<b>Nominal Voltage (VRMS)<sup>1</sup></b>	<b>Voltage Range (VRMS)</b>	<b>Voltage Range (%)</b>	<b>Frequency (Hertz)</b>
Single Phase 2 Wire + Gnd	200	180 - 220	±10	47 - 63
	208	177 - 229	+10, -15	47 - 63
	220	187 - 242	+10, -15	47 - 63
	230	207 - 253	±10	47 - 63
	240	204 - 264	+10, -15	47 - 63
Three-Phase Δ 3 wire + Gnd	200	170 - 220	+10, -15	50
	220	187 - 242	+10, -15	50
	230	196 - 253	+10, -15	50
	240	204 - 264	+10, -15	50
Three-Phase Y 3 wire + Gnd/Neutral	380	323 - 418	+10, -15	50
	400	340 - 440	+10, -15	50
	415	353 - 457	+10, -15	50
Three-Phase Δ 3 wire + Gnd	200	170 - 220	+10, -15	60
	208	177 - 229	+10, -15	60
	220	187 - 242	+10, -15	60
	230	196 - 253	+10, -15	60
	240	204 - 264	+10, -15	60

<sup>1</sup> Phase to phase.

In some cases, the equipment requires jumpers to select the correct voltage range. In others, the equipment operates over the entire range. Some models may operate over a more narrow voltage range.

Consult your StorageTek representative if the nominal voltages listed above do not meet the requirements of your particular country.

For machines that require three-phase power, two types are available:

- Phase-to-phase voltage consisting of three-phase wires and one insulated equipment grounding conductor
- Phase-to-neutral voltage consisting of three-phase wires, one neutral wire and one insulated equipment grounding conductor

Single phase machines require two-phase wires and one insulated equipment grounding wire. The computer room power panel should be used to power computer and data processing machines only.

### ***Voltage Limits***

As indicated previously, the phase-to-phase steady state voltage must be maintained within +10% or -15% of the nominal voltage, measured at the receptacle when the system is operating. A transient-voltage condition must not exceed +15% or -18% of the nominal voltage, and must return to the limits stated above within 0.5 second. Minus 18% or greater transients for longer periods of time should not cause damage to the equipment but may cause data errors or temporary down time.

### ***Frequency Limits***

The phase frequency must be maintained at 50 or 60 Hz  $\pm$  0.5 Hz for most equipment. Some products may be more frequency tolerant.

### ***Line-to-Line Voltage Imbalance***

The value of any of the three phase-to-phase equipment voltages in a three-phase system shall not differ by more than 2.5% from the arithmetic average of the three voltages.

### ***Harmonic Content***

When the equipment is operating, the maximum total harmonic content of the power system voltage wave forms on the equipment feeder must not exceed 5% with the equipment operating.

## Power Distribution System

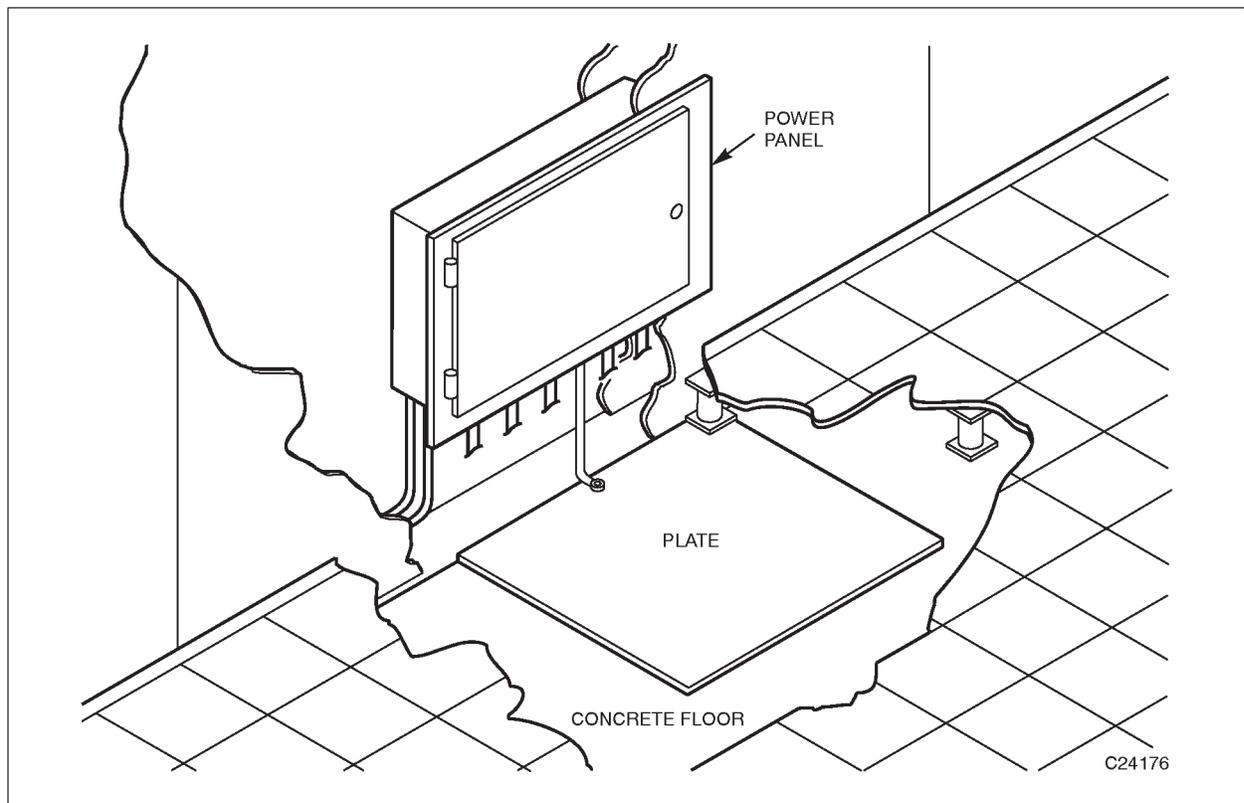
The following defines the electrical power distribution system required for proper operation of your StorageTek equipment.

### *Power Load*

By adding the power load of all the equipment, you may determine the amount of amps required for your power service. Consider large in-rush conditions such as motor start times.

### *Primary Power Problem Areas*

Most electrical utility companies provide normal power to satisfactorily operate your StorageTek equipment. However, possible equipment errors can be caused by outside (radiated or conducted) transient electrical noise signals being superimposed on the power to the equipment. To guard against this interference, power distribution design should comply with that specified in this chapter. Figure 1-1 shows a typical transient grounding plate which is not to be confused with the code approved grounding electrode.



**Figure 1-1. Transient Grounding Plate**

Failures caused by the power source are basically of three types:

- Power outages include short duration dips in voltage as well as prolonged outages (brown outs). If the frequency and length of such outages is not acceptable to your operation, installing standby power such as an uninterruptible power source (UPS) may be necessary to guarantee against system errors.
- Transient electrical noise superimposed on power lines may be caused by a variety of industrial, medical, communication or other equipment:
  - 1) Within or adjacent to the computing facility
  - 2) Near the power company's distribution lines
- Switching large electrical loads may cause problems even though the source is on a different branch circuit. If you suspect such a condition, it may be advisable to provide a separate dedicated feeder or transformer for your StorageTek equipment directly from your power source.

Motor operated devices on the same power source as StorageTek equipment may, under certain conditions, cause intermittent electrical disturbances. To minimize the effects of high frequency noises, the branch circuit power panel servicing the equipment should be mounted in contact with bare building steel or connected to it by a short length of cable. If this is not possible, a metal area (power panel plus conduit, plus plate) of approximately 1 square meter (10 square feet) in contact with masonry may be used. The plate should be connected to the green wire common (Figure 1-2). The connection should not be more than 1.5 meters (5 feet) long and should consist of No. 12 AWG (3.3 square mm or 0.0051 square inches) or larger wire.

If transient producing devices have been removed from the power bus and the computer room power panel and power line disturbances are still present, it may be necessary for you to install power line isolation equipment such as:

- Transformers
- Motor generators
- Uninterruptible power sources (UPSs)
- Other power-conditioning equipment

### ***Power Source***

The primary power source (Figure 1-2) is normally a wye or delta type, three-phase service coming from a service entrance or a separately derived source with appropriate overcurrent protection and suitable ground. A three-phase, five wire power distribution system should be provided for flexibility in your data processing installation. The use of five wires enables you to provide power for three phase or single phase equipment. The five wires consist of three phase wires, one neutral wire and one insulated equipment ground wire (green or green with yellow trace).

### ***Power Panel Feeders***

Make sure that the feeder wires to the branch-circuit distribution panel (Figure 1-2) are large enough to handle the total power load. It is recommended that these feeders not service any other loads.

### ***Branch Circuits***

The computer branch circuit panel should be in an unobstructed, well lighted area in the computer room.

The individual branch circuits on the panel should be protected by suitable circuit breakers properly de-rated according to manufacturers' specifications and applicable codes. The minimum rating should not be less than the equipment's main breaker rating, nor should it exceed what local code requires to protect branch circuit conductors. Breakers should have delays for motor start in-rush. Each circuit breaker should be labeled to indicate which branch circuit it is protecting.

Branch circuits installed under a raised floor should be within 3 meters (10 ft) of the machines they supply. If the branch circuits are required to run in a metal conduit, either rigid or nonrigid, the conduit system should be continuous and uninterrupted from the machine power cord connection to the building or transformer ground.

Power cords are supplied in 4.5 meter (15 ft) lengths unless otherwise noted.

### ***Grounding***

StorageTek equipment power cords contain an insulated equipment grounding wire (green or green with a yellow stripe) that connects the machine frame to the ground terminal at the power outlet. The power receptacles for StorageTek equipment should be connected by an equipment grounding conductor to the grounding bus bar in the branch circuit distribution panel. The grounding bus bar should be connected by an equipment grounding wire back to the service entrance (Figure 1-2).

### ***Phase Rotation***

The three-phase power receptacles for some StorageTek equipment must be wired for correct phase rotation. When looking at the face of the receptacle and counting clockwise from the ground pin, the sequence is phase 1, phase 2, and phase 3. This is critical to make sure of proper media rotation in disc drives.

### ***Emergency Power Control***

A means for disconnecting power from all equipment in the computer room should be provided. This disconnecting means should be in locations readily accessible to the operator at the principle exit doors. Consult your local and national codes to determine the requirements for this disconnect.

### ***Convenience Outlets***

Convenience outlets may be supplied on your 60-Hz StorageTek equipment. You should also provide convenience outlets with proper grounding wires throughout the computer room. If possible, these outlets should be on a separate power circuit from your computer equipment power circuit. Under no conditions should you use the convenience outlets on your StorageTek equipment for any other purpose other than powering test equipment used to troubleshoot or test system problems.

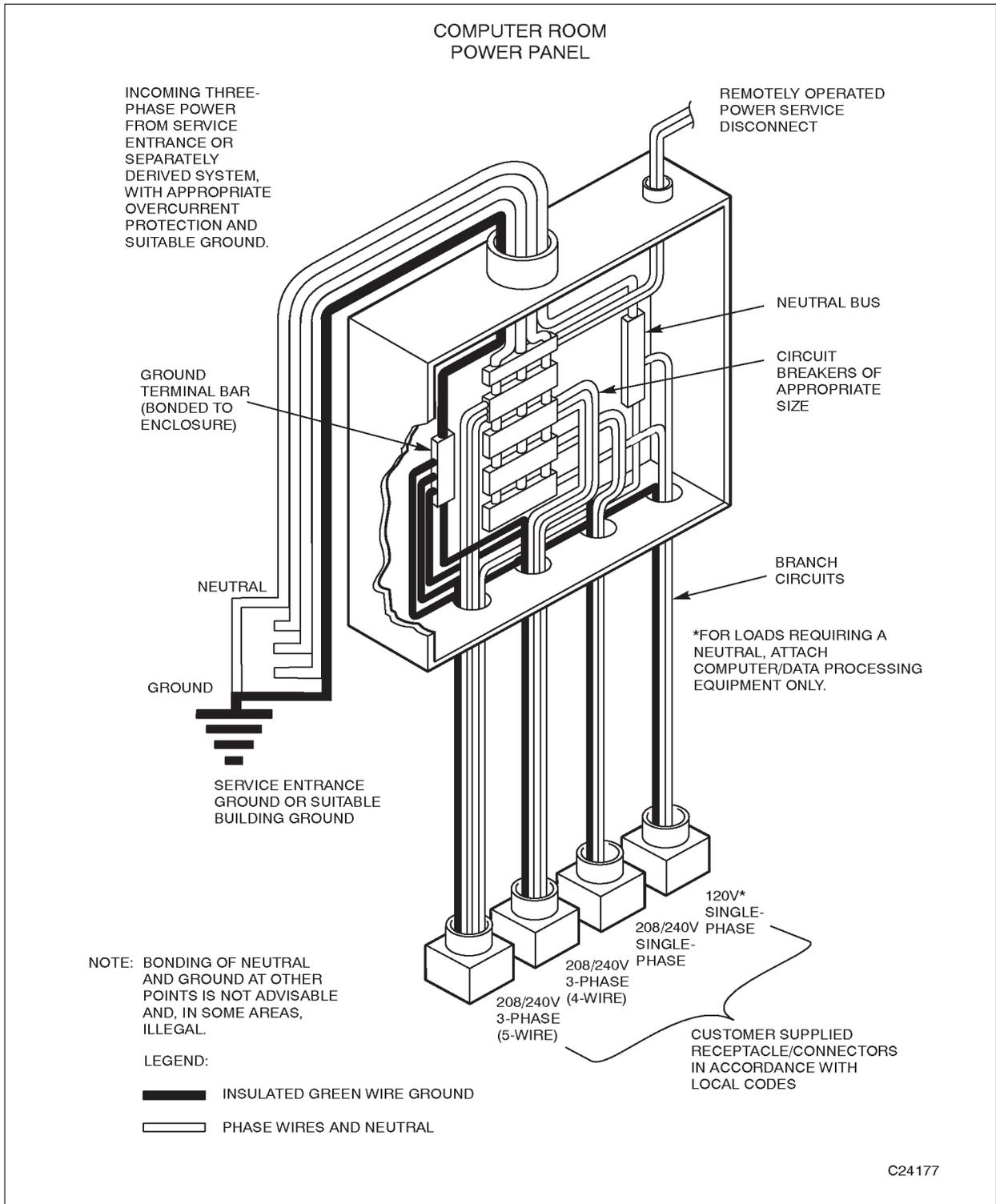
### ***Lightning Protection***

Properly installed lightning protection should be installed on the computer power source.

## **Storage Areas**

All storage areas should comply with National Fire Protection Association standards. Magnetic tapes should be stored in fire resistant cabinets away from magnetic fields. Magnetic fields greater than 50 oersteds intensity can cause loss of information or the introduction of noise on both tapes and disks.

The media should be stored in metal cabinets or fire-resistant containers when not in use. A separate room for data storage is strongly recommended for security purposes and for protection against fire. The room should be constructed of fire-resistant material with a minimum two-hour fire-resistance rating. The fire prevention equipment recommended for the room is a chemical-flooding system such as Halon 1301 or a sprinkler system.



**Figure 1-2. Electrical Power and Grounding**

## Wiring Comments Site Survey

We recommend that the customer request the installing electrician fill out and use the following checklist as a site survey. You may wish to obtain quotes on any “No” item checked.

### Wiring Comments Site Survey from Distribution Transformer to Distribution Panel

Yes	No	
<input type="checkbox"/>	<input type="checkbox"/>	Neutral properly connected to the distribution transformer and distribution transformer properly grounded to the service entrance ground via full-sized insulated conductor (not just the small strap furnished with the transformer).
<input type="checkbox"/>	<input type="checkbox"/>	Neutral and ground wiring insulated and full-sized as above. (Same size as phase conductors.)
<input type="checkbox"/>	<input type="checkbox"/>	Verify that all connections are tight both by checking tightness and visually inspecting for discoloration.
<input type="checkbox"/>	<input type="checkbox"/>	With an ohmmeter check and verify that all isolated ground terminals are terminated to the same point.  Remove the incoming ground connection (with power off) and verify the receptacles are not grounded with the incoming ground removed.  Remove the incoming neutral. Verify there are no neutral to ground shorts or bonding on the load side.
<input type="checkbox"/>	<input type="checkbox"/>	All portions of mainframe, related peripherals, and nearby terminals (including CRTs, consoles, printers, modems, etc.) powered via protected power.
<input type="checkbox"/>	<input type="checkbox"/>	All voltages at proper levels as required. Adjust distribution transformers if voltages are out of tolerance.
<input type="checkbox"/>	<input type="checkbox"/>	All phase wiring at least the minimum size required by the NEC and preferably one size larger per 100 feet (30.5 meters) of run.
<input type="checkbox"/>	<input type="checkbox"/>	Each circuit has a full size neutral and full size ground conductor not shared with any other circuit.
<input type="checkbox"/>	<input type="checkbox"/>	Ground <i>not</i> shared or common with neutral except at service entrance or main ground point; neutral <i>not</i> bonded at panel.
<input type="checkbox"/>	<input type="checkbox"/>	Consistent grounding (preferably single-point reference) used on all of the above. (Not random conduit.)
<input type="checkbox"/>	<input type="checkbox"/>	System ground not bonded at circuit breaker panel.
<input type="checkbox"/>	<input type="checkbox"/>	Install all isolated ground (orange) receptacles.
<input type="checkbox"/>	<input type="checkbox"/>	Above wiring loaded to less than 80% as shown by ammeter while system is operating with maximum activity. Distribution transformers not over-loaded.
<input type="checkbox"/>	<input type="checkbox"/>	All phases at panel are properly balanced while system is operating at normal activity.
<input type="checkbox"/>	<input type="checkbox"/>	Verify all connections are tight and not discolored.

## Fire Precautions

Fire prevention may be considered in two categories: passive and active.

1. Passive fire prevention (the first line of defense) is the integrity of the computer room and its ability to withstand fire and water damage. It should begin with locating the computer room away from the storage of gases and other potential explosives. Walls, floors, and ceilings should be fireproof and waterproof. Shatterproof windows sealed in masonry should be installed. All main electrical circuits should have emergency power-off switches located where they can be quickly activated during an emergency evacuation.
2. Active fire prevention is the fire control system and is implemented through the installation of fire prevention equipment. Smoke alarms or other early warning equipment should be installed in the computer room. All combustible waste should be placed in flame-suppressant trash containers. Carbon dioxide fire extinguishers should be installed for electrical fires, and pressurized water extinguishers should be installed for ordinary combustible materials.

## Halon Attachment to Automated Cartridge Systems

Halon 1301 is the extinguishing agent used by manufacturers for computer room fire suppression systems. This agent is stored as a liquid and is discharged as a colorless, odorless and electrically nonconductive vapor. Halon can be safely discharged in occupied areas without harm to the people. Halon leaves no residue and tests have been conducted to make sure that it will not damage the media or the labels if it is discharged into the 4400 ACS.

Three vendors conducted extensive tests in StorageTek labs. Each designed a system that would provide an initial 6% Halon concentration and maintain a minimum 5% concentration level in our LSMs for a period of 10 minutes.

Vendors are responsible for producing and distributing the required documentation about their systems to their local representatives include:

- Ansul Fire Protection of Marinette, Wisconsin (1-800-346-3626)
- Fenwal Incorporated of Ashland, Massachusetts (508-881-2000)
- Fike Fire Suppression Systems of Blue Springs, Missouri (816-229-3405)

## Carbon Dioxide Attachment to the 4400 ACS

As a result of recent discoveries regarding ozone depletion associated with chlorofluorocarbons (CFCs), many customers have requested an alternate fire suppressing agent. Chemetron has developed a system that discharges carbon dioxide (CO<sub>2</sub>) and attaches to the 4400 ACS Library. This system provides an alternate solution to the customer's fire protection needs. Chemetron Fire Systems is located in University Park, Illinois.

## Site Planning Checklist

This site planning checklist helps ensure a smooth installation plan for StorageTek's Nearline products:

---

### ***General Requirements***

- 1. Determine needed power and air-conditioning.
- 2. Determine equipment location and/or relocation.
- 3. Reserve space for spare parts and documentation.
- 4. Determine number and length of required cables.
- 5. Determine channel attachments.
- 6. Assign device addresses.
- 7. Determine number and type of cartridge storage cabinets.
- 8. Determine number and type of cartridge system tapes required (enhanced capacity cartridges or base cartridges).
- 9. Determine number of cleaning cartridges required.
- 10. Design a floor plan for the equipment layout.
- 11. Prepare for any equipment re-arrangement.

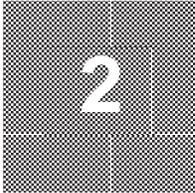
### ***Cartridge Labels***

- 1. Determine if a StorageTek ACS will share data cartridges.
- 2. Determine number of labels required by type.
- 3. Determine label numbering sequences.

### ***Ordering Equipment and Consumables***

- 1. Order machines and features.
- 2. Order cartridge storage cabinets.
- 3. Order cleaning cartridges.
- 4. Order cables.
- 5. Order labels.
- 6. Schedule any facility changes.

# Automated Cartridge Systems



2

This chapter provides planning information for StorageTek's automated cartridge systems (ACSs) and includes:

- Physical specifications
- Electrical specifications
- Cables types, lengths, and part numbers
- Floor-space requirements

**Note:** Floor-space requirements are normally shown using the 4480 Cartridge Drive. The 4480 was selected because it is the same size as StorageTek's 4490, 4791, 4780, and 4781 Cartridge Subsystems. The 9490 (TimberLine) and SD-3 (RedWood) have different (smaller) floor-space requirements than the 4480.

The information presented in this chapter consists of:

- "Large Libraries", which includes products such as Powderhorn
- "Small Libraries", which includes products such as WolfCreek

**Note:** Configuration templates are provided in Appendix A.

## ■ Overview

StorageTek's automated cartridge subsystems consist of five elements:

- Cartridge subsystems which attaches to the LSM and contains the transports where the cartridges are placed for read/write operations.
- Library control unit (LCU) which attaches to the LSM and contains the microcode and electronic that controls the robotic operations.
- Library management unit (LMU) which controls the LSMs. The LMU interprets commands from the operating system and relays instructions to the LSM.
- Library storage units (LSMs) which holds the cartridge tapes and contains the robotic components to move the tapes to their correct destination.
- Software component which interfaces between the operating system and ACS for mount messages and tape processing.

## ■ Large Libraries

Large libraries such as the 4410 and 9310 (also called Powderhorn) are 12-sided structures that store up to 6,000 cartridge tapes and can have from 1 to 4 cartridge drives (2 to 16 transports) installed. Up to 16 LSMs can be interconnected using pass-thru-ports which are controlled from one LMU.

Table 2-1 through Table 2-3 lists the specifications for the large library units:

<b>Table 2-1. Physical Specifications: 44xx/93xx</b>		
Library Management Unit (4430)	Height Width <sup>1</sup> Depth <sup>2</sup> Service clearance front rear Weight	1.07 m (42.0 in.) 737 mm (29.0 in.) 813 mm (32.0 in.) 813 mm (32.0 in.) 813 mm (32.0 in.) 113 kg (250 lbs)
Library Management Unit (9330)	Height Width <sup>1</sup> Depth <sup>2</sup> Service clearance front rear Weight	930 mm (36.6 in.) 737 mm (29.0 in.) 597 mm (23.5 in.) 813 mm (32.0 in.) 813 mm (32.0 in.) 97.5 kg (215 lbs)
Library Control Unit (4411/9311)	Height Width <sup>1</sup> Depth <sup>2</sup> Service clearance front rear Weight	1.61 m (63.5 in.) 396 mm (15.6 in.) 572 mm (22.5 in.) 396 mm (15.6 in.) NA 136 kg (300 lbs)
Library Storage Module (4410/9310)	Height Diameter Service clearance <sup>3</sup> Weight	2.35 m (92.5 in.) 3.25 m (128.0 in.) NA 3810 kg (8400 lbs) (Loaded) 2449 kg (5400 lb) (Unloaded)
Raised Floor Loading: 244 - 293 kg/sq m (50 - 60 lb/sq ft)		
<b>Note:</b>		
<sup>1</sup> With side panels on		
<sup>2</sup> With front and rear panels on		
<sup>3</sup> 860 mm (34 in.) required to open door.		

<b>Table 2-2. Electrical Specifications: 44xx/93xx</b>		
Library Management Unit (4430)	Volts (AC) <sup>5</sup>  Frequency Phases Current Power consumption (operating)	200 ±10% 208 +10%, -15% 220 +10%, -15% 230 ±10% 240 +10%, -15% 47 to 63 Hz Single 8 A RMS <sup>1 2</sup> 0.9 kVA (0.6 kW)
Library Management Unit (9330)	Volts (AC) Frequency Phases Current Power consumption (operating)	200 - 250, nominal 47 to 63 Hz Single 20 A 1.85 kVA (1.2 kW)
Library Storage Module/ Library Control Unit (4410/4411)	Volts (AC) <sup>5</sup>  Frequency Phases Current Power consumption (operating)	200 ±10% 208 +10%, -15% 220 +10%, -15% 230 ±10% 240 +10%, -15% 47 to 63 Hz Single 12 A RMS <sup>1 2</sup> 1.5 kVA (1.1 kW)
Power Connectors <sup>3</sup>	LMU (4430) LCU (4411) LSM (4410)	US/Canada: Russellstoll® 3720 (male) 3743 (box receptacle) <sup>4</sup> 3913 (inline connector) <sup>4</sup>
<b>Notes:</b>		
<sup>1</sup> Branch circuit rating <sup>2</sup> Average line current = 8.4 A @ 180 VAC (200 VAC nominal) <sup>3</sup> 9330 connectors are listed in Table 2-10 <sup>4</sup> Customer supplied female connector <sup>5</sup> Voltages are selectable using jumpers		

<b>Table 2-3. Environmental Limits: 4410/4411/4430</b>	
Temperature	
Operating	16°C to 32°C (60°F to 90°F)
Storage	4.4°C to 32°C (40°F to 90°F)
Shipping	-30°C to 49°C (-22°F to 120°F)
Relative Humidity	
Operating	20% to 80%
Storage	10% to 90%
Shipping	5% to 95% noncondensing
Temperature Change	
Operating	< 5°C/hr (≤ 9°F/hr)
Storage	<15°C/hr (≤27°F/hr)
Shipping	<15°C/hr (≤27°F/hr)
Heat Output	
LMU (4430)	517 kcal/hr (2,050 Btu/hr)
LCU/LSM (4411/4410)	945 kcal/hr (3,750 Btu/hr)

## External Cables

<b>Table 2-4. External Cable Requirements: 4430/4411</b>			
<b>Units Connected</b>	<b>Cable Type</b>	<b>Number of Cables</b>	<b>Maximum Length</b>
Terminal Control Unit to LMU1	RG-62A/U coaxial (93 Ω)	1 per station (Up to 16)	750 m (2460 ft)
LMU to LCU (LAN cables) <sup>2</sup>	RG-58A/U coaxial (50 Ω)	2 <sup>3</sup>	182.9 m (600 ft) <sup>4</sup>
UNIX-based workstation to LMU (ACSLs)	RS-423	1 per workstation	60.9 m (200 ft) <sup>5</sup>
<b>Notes:</b>			
<sup>1</sup> Customer supplied.			
<sup>2</sup> Total length of the LAN network is 182.9 m (600 ft). LAN cables must be ordered separately.			
<sup>3</sup> Two (redundant) networks.			
<sup>4</sup> Part of LAN: a tapped, bidirectional bus. LMU and LSMs are connected serially in any sequence. Minimum between gaps, 1.83 m (6 ft).			

## Local Area Network Cables

Local area network (LAN) cables interconnect the library storage modules (LSMs) to the library management unit (LMU). Table 2-5 lists the lengths and part numbers for these cables:

Length		Part Numbers	Length		Part Numbers
Meters	Feet		Meters	Feet	
7.6	25	410612401	91.4	300	410612408
15.2	50	410612402	106.7	350	410612409
22.9	75	410612403	121.9	400	410612410
30.5	100	410612404	137.2	450	410612411
45.7	150	410612405	152.4	500	410612412
60.9	200	410612406	167.6	550	410612413
76.2	250	410612407	182.9	600	410612414

Table 2-6 lists the lengths and part numbers for the LAN cables going from a SPARC workstation to the LMU:

Cable Description	Cable Length		Part Number
	Meters	Feet	
LMU DB25 - USS DB9	6.9	20	410913802
	15.2	50	410913805
	30.5	100	410913810
	45.7	150	410913815
	60.9	200	410913820
LMU DB25 - USS DB25	6.9	20	410891202
	15.2	50	410891205
	30.5	100	410891210
	45.7	150	410891215
	60.9	200	410891220
LMU DB25 - USS dual DB25 <sup>1</sup>	15.2	50	411238505
	30.5	100	411238510
	60.9	200	411238520
<b>Note:</b>			
<sup>1</sup> SPARC units only (NearNet co-host)			



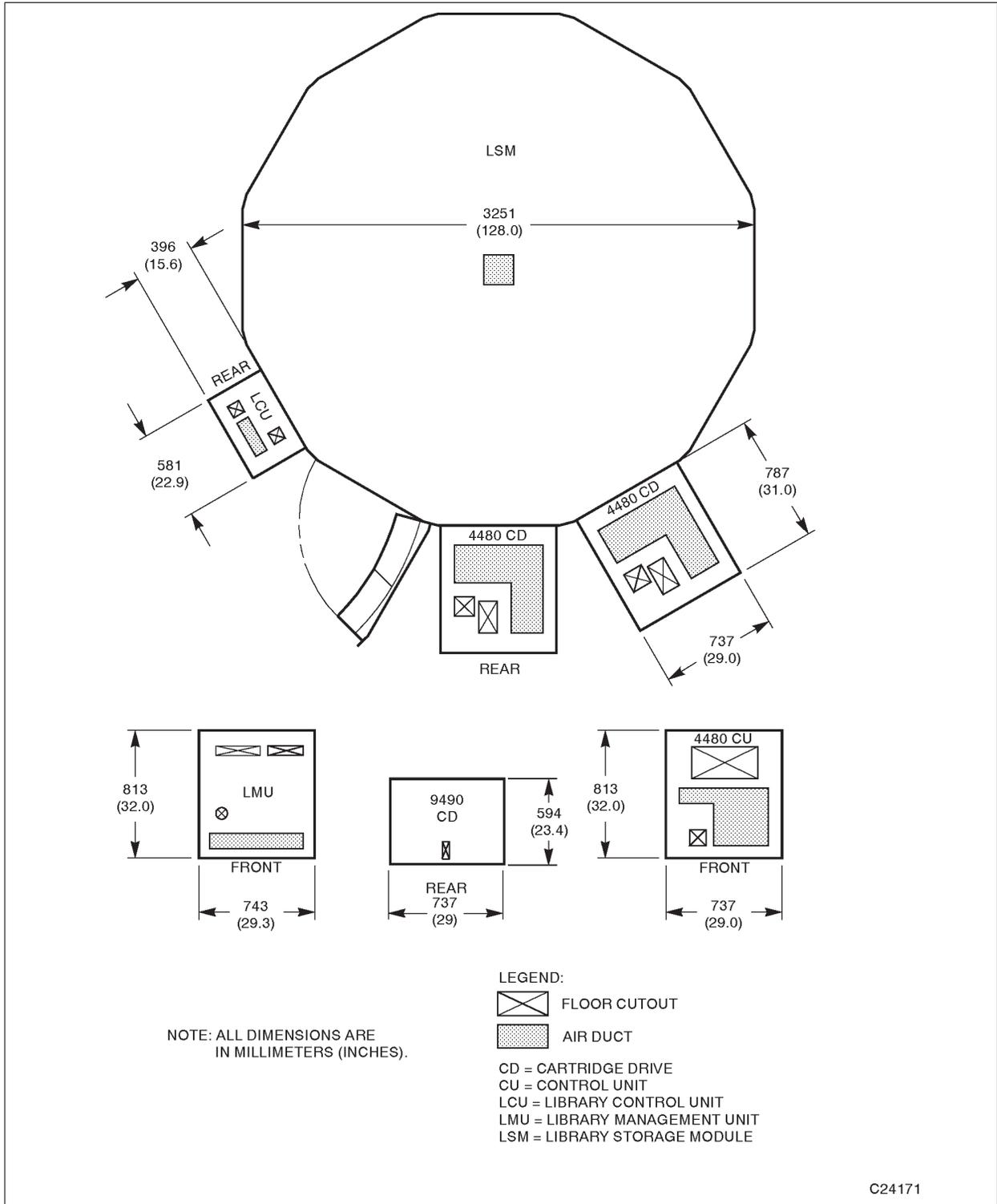


Figure 2-2. Floor Cutouts - 44xx/93xx (Part 1 of 3)

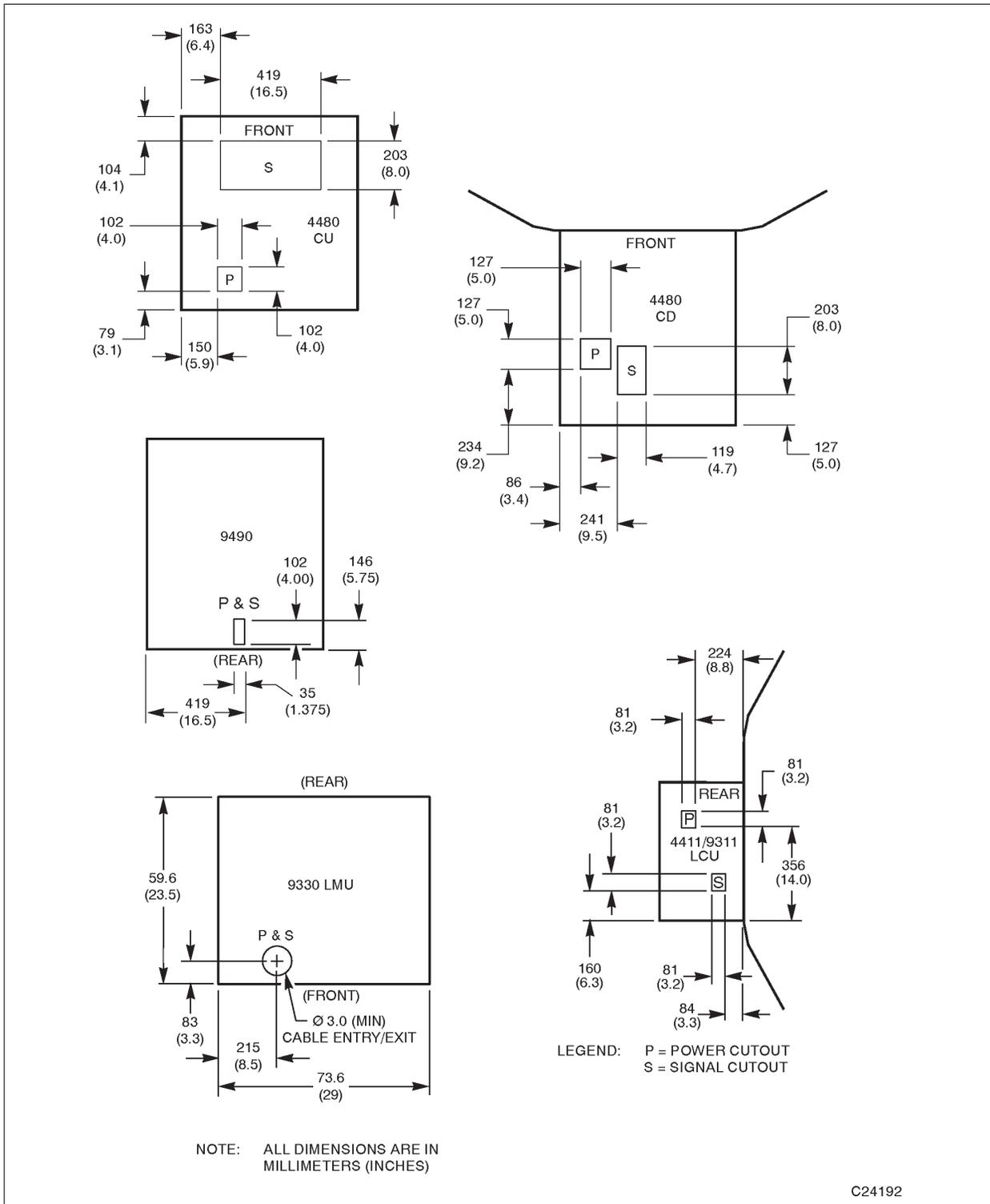


Figure 2-2. Floor Cutouts - 44xx/93xx (Part 2 of 3)

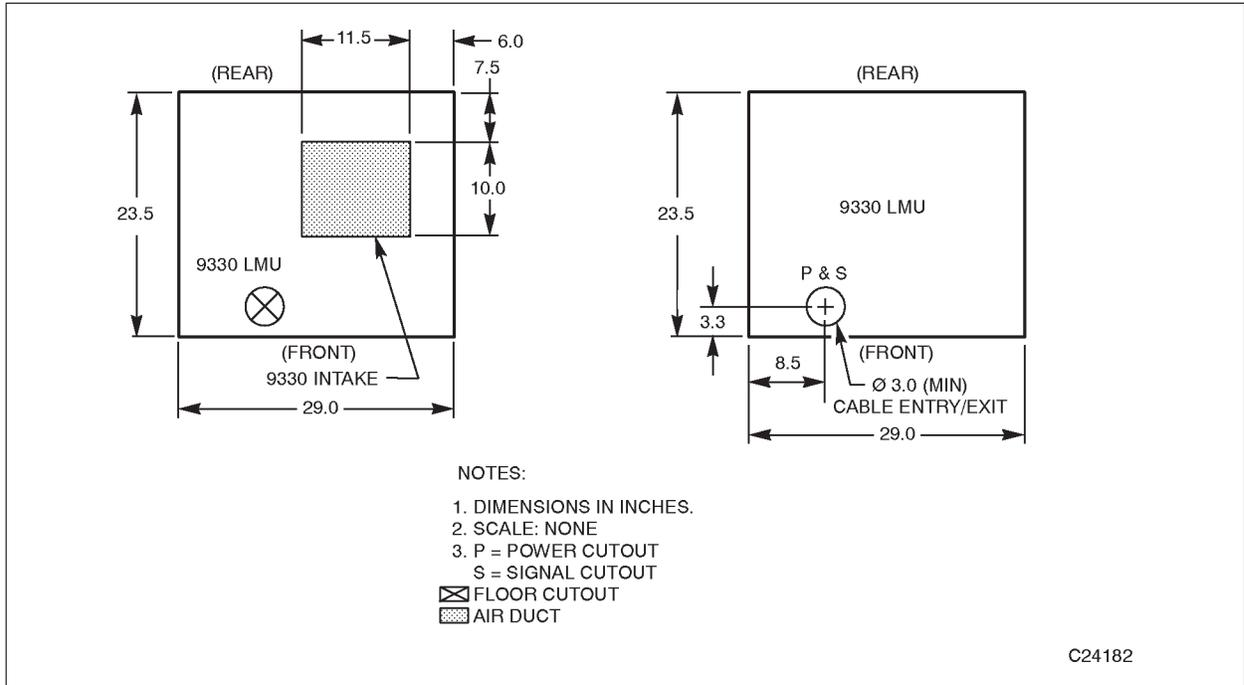


Figure 2-2. Floor Cutouts - 44xx/93xx (Part 3 of 3)

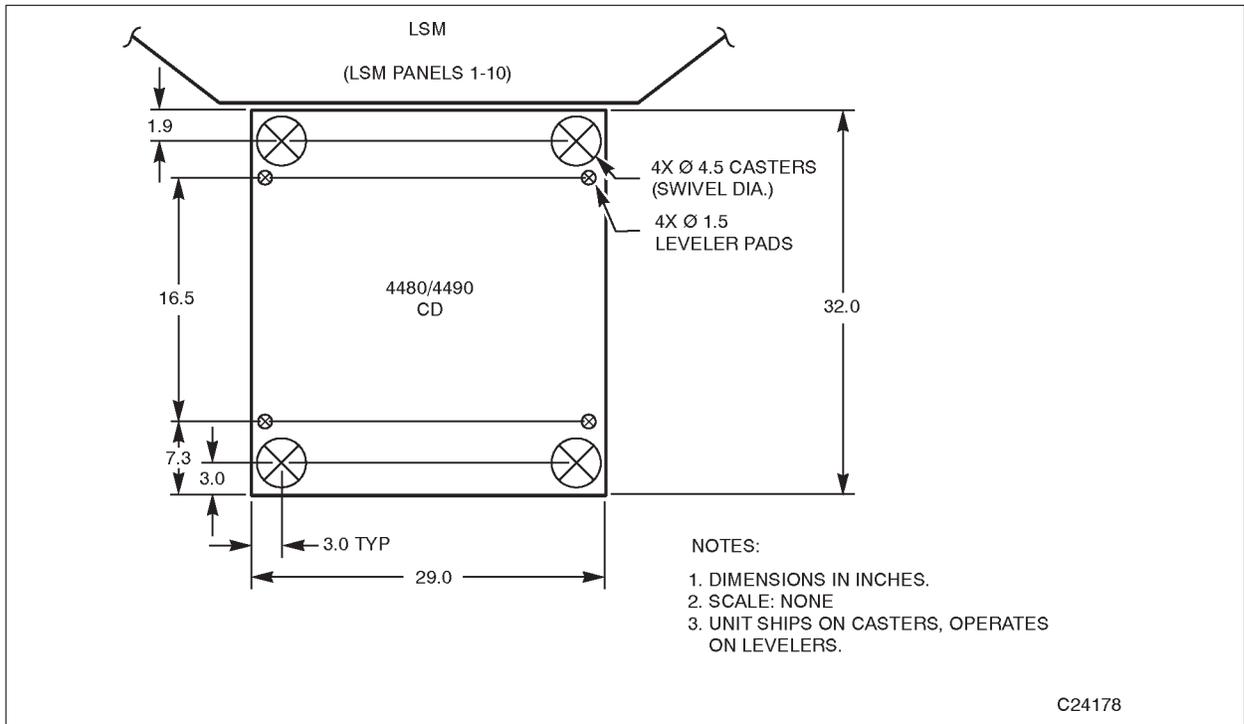


Figure 2-3. Leveling Pad Locations - 44xx/93xx (Part 1 of 4)

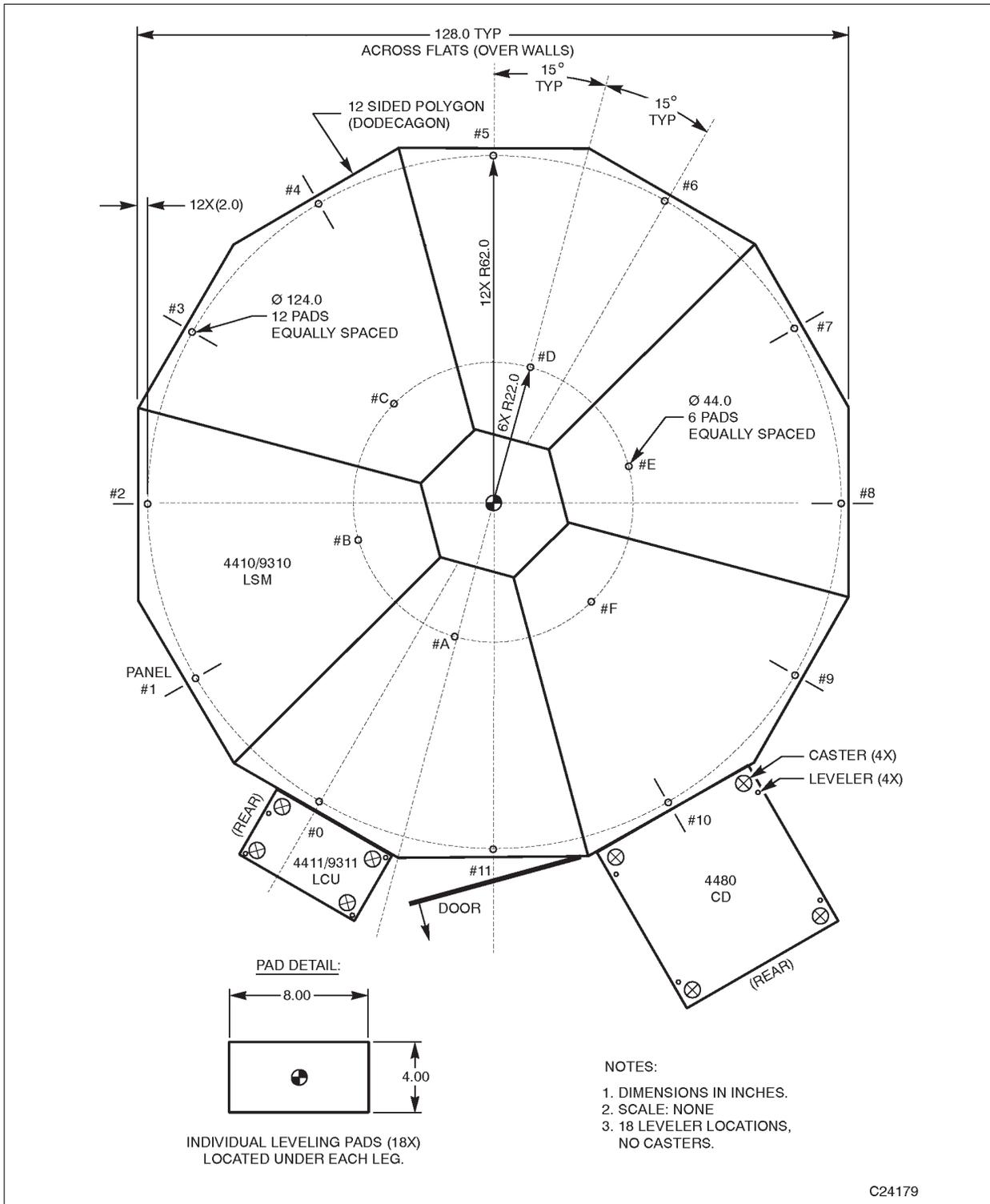


Figure 2-3 Leveling Pad Locations - 44xx/93xx (Part 2 of 4)

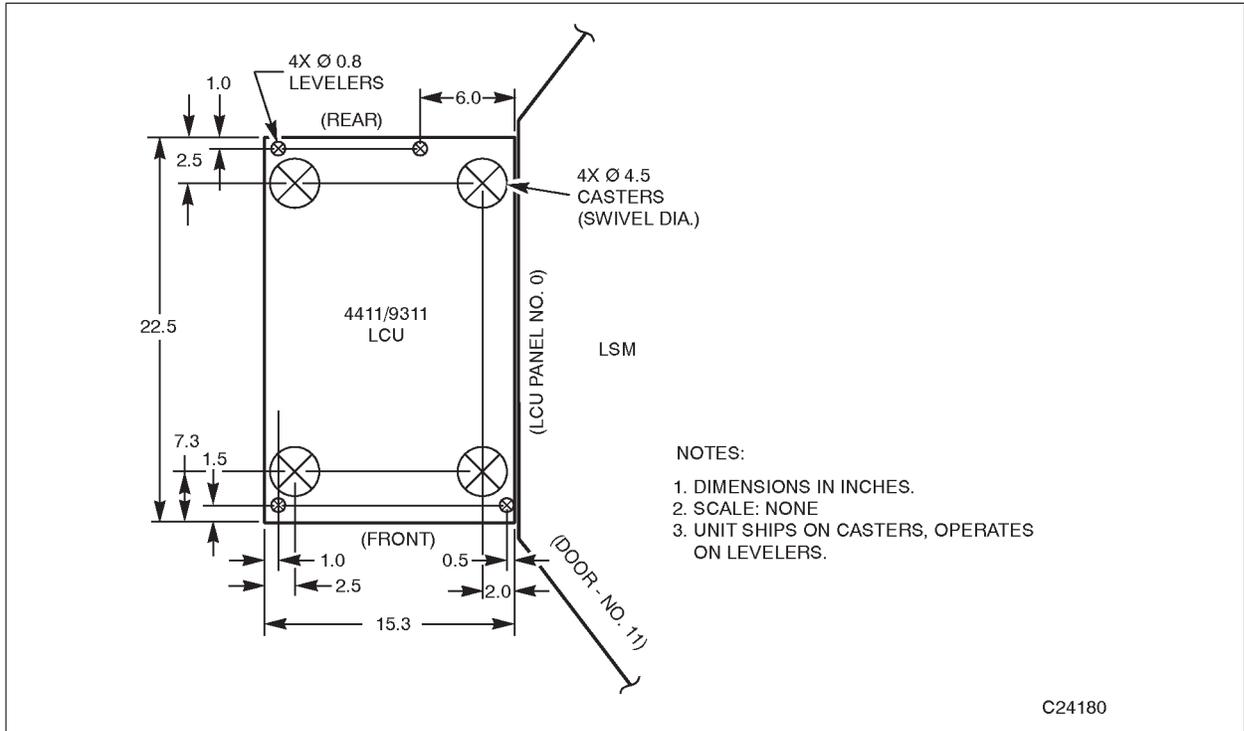


Figure 2-3 Leveling Pad Locations - 44xx/93xx (Part 3 of 4)

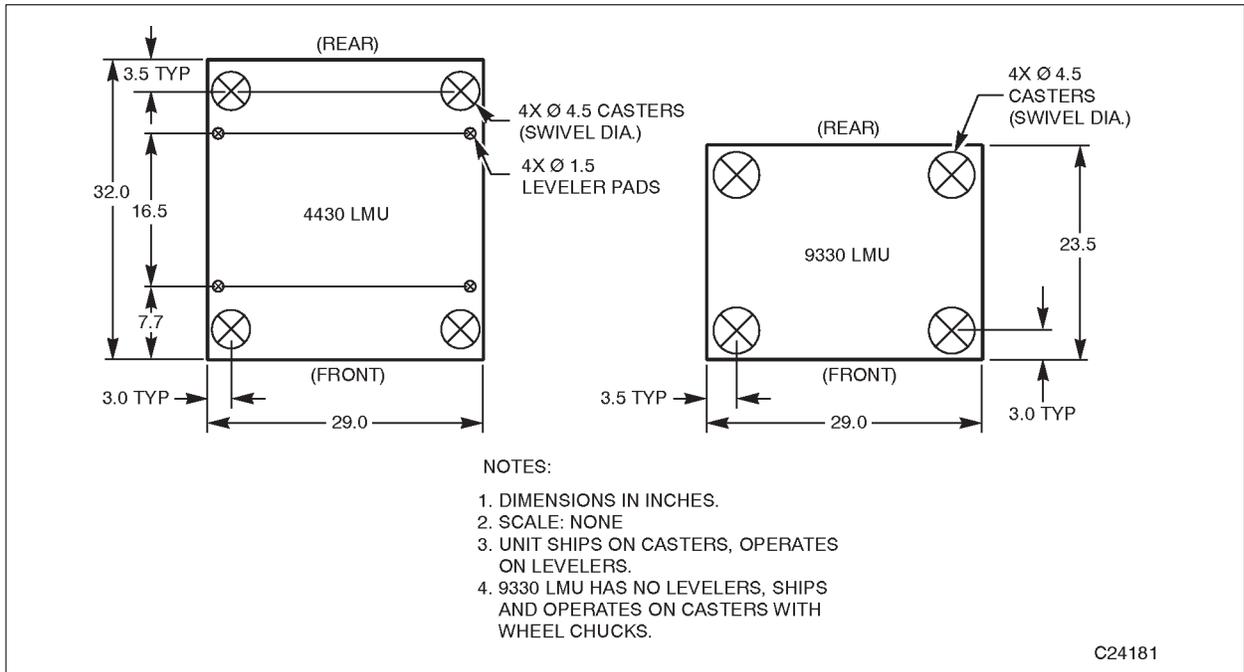


Figure 2-3 Leveling Pad Locations - 44xx/93xx (Part 4 of 4)

## ■ Small Libraries

The 9360 (also known as WolfCreek) is a small library and can be configured for three storage capacities of cartridge tapes: 500, 750, or 1000. Up to 16 LSMs can be interconnected using pass-thru-ports which are controlled from one LMU. The LMU and LCU for the 9360 is integrated into an electronic module (EM) attached to the left side of the LSM.

Table 2-7 through Table 2-9 lists the physical, electrical, and environmental specifications for the 9360 library:

Library Management Unit (9330)	Height Width Depth Service clearance front rear Weight	930 mm (36.6 in.) 737 mm (29.0 in.) 597 mm (23.5 in.) 813 mm (32.0 in.) 813 mm (32.0 in.) 97.5 kg (215 lbs)
Electronics Module (9312/9315)	Height Width Depth Service clearance front rear Weight with LMU without LMU	1.8 m (72 in.) 521 mm (20.5 in.) 864 mm (34 in.) 534 mm (21.0 in.) 534 mm (21.0 in.) 274 kg (523 lbs) 213 kg (469 lbs)
Library Storage Module (9360)	Height Width Depth Service clearance Weight base unit expansion unit with CAPs	1.8 m (72 in.) 1.5 m (60.5 in.) 1.5 m (60 in.) 762 mm (30 in.) 435 kg (957 lbs) 329 kg (724 lbs)

Input Voltage Range	170 - 265 VAC
Nominal Voltage	200 - 250 VAC
Frequency	47 - 63 Hz
Phases	Single
Input Current	20 A (3 wire)
Power Consumption	1.85 kVA (1.2 kW)
Power Configuration US/Canada 200 - 240 VAC Europe 200 - 240 VAC	UL/CSA power cable HAR power cable

Temperature	
Operating	16°C to 32°C (60°F to 90°F)
Storage	4.4°C to 32°C (40°F to 90°F)
Shipping	-40°C to 60°C (-40°F to 140°F)
Relative Humidity	
Operating	20% to 80%
Storage	10% to 90%
Shipping	5% to 95% noncondensing
Wet Bulb Maximum	
Operating	25.6°C (78°F)
Storage	26.7°C (80°F)
Shipping	26.7°C (80°F)
Heat Output Maximum	
Operating	1 033 kcal/hr (4,100 Btu/hr)
Altitude	
Operating	0 to 3.05 km (0 to 10,000 ft)
Storage	0 to 3.05 km (0 to 10,000 ft)
Shipping	0 to 15.24 km (0 to 50,000 ft)

## Cables

Cables *must* be ordered separately for *each* machine. Additionally, the *customer* must order the correct power cord/connector (refer to Table 2–10).

**Note:** A branch-circuit fuse or circuit-breaker protection for the receptacle providing AC power to the 9330 should not exceed 20 amperes. This limitation is required to provide adequate short-circuit and ground-fault protection to the AC power conductors.

<b>Table 2–10. Detachable Power Cord: 9330/9312/9315</b>			
<b>Use</b>	<b>STK Cable Length</b>	<b>STK Plug Type</b>	<b>Customer Installed Item<sup>1</sup></b>
North America	411063001 3.15 m (10 ft)	Russellstoll RS F35417 Cat No 3720	Russellstoll F4243B (inline connector), Cat No 3913 -or- F18665B (receptacle), Cat No 3743
North America	410573502 3.15 m (10 ft)	Type: IEC 309 HUBBELL® 320P6W -or- Russellstoll RS320P6W	HUBBELL 320C6W (inline connector) -or- HUBBELL 320R6W (receptacle) Russellstoll RS320C6W (inline connector) -or- Russellstoll RS320R6W (receptacle)
Export	410573402 (Harmonized) 3.15 m (10 ft)	Type: IEC 309 HUBBELL 320P6W -or- Russellstoll RS 320P6W	HUBBELL 320C6W (inline connector) -or- HUBBELL 320R6W (receptacle) Russellstoll RS320C6W (inline connector) -or- Russellstoll RS320R6W (receptacle)
Export	411063801 (Harmonized) 3.15 m (10 ft)	None <sup>2</sup>	Customer's option
<b>Notes:</b>			
<sup>1</sup> The customer cable connector or a fixed receptacle must be ordered separately.			
<sup>2</sup> Bare wire ends for customer installed connector.			

<b>Units Connected</b>	<b>Cable Type</b>	<b>Number of Cables</b>	<b>Maximum Length</b>
Terminal Control Unit to LMU <sup>1</sup>	RG-62A/U coaxial (93 $\Omega$ )	1 per station (Up to 16)	750 m (2460 ft)
LMU to LCU (LAN cables) <sup>2</sup>	RG-58A/U coaxial (50 $\Omega$ )	2 <sup>3</sup>	182.9 m (600 ft) <sup>4</sup>
UNIX-based workstation to LMU (ACSLs)	RS-423	1 per workstation	60.9 m (200 ft) <sup>5</sup>

**Notes:**

1 Customer supplied.

2 Total length of the LAN network is 182.9 m (600 ft). LAN cables must be ordered separately.

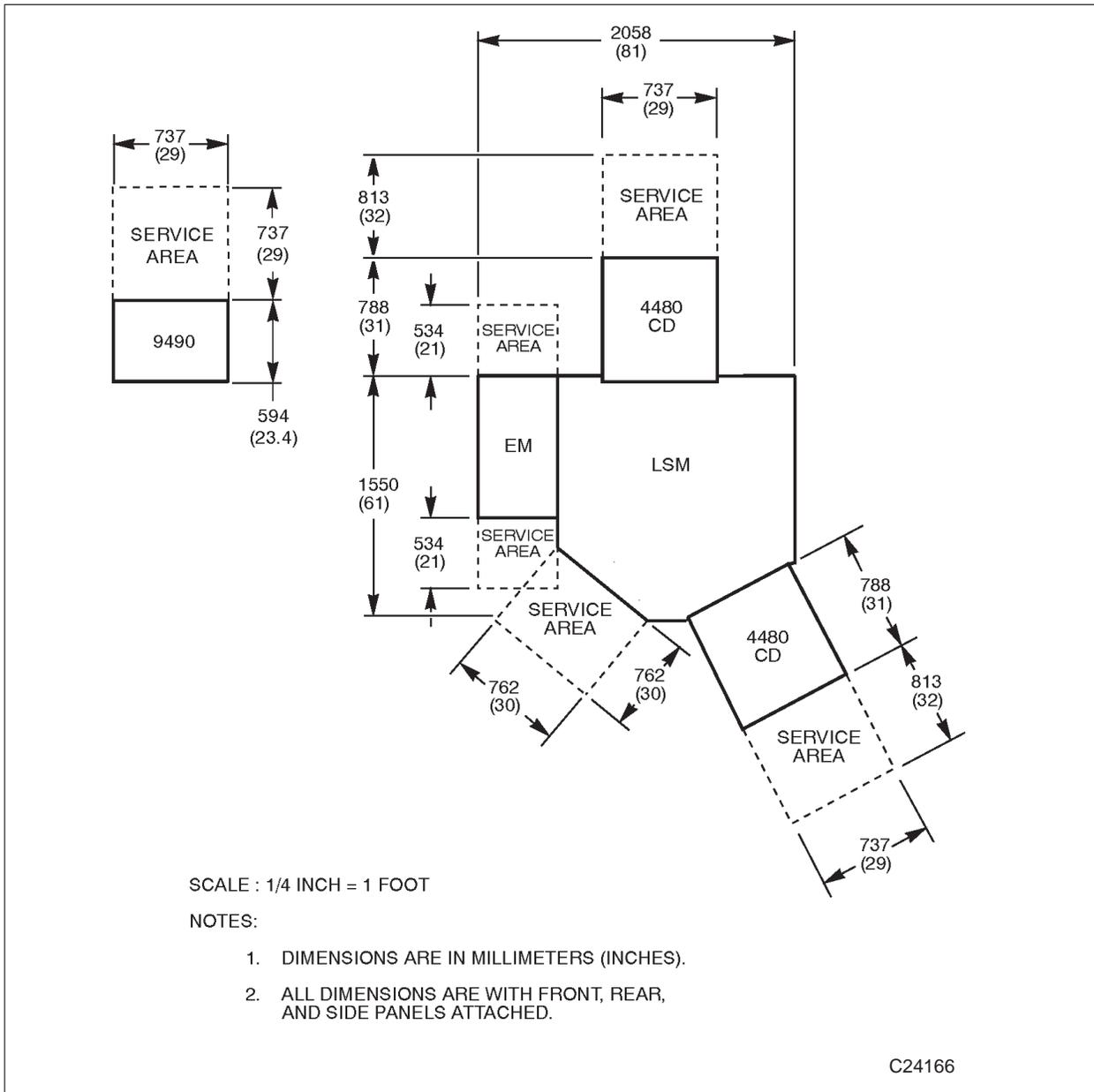
3 Two (redundant) networks.

4 Part of LAN: a tapped, bidirectional bus. LMU and LSMs are connected serially in any sequence. Minimum between gaps, 1.83 m (6 ft).

## Local Area Network Cables

Local area network (LAN) cables interconnect the library storage modules (LSMs) to the library management unit (LMU). Table 2-12 lists the lengths and part numbers for these cables:

<b>Length</b>		<b>Part Numbers</b>	<b>Length</b>		<b>Part Numbers</b>
<b>Meters</b>	<b>Feet</b>		<b>Meters</b>	<b>Feet</b>	
4.0	13	410612215	91.4	300	410612408
7.6	25	410612401	106.7	350	410612409
15.2	50	410612402	121.9	400	410612410
22.9	75	410612403	137.2	450	410612411
30.5	100	410612404	152.4	500	410612412
45.7	150	410612405	167.6	550	410612413
60.9	200	410612406	182.9	600	410612414
76.2	250	410612407			



**Figure 2-4. Floor-Space Requirements – 9312/9315/9360**

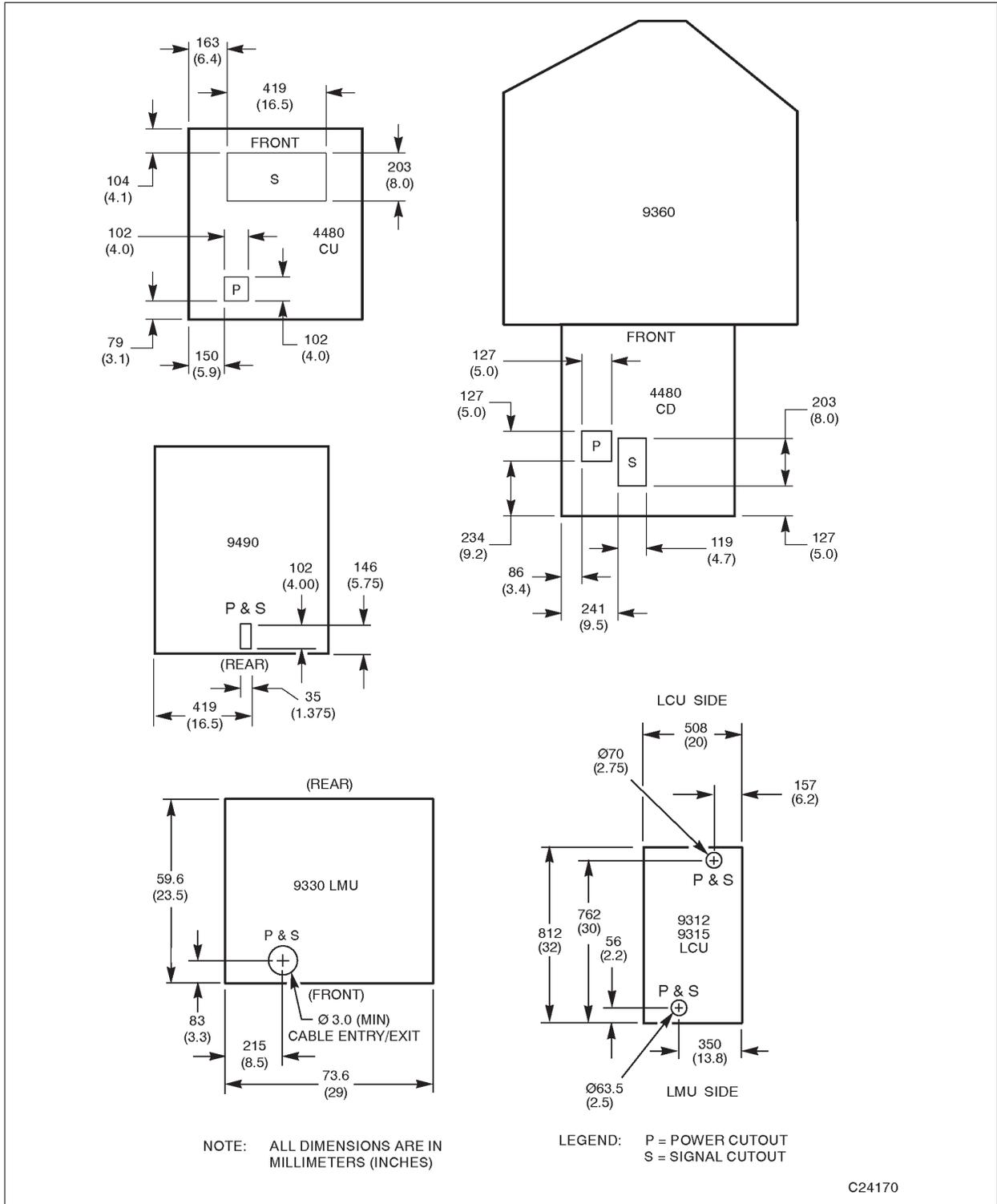
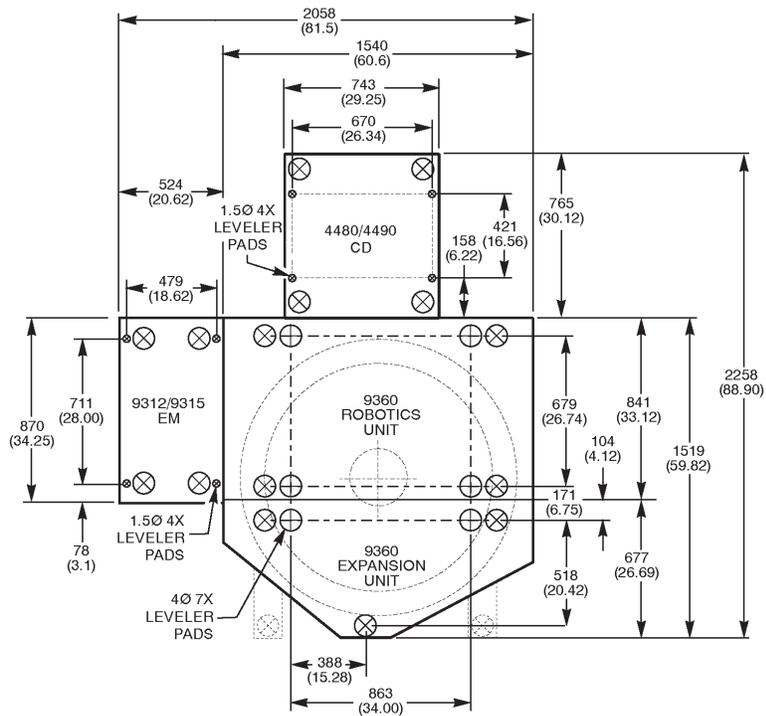


Figure 2-5. Small Library Floor Cutouts



NOTES:

1. DIMENSIONS ARE IN MILLIMETERS (INCHES).
2. ALL DIMENSIONS ARE WITH FRONT, REAR, AND SIDE PANELS ATTACHED.
3. UNIT SHIPS ON CASTERS, OPERATES ON LEVELERS

- ⊕ LEVELING PAD LOCATIONS
- ⊗ CASTER LOCATIONS

C24183

Figure 2-6. Leveling Pad Locations - 9312/9315/9360

## Configuration Restrictions

When attaching a 9360 to a 4410/9310 LSM, certain restrictions must be taken into consideration. Three instances are:

1. Connecting a 9360 to Wall Panel 2 on a 4410/9310

This configuration restricts access to the rear of the 4410/9310 LCU. Maintenance access to the optional tape drive (Drive 1) is likewise restricted.

Refer to Figure 2-7, Example 1.

2. Connecting a 9360 to Wall Panel 1 on a 4410/9310

This configuration is not permitted for two reasons:

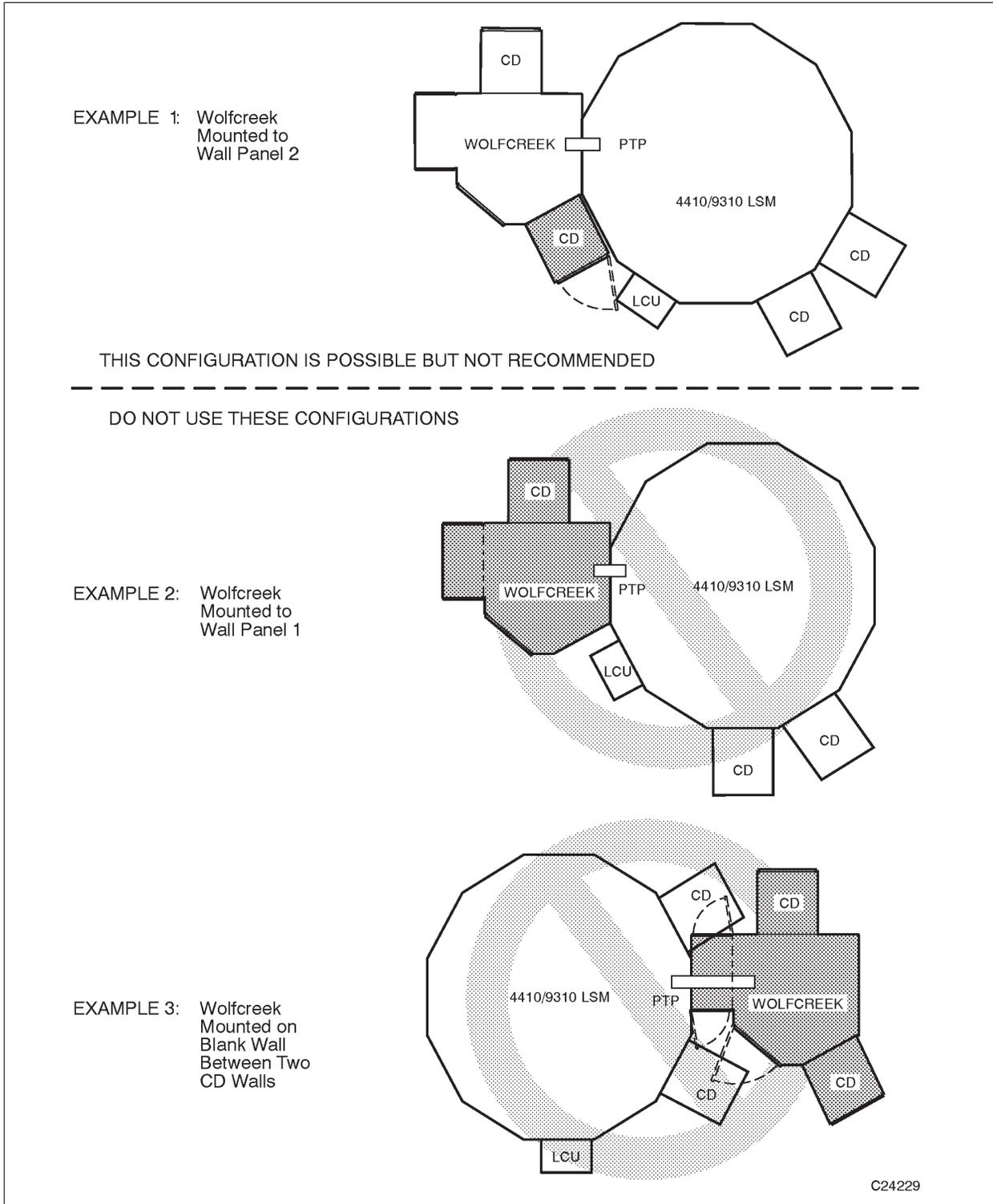
- It severely restricts access to the rear of the 4410/9310 LCU
- The optional tape drive (Drive 1) for the 9360 LSM cannot be installed.

Refer to Figure 2-7, Example 2.

3. Connecting a 9360 to a 4410/9310 panel that is adjacent to a drive panel

This configuration is not permitted because when attaching a 9360 to a 4410/9310 LSM, there must be a blank 4410/9310 external wall on both sides of the 9360 LSM. The blank walls are required to prevent severe access restrictions to the 9312 EM, the 9360 LSM door, and a cartridge drive attached to the 4410/9310 LSM

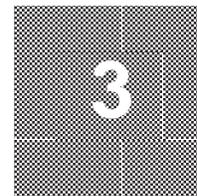
Refer to Figure 2-7, Example 3.



**Figure 2-7. 4410/9310 Attachment Restrictions**

# Cartridge Tape Subsystems

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This chapter provides planning information for StorageTek's cartridge tape subsystems for both stand-alone and library-attached configurations, including:

- Physical specifications
- Electrical specifications
- Cables types, lengths, and part numbers
- Structure kit part numbers
- Floor-space requirements
- Stand-alone configuration possibilities

Structure kits are only required when the cartridge subsystem is installed in a library configuration. Several structure kits are available because of the differences in the heights of library storage modules and position of cartridge subsystem switch panels.

The information in this chapter is presented, by product under the following headings:

- "4480/4780/4781/4490/4791 Cartridge Subsystems"
- "9490 Cartridge Subsystem" (also known as TimberLine)
- "SD-3 Cartridge Subsystem" (also known as RedWood)

Configuration templates for library configurations are in Appendix A.

**Note:** Use this guide with the appropriate cartridge subsystem – *Systems Assurance Guide* to complete the worksheets to order the equipment.

## ■ 4480/4780/4781/4490/4791 Cartridge Subsystems

StorageTek has five cartridge subsystems that support different recording formats and that attach to a variety of interfaces. Table 3-1 lists the five cartridge subsystems, recording format, maximum number of transports within the subsystem, and interface types for each.

The architecture of these cartridge subsystems is one or two stand-alone control units and cartridge drives that house the transports. There are four models of cartridge drives for these subsystems:

**4480/4780/4781** (18-track cartridge subsystems):

- M22, which contains two transports per cartridge drive
- M24, which contains four transports per cartridge drive

**4490/4791** (36-track cartridge subsystems):

- M32, which contains two transports per cartridge drive
- M34, which contains four transports per cartridge drive

**The interface adapters include:**

- Federal Information Processing Standard (FIPS) which uses bus and tag cables and transmits data up to 4.5 megabytes per second (MB/s)
- IBM's Enterprise Systems Connection (ESCON) which uses fiber optic cables and transmits data up to 4.5 MB/s
- Small computer system interface (SCSI-1) which can use either the single-ended or differential alternative for the SCSI bus

<b>Models</b>	<b>Recording Format</b>	<b>Transports (maximum)</b>	<b>Interface Types</b>
4480	18-track	16	FIPS & ESCON
4780	18-track	16	FIPS
4781	18-track	8	SCSI-1
4490	36-track	16	FIPS & ESCON
4791	36-track	8	SCSI-1

Areas to consider when installing these subsystems include:

- Ordering the appropriate type and length of interface cables
- Ordering the appropriate digital/analog, and interconnect cables
- Ordering the appropriate power cord
- Ordering the optional features

The following pages contain tables and figures that identify the subsystem's:

- Specifications
- Cables
- Features and kits

## Subsystem Specifications

Control Unit	Height	1.6 m (63.5 in.)
	Width	737 mm (29.0 in.)
	Depth	813 mm (32.0 in.)
	Service clearance	
	front	813 mm (32.0 in.)
	rear	813 mm (32.0 in.)
	Weight	159 kg (350 lb)
Cartridge Drive	Height	1.6 m (63.5 in.)
	Width	737 mm (29.0 in.)
	Depth	813 mm (32.0 in.)
	Depth (library)	749 mm (29.5 in.)
	Service clearance	
	front	NA
	rear	813 mm (32.0 in.)
	Weight	
	2 transports	295 kg (650 lbs)
4 transports	386 kg (850 lb)	

Volts AC	200 $\pm$ 10% <sup>2</sup>
	208 +10% -15%
	220 +10% -15%
	230 $\pm$ 10%
	240 +10% -15%
	380 +10% -15%
	400 +10%
	415 +10% -15%
Frequency	47 to 63 Hz
Phases	3 phase (Delta or Wye)
Current	24 A RMS (200 - 240 VAC)
	15 A RMS (380 - 415 VAC)
Power Consumption	3.8 kVA (3.5 kW)
Power Connectors	US/Canada:
	Russellstoll® 3760 (Male)
	Russellstoll 3934 (inline connector) 3754 (box receptacle)

Temperature Operating Storage Shipping	16°C to 32°C (60°F to 90°F) 4.4°C to 32°C (40°F to 90°F) -10°C to 48°C (-23°F to +120°F)
Temperature Change Operating Storage Shipping	≤ 5°C/hr (≤ 9°F/hr) ≤ 15°C/hr (≤ 27°F/hr) ≤ 15°C/hr (≤ 27°F/hr)
Humidity Operating Storage Shipping	20% to 80% 10% to 90% 5% to 100%
Altitude Operating Storage Shipping	0 to 3.05 km (0 to 10,000 ft) 0 to 3.05 km (0 to 10,000 ft) 0 to 15.24 km (0 to 50,000 ft)
Heat Output CU CD (M22/M32) CD (M24/M34)	602 kcal/hr (2390 Btu/hr) 645 kcal/hr (2560 Btu/hr) 1205 kcal/hr (4780 Btu/hr)

## Cables

The following tables list the cables and part numbers for the cartridge subsystems.

The following table identifies the possible combinations of ESCON and FIPS channels supported by the 4480/4490 Version 2 Control Units.

Number of ESCON Channels	Number of FIPS Channels				
	0	2	4	6	8
4	●				
3	●	●			
2	●	●	●		
1	●	●	●	●	
0		●	●	●	●

**Note:** Refer to Table 3-14 for a list of ESCON cables and part numbers.

Table 3–5 lists the FIPS and subsystem cables for the 4480, 4780, and 4490 Cartridge Subsystems:

Description	Length		Part Number	
	Meters	Feet	Standard Cable (CL2)	Plenum Cable (CL2P)
Bus & Tag (maximum)	122	400	305436xxx	
Dual CU Cable Set	6	20	410430201	411208501
Digital/Analog Set	3	10	411211101	411210101
Digital/Analog Set	4.5	15	411211201	411210201
Digital/Analog Set	6	20	411211301	411210301
Digital/Analog Set	10.5	35	411211401	411210401
Digital/Analog Set	20	65	411211501	411210501
M22 Interconnect	1.2	4	404628001	
CD Power Cable	4.5	15	410848615	
CD Power Cable	7.5	25	410848625	
CD Power Cable	12	40	410848640	
CD Power Cable	21	70	410848670	
M22/M32 "Y" Power Cable	13	45	410530001	
PCI (EPO)			50031xxx	

Note: xxx = cable length in feet.  
 Note: Cables run outside the computer room should be Type CL2P.

Table 3–6 lists the cables for the 4781 and 4791 Cartridge Subsystems:

Length		CL2	CL2P
Meters	Feet		
3	10	411028201	308756401
5.5	18	308756301	308762701
13.7	45	411050101	308756501
23	75	411051101	308756601

Note: These cables do not support TimberLine or RedWood.

## Optional Features

Table 3–7 lists the optional features for the cartridge subsystems:

<b>Feature #</b>	<b>Description</b>
1511	1st additional FIPS channel
1512	2nd additional FIPS channel (req. 1511)
1513	3rd additional FIPS channel (req. 1511 & 1512)
1514	4th additional FIPS channel (req. 1511, 1512, 1513)
1515	5th additional FIPS channel (req. 1511, 1512, 1513, 1514)
1516	6th additional FIPS channel (req. 1511, 1512, 1513, 1514, 1515)
1517	7th additional FIPS channel (req. 1511, 1512, 1513, 1514, 1515, 1516)
2511	Cartridge Scratch Loader
3044	IBM 3044 Fiber Optic Channel extender
3211	Control Unit coupler
3305	Improved Cartridge Recording Capability (ICRC)
3311	1st ESCON channel
3312	2nd ESCON channel
3313	3rd ESCON channel
3314	4th ESCON channel
4411	Detached operation
4412	4410/9310 library storage module attach
4413	Non-library attach
4414	9360 library storage module attach
4442	Velocity option
6140	4.5 MB/s channel transfer rate

## Structure Kits

<b>Kit PN</b>	<b>Description</b>
308670201	9360 attachment kit, 2 transports
308670301	9360 attachment kit, 4 transports
411077301	4410/9310 attachment kit, 2 transports
411077401	4410/9310 attachment kit, 4 transports

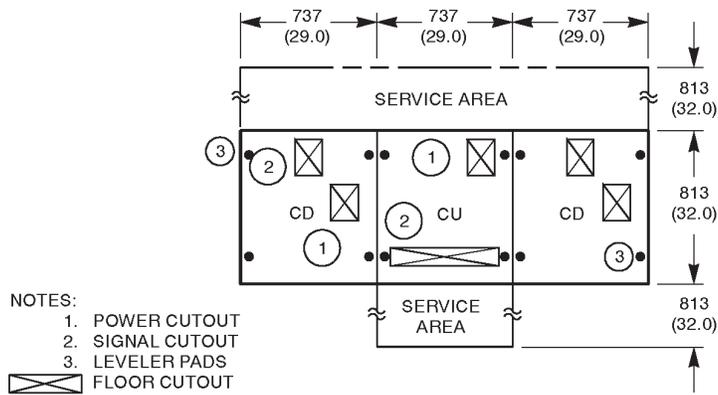


EXHIBIT A. CARTRIDGE SUBSYSTEM CONFIGURATION (ALTERNATE)

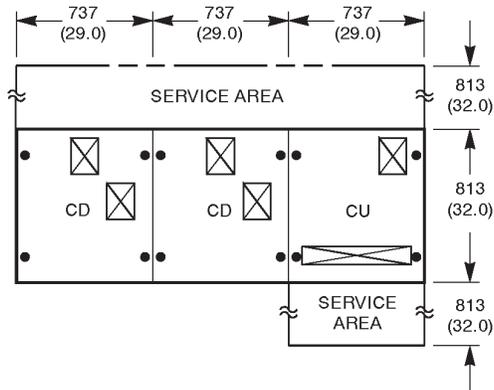


EXHIBIT B. CARTRIDGE SUBSYSTEM CONFIGURATION (ALTERNATE)

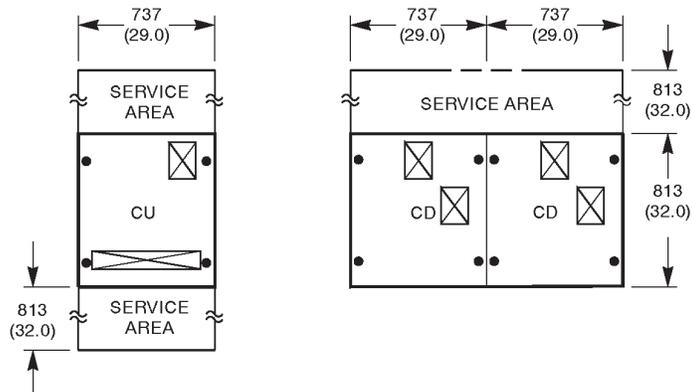
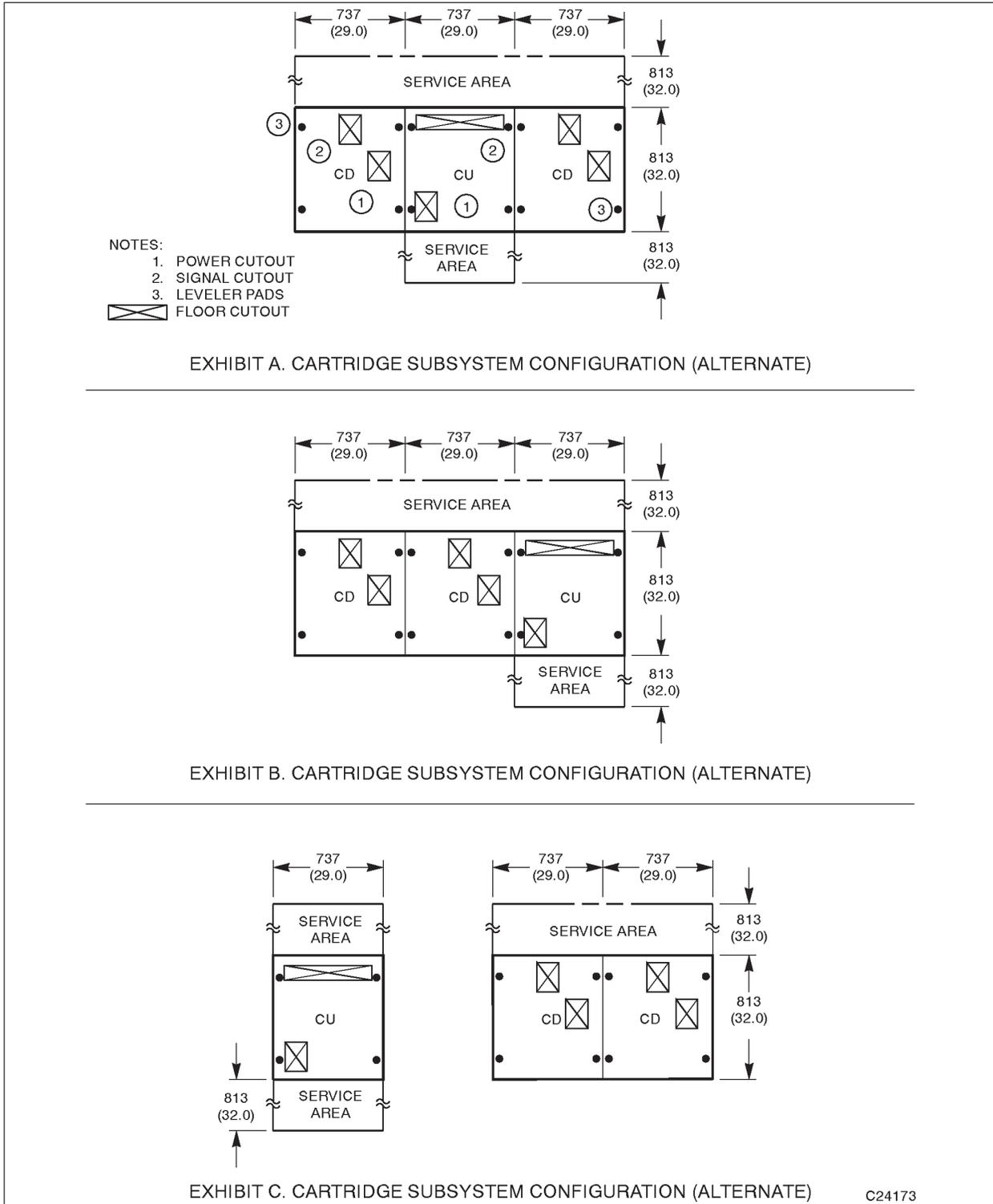


EXHIBIT C. CARTRIDGE SUBSYSTEM CONFIGURATION (ALTERNATE)

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Figure 3-1. Version 1 Floor-space Requirements



**Figure 3-2. Version 2 Floor-space Requirements**

## ■ 9490 Cartridge Subsystem

StorageTek's 9490 Cartridge Subsystem (also known as TimberLine) is a high-performance, 36-track cartridge subsystem that uses both the Enhanced Capacity cartridge tape (E-Cart,) and standard length cartridge tapes.

The recording formats for the 9490 Cartridge Subsystem are compatible with the American National Standards Institute (ANSI) and European Computer Manufacturers Association (ECMA) specifications.

The 9490 Cartridge Subsystem consists of 1–12 cartridge drives (CDs) with a maximum of 24 controller transport units (CTUs) within the subsystem.

Controller transport units are independent subassemblies within the cartridge subsystem. Each CTU consists of a separate controller and transport and provides a 1-by-1 architecture. Because of this architecture:

- Operation of one CTU does not effect the operations of any other CTUs in the cartridge subsystem.
- Maintenance on a CTU does not disrupt operations of any other CTUs in the cartridge drive or cartridge subsystem.

Cartridge drives are available in two models:

- M32, which contains *two* CTUs in a single frame
- M34, which contains *four* CTUs in a single frame
- M44, which contains *four* CTUs and *four* cartridge scratch loaders

All cartridge subsystems must have a subsystem support unit (SSU) to store and download functional and diagnostic microcode to the CTUs as required. The SSU communicates with all CTUs in the subsystem over a thin-wire, Ethernet, local area network (LAN).

The 9490 Cartridge Subsystem supports two interface adapters:

- The Enterprise System Connection® (ESCON®) fiber optic interface, capable of transferring data at 18 megabytes per second (MB/s)
- A small computer system interface (SCSI-2), capable of transferring data over a wide SCSI bus at 20 MB/s

Areas to consider when installing a 9490 Cartridge Subsystem include:

- Determining the type of interface adapter (ESCON or SCSI)
- Ordering the appropriate interface cables
- Ordering the appropriate power cord
- Ordering the required SSU and LAN cables

The following pages contain tables and figures that identify the subsystem's:

- Specifications
- Cables
- Features
- Accessories
- Kits

## Specifications

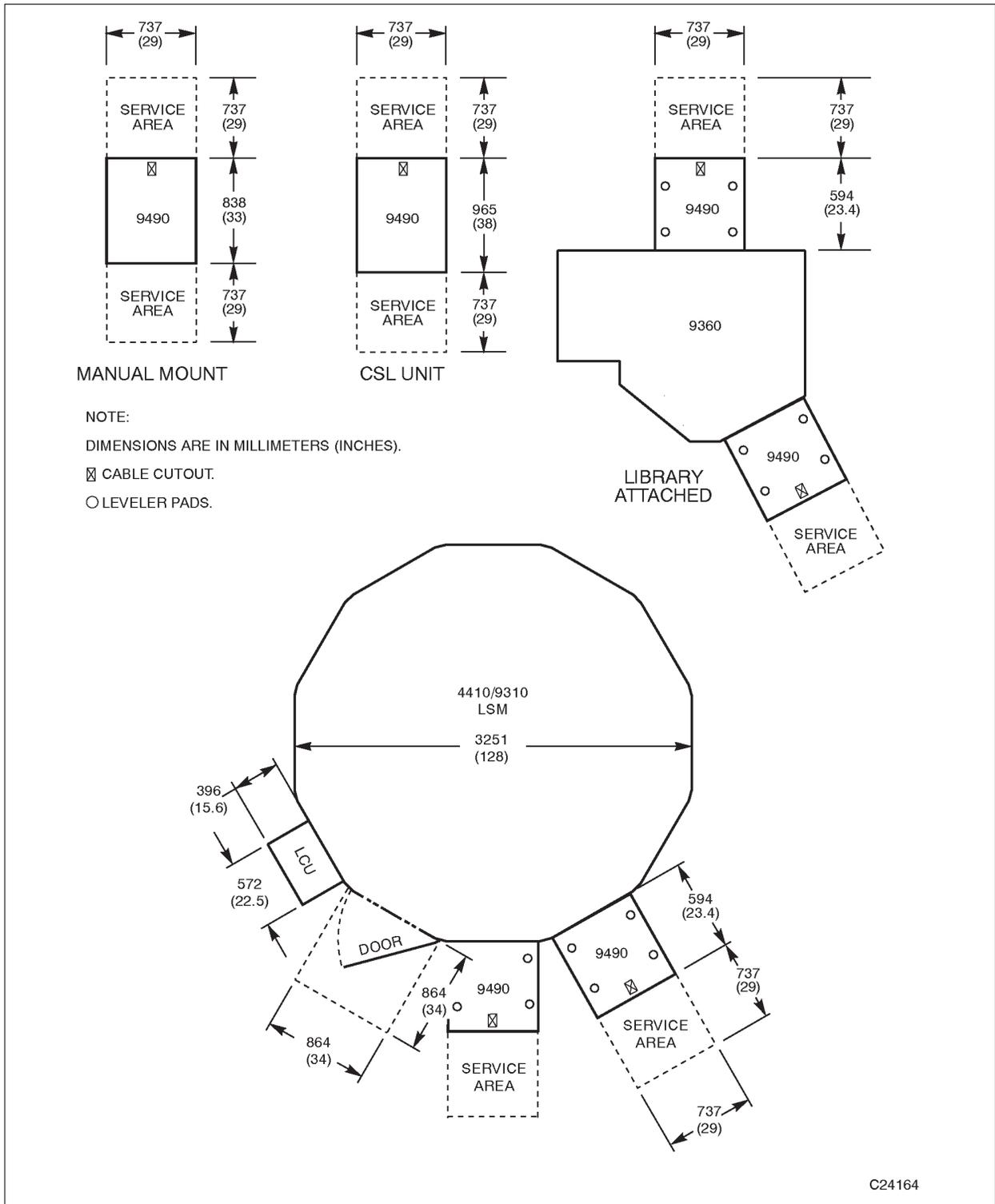
<b>Table 3-9. Cartridge Drive Specifications</b>	
<b>Item</b>	<b>Description</b>
<b><i>Manual Standalone</i></b> Height <sup>1</sup> Width Depth Weight (4 CTUs) Weight (2 CTUs)	1.8 m (72.0 in.) 762 mm (30.0 in.) 838 mm (33.0 in.) 553 kg (1,219 lbs) 476 kg (1,050 lbs)
<b><i>CSL Standalone</i></b> Height <sup>1</sup> Width Depth Weight (2 CTUs)	1.8 m (72.0 in.) 762 mm (30.0 in.) 965 mm (38.0 in.) 517 kg (1,140 lbs)
<b><i>Library Attached M32 or M34</i></b> Height <sup>1</sup> Width Depth (extension from library) Weight (4 CTUs) Weight (2 CTUs)	1.8 m (72.0 in.) 762 mm (30.0 in.) 610 mm (24.0 in.) 472 kg (1,040 lbs) 395 kg (872 lbs)
<b><i>Model M44 Standalone</i></b> Height <sup>1</sup> Width Depth without CSLs Depth with CSLs Weight (4 CTUs)	1.8 m (72.0 in.) 1010 mm (40.0 in.) 757 mm (29.8 in.) 922 mm (36.3 in.) 677 kg (1,494 lbs)
<b><i>Service Clearance</i></b> Height <sup>1</sup> Width	None required 74 cm (29 in.)
<b><u>CHANNEL ATTACHMENTS</u></b>	1 or 2 ESCON 1 SCSI-2
<b>Note<sup>1</sup>:</b> When the overhead display is installed, the overall height varies from 2.2 m (85.5 in.) to 2.4 m (94.75 in.).	

<b><u>TRANSPORT</u></b>	
Type	Automatic self-threading reel-to-reel
Writing Speed	4.0 m/s (157 in/s)
Reading Speed	4.0 m/s (157 in/s)
Load plus Unload Time	6.3–9.6 s
Rewind/Search Time (maximum)	41–64 s (1100 ft cartridge) at 10 m/s 20.5 s (550 ft cartridge) at 8 m/s
<b><u>TRANSFER RATES</u></b>	
ESCON Channels to CTU	Up to 18 MB/s
SCSI Channels to CTU	Up to 20 MB/s fast and wide
Data buffer to tape	6 MB/s (nominal) to 12.5 MB/s (maximum)
Data Buffer Size	4 MB per CTU

<b>Item</b>	<b>Description</b>				
<b><i>Requirements:</i></b>	200 to 240 VAC Nominal Single Phse, 3-wire 47 to 63 Hz 10 amps (RMS) maximum				
<b><i>Consumption:</i></b> 4 CTUs <sup>2</sup> 2 CTUs <sup>2</sup> 2 CTUs + 2 CSLs <sup>2</sup> 4 CTUs + 4 CSLs <sup>2</sup>	1.46 kVA (1.40 kW) 0.88 kVA (0.84 kW) 0.99 kVA (0.94 kW) 1.60 kVA (1.50 kW)				
<b><i>Delta Connection:</i></b>					
Line Voltage	200	208	220	230	240
Tolerance	± 10%	+ 10% – 15%	+ 10% – 15%	± 10%	+ 10% – 15%
<b><i>Connectors</i></b> U.S. and Canada	Russellstoll 3720 IEC 309 Type Pigtail (no plug)				
<b>Note<sup>2</sup>:</b> SSU adds 0.07 kVA (0.06 kW)					

<b>Table 3-12. Environmental Specifications</b>	
<b>Item</b>	<b>Description</b>
<p><b>Temperature:</b>            Operating            Storage            Shipping</p> <p><b>Relative Humidity:</b>            Operating            Storage            Shipping</p> <p><b>Wet Bulb Maximum:</b>            Operating            Storage            Shipping</p> <p><b>Altitude:</b>            Operating            Storage            Shipping</p>	<p>16° to 32° C (60° to 90° F)            4.4° to 32° C (40° to 90° F)            -10° to 48° C (-23° to 120° F)</p> <p>20% to 80%            10% to 90%            5% to 100%</p> <p>25.6° C (78° F)            26.7° C (80° F)            26.7° C (80° F)</p> <p>0 to 3 500 m (0 to 10,000 ft)            0 to 3 500 m (0 to 10,000 ft)            0 to 15 240 m (0 to 50,000 ft)</p>
<p><b><u>OPERATING HEAT OUTPUT</u></b>            4 CTUs<sup>3</sup>            2 CTUs<sup>3</sup>            2 CTUs + 2 CSLs<sup>3</sup>            4 CTUs + 4 CSLs<sup>3</sup></p>	<p>1,210 kcal/hr (4,800 Btu/hr)            730 kcal/hr (2,900 Btu/hr)            800 kcal/hr (3,200 Btu/hr)            1,210 kcal/hr (4,800 Btu/hr)</p>
<p><b>Note<sup>3</sup>:</b> The SSU adds 51 kCAL/hr (200 Btu/hr)</p>	

<b>Table 3-13. Cartridge Tape Specifications</b>	
<b>Item</b>	<b>Description</b>
<p><b><u>RECORDING MEDIA</u></b></p> <p>Number of Tracks            Density</p> <p><b>Standard Cartridge</b>            Usable Length            Width            Thickness            Circumference</p> <p><b>Enhanced Cartridge (E-Cart)</b>            Usable Length            Width            Thickness            Circumference</p>	<p>36 (18 in Wrap 1 / 18 in Wrap 2)            1491 cp/mm (37,871 cpi)</p> <p>165–245 m (541–807 ft)            12.7 mm (0.5 in.)            25.9–33.7 μm (1020–1330 μin.)            280–307 mm (11–12 in.)</p> <p>Not less than 332 m (1089 ft)            12.573 mm (0.495 in.)            16.1–18.0 μm (635–710 μin.)            310–314 mm (12.2–12.4 in.)</p>



**Figure 3-3. 9490 Cartridge Subsystem Floor-space Requirements**

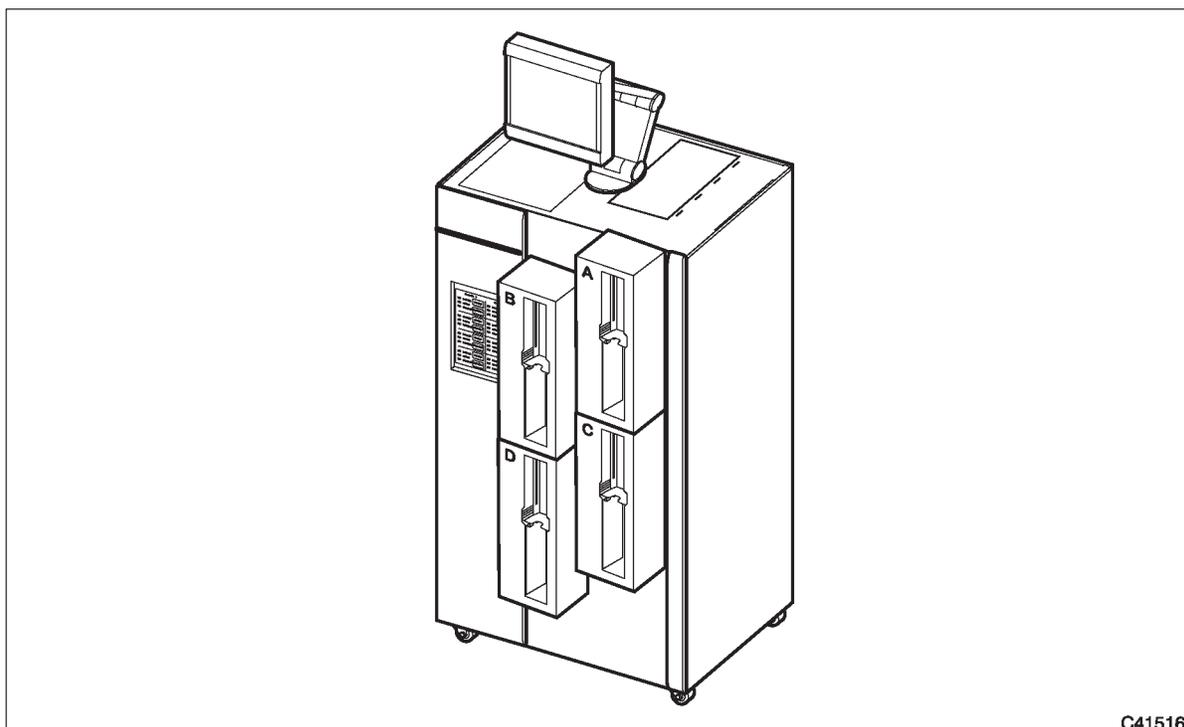
## Model M44

The M44, shown in Figure 3-4, is a stand-alone model featuring four CTUs and four Cartridge Scratch Loaders.

**Note:** This model cannot be configured for library attach.

Each CSL has three modes of operation:

- Auto**            The CSL automatically loads and unloads cartridge tapes when the START switch is pressed.
- System**        The operating system controls the loading and unloading of the cartridge tapes.
- Manual**        The operator controls the CSL by pressing the START switch *each time* a cartridge tape is required.



**Figure 3-4. M44 Front View showing CSL Locations**

## ■ SD-3 Cartridge Subsystem

StorageTek's SD-3 Cartridge Subsystem (also known as RedWood) is a high-performance, helical-scan cartridge subsystem that uses *unique* half-inch cartridge tapes that meets the *American National Standard Helical-Scan Digital Computer Tape Cartridge 12.65 mm (0.498 in.) for Information Interchange* specifications.

The SD-3 Cartridge Subsystem consists of 1–12 cartridge drives (CDs) with a maximum of 24 controller transport units (CTUs) within the subsystem.

Controller transport units are independent subassemblies within the cartridge subsystem. Each CTU consists of a separate controller and transport and provides a 1-by-1 architecture. Because of this architecture:

- Operation of one CTU does not effect the operations of any other CTUs in the cartridge subsystem.
- Maintenance on a CTU does not disrupt operations of any other CTUs in the cartridge drive or cartridge subsystem.

Cartridge drives are available in four models:

- H31, which contains *one* CTUs in a single frame
- H32, which contains *two* CTUs in a single frame
- H32, which contains *three* CTUs in a single frame
- H34, which contains *four* CTUs in a single frame

All cartridge subsystems must have a subsystem support unit (SSU) to store and download functional and diagnostic microcode to the CTUs as required. The SSU communicates with all CTUs in the subsystem over a thin-wire, Ethernet, local area network (LAN).

The SD-3 Cartridge Subsystem supports two interface adapters:

- The Enterprise System Connection® (ESCON®) fiber optic interface, capable of transferring data at 18 megabytes per second (MB/s)
- A small computer system interface (SCSI-2), capable of transferring data over a wide SCSI bus at 20 MB/s

Areas to consider when installing a SD-3 Cartridge Subsystem include:

- Determining the type of interface adapter (ESCON or SCSI)
- Ordering the appropriate interface cables
- Ordering the appropriate power cord
- Ordering the required SSU and LAN cables

The following pages contain tables and figures that identify the subsystem's:

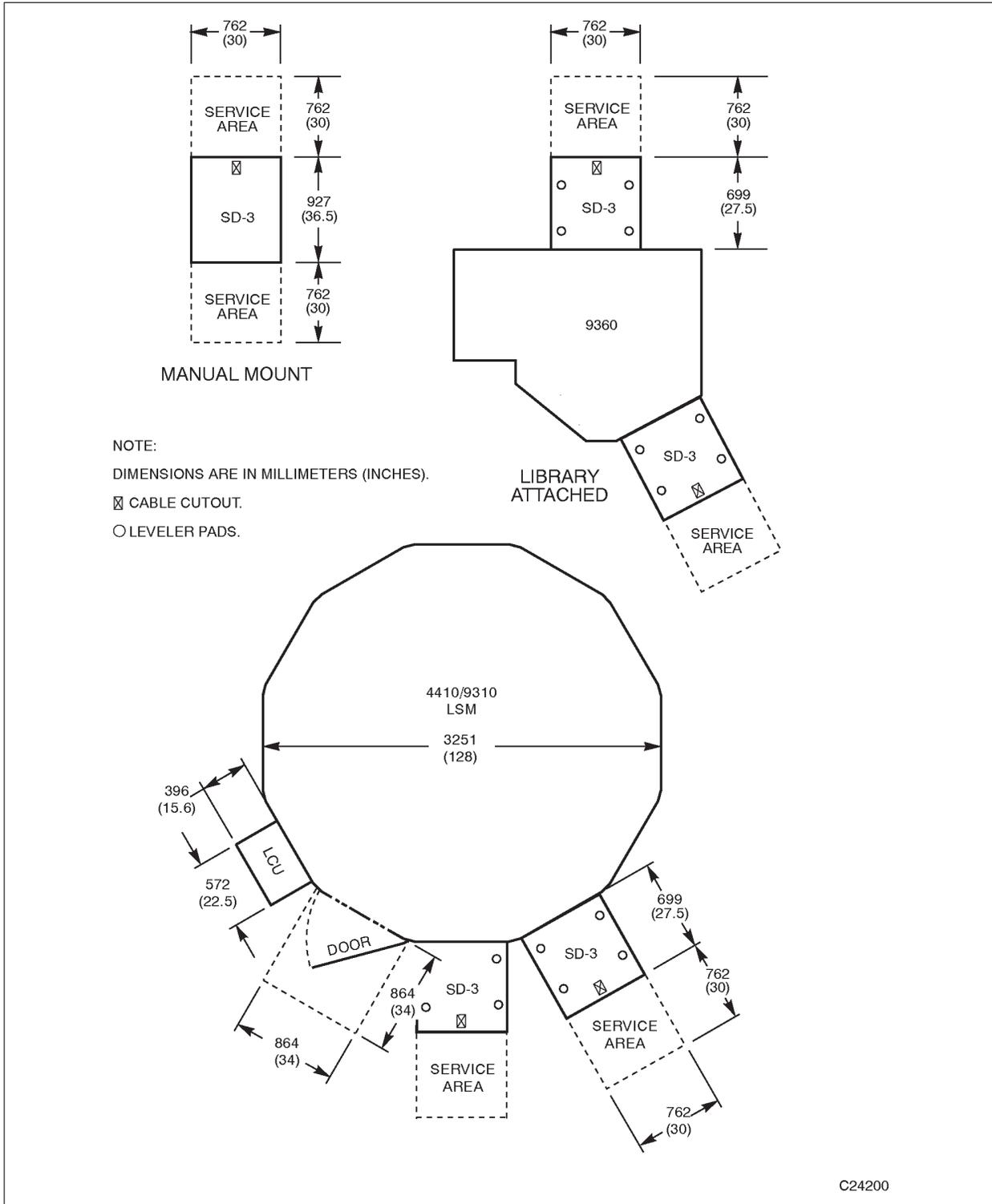
- Specifications
- Cables
- Features
- Accessories
- Kits

## Specifications

Library attached	
Height <sup>1</sup>	1.83 m (72.0 in.)
Width	762 mm (30.0 in.)
Depth	699 mm (27.5 in.)
Service clearance	762 mm (30.0 in.)
Weight	
Model H31	401 kg ( 883 lbs)
Model H32	451 kg ( 992 lbs)
Model H33	500 kg (1102 lbs)
Model H34	550 kg (1211 lbs)
Manual mount	
Height <sup>1</sup>	1.83 m (72.0 in.)
Width	762 mm (30.0 in.)
Depth	927 mm (36.5 in.)
Service clearance	762 mm (30.0 in.)
Weight	
Model H31	465 kg (1023 lbs)
Model H32	514 kg (1132 lbs)
Model H33	564 kg (1242 lbs)
Model H34	614 kg (1351 lbs)
Cartridge scratch loader (CSL)	
Height <sup>1</sup>	1.83 m (72.0 in.)
Width	762 mm (30.0 in.)
Depth	1.05 m (41.5 in.)
Service clearance	762 mm (30.0 in.)
Weight	
Model H31	489 kg (1078 lbs)
Model H32	552 kg (1217 lbs)
<b>Note:</b>	
<sup>1</sup> When overhead display is installed, the overall height varies from 2.2 m (85.5 in.) to 2.4 m (94.8 in.).	

<b>Table 3-15. Electrical Specifications: SD-3</b>	
Volts AC	170–264 (200 - 240, nominal)
Frequency	47–63 Hz (50/60 Hz, nominal)
Phases	Single
Current	16 A RMS (max.) 80 A pk < 20 msec (in-rush)
Power Consumption	
SSU	48 VA, 42 Watts
Fans	235 VA, 199 Watts
CTU	569 VA, 553 Watts
SD-3 with 1 CTU + 1 SSU	852 VA, 794 Watts
SD-3 with 2 CTUs + 1 SSU	1421 VA, 1347 Watts
SD-3 with 3 CTUs + 1 SSU	1990 VA, 1900 Watts
SD-3 with 4 CTUs + 1 SSU	2559 VA, 2453 Watts
Power Connectors <sup>1</sup>	
US/Canada	
HUBBELL 320P6W (male)	HUBBELL 320C6W (female) or HUBBELL 320R6W (female)
Russellstoll 3720 (male)	Russellstoll 3913 (female) or Russellstoll 3743 (female)
Export	
HUBBELL 320P6W (male)	HUBBELL 320C6W (female) or HUBBELL 320R6W (female)

<b>Table 3-16. Environmental Specifications: SD-3</b>	
Temperature	
Operating	15°C to 27°C (59°F to 81°F)
Storage	10°C to 40°C (50°F to 104°F)
Shipping	-40°C to 60°C (-40°F to 140°F)
Relative Humidity	
Operating	30% to 60%
Storage	10% to 95%
Shipping	10% to 95%
Wet Bulb Maximum	
Operating	25.6°C (78°F)
Storage	26.7°C (80°F)
Shipping	26.7°C (80°F)
Altitude	
Operating	0 to 3.05 km (0 to 10,000 ft)
Storage	0 to 3.05 km (0 to 10,000 ft)
Shipping	0 to 15.24 km (0 to 50,000 ft)
Operating Heat Output	
CTU	647 kcal/hr (2567 Btu/hr)
SSU	36 kcal/hr (143 Btu/hr)
H34 (4 CTUs + SSU)	8373 kcal/hr (2110 Btu/hr)



**Figure 3-5. SD-3 Cartridge Subsystem Floor-space Requirements**

## 9490 and SD-3 Caster Locations

The following figures show the dimensions and caster locations for the 9490 and SD-3 Cartridge Subsystems:

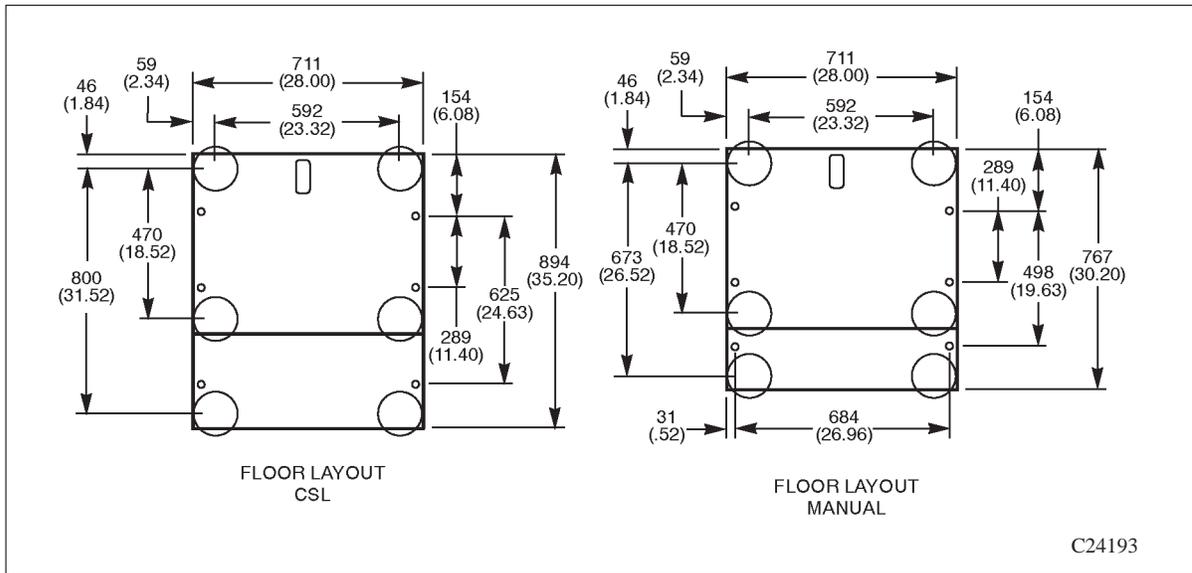


Figure 3-6. 9490 Cartridge Subsystem Caster Locations

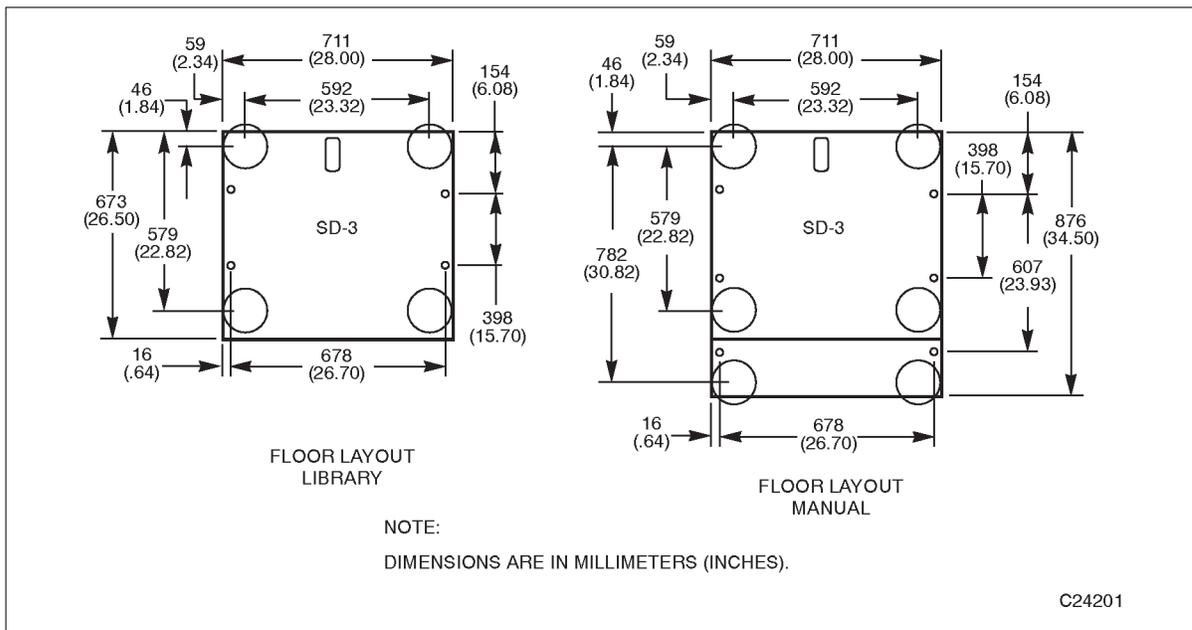
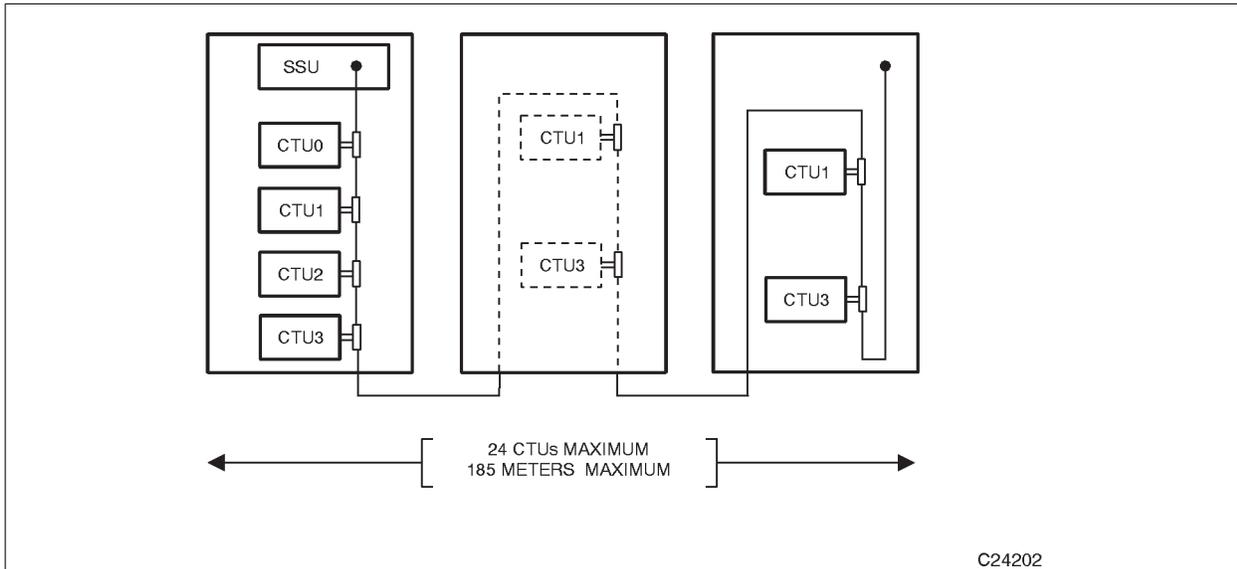


Figure 3-7. SD-3 Cartridge Subsystem Caster Locations

## LAN Cables

The subsystem support unit uses local area network (LAN) cables to communicate with the controller transport units in the 9490 and SD-3 Cartridge Subsystems. The maximum cable length in the subsystem cannot exceed 24 CTUs in 185 meters (610 feet).



**Figure 3-8. Cartridge Subsystem Local Area Network**

**Table 3-17. Cartridge Subsystem LAN Cables**

Part Number	Length
308367101	3 m (10 ft)
308367201	4.6 m (15 ft)
308367301	6.1 m (20 ft)
308367401	7.6 m (25 ft)
308367501	9.1 m (30 ft)
308367601	10.7 m (35 ft)
308367701	12.2 m (40 ft)
310772001	22.9 m (75 ft)
310772101	30.5 m (100 ft)
310772201	45.7 m (150 ft)

**Note:**

Maximum length of LAN is 185 m (610 ft).  
Subtract 4.3 m (14 ft) for each CD.

## ESCON Cables

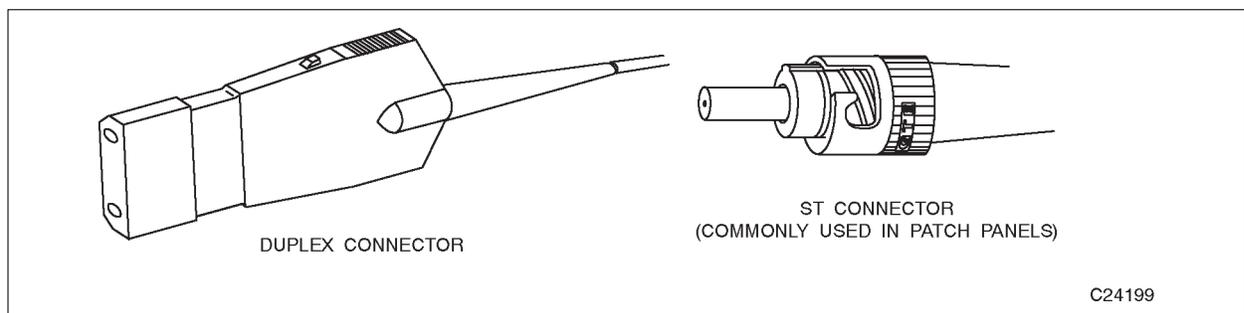
Table 3-18 lists the ESCON cables to connect the 9490 and SD-3 Cartridge Subsystems to ESCON channels:

Length		Duplex to Duplex		ST to Duplex	
Meters	Feet	Riser <sup>1</sup>	Plenum <sup>2</sup>	Riser <sup>1</sup>	Plenum <sup>2</sup>
2	6.5	10800056	10800043		
3	10	10800057	10800044	10800070	10800081
4	13	10800058	10800045		
7	22	10800059	10800046	10800071	10800082
13	42	10800060	10800047	10800072	10800083
22	72	10800061	10800048	10800073	10800084
31	100	10800062	10800049	10800074	10800085
46	150	10800063	10800050	10800075	10800086
61	200	10800064	10800051	10800076	10800087
77	250	10800065	10800052	10800077	10800088
92	300	10800066	10800053	10800078	10800089
107	350	10800067	10800054	10800079	10800090
122	400	10800068	10800055	10800080	10800091

**Notes**

<sup>1</sup> Riser cables can be used in computer rooms. Riser cable materials are not classified according to flammability or toxic gas emissions.

<sup>2</sup> Plenum cables are designed for installation in air ducts. Plenum materials are manufactured to meet UL standards for flammability (produce very little smoke).



**Figure 3-9. ESCON Jumper Cable Connectors**

## SCSI Cables

The 9490 and SD-3 Cartridge Subsystems connect to a SCSI bus using a 2.5 m (8 ft) long SCSI-3 P-cable, part number 310723001.

**Note:** The maximum distance from cartridge subsystem to the host is 25 m (82 ft). When calculating the maximum distance from the host, you must include the 2.5 m (8 ft) of P-cable that comes with the subsystem.

The last device on *both ends* of a SCSI bus requires a SCSI terminator. StorageTek's part number is: 10148003.

The 9490 and SD-3 Cartridge Subsystems can connect to a *narrow* SCSI bus using an adapter, part number 10148010.

Table 3-19 lists the daisy-chain cables to interconnect CTUs within the same cartridge drive:

Type	Length		Part Number
	Meters	Feet	
Single (M34)	0.66	2	310723301
Double (M32)	0.93	3	310723401

Table 3-20 lists the external SCSI bus cables supporting fast and wide, 16-bit data transfers are:

Length		Cable Type	
Meters	Feet	CL2 <sup>1</sup>	CL2P <sup>2</sup>
3	10	10083309	10083313
6	20	10083310	10083314
15	49	10083311	10083315
20	65	10083312	10083316

**Note:**

- Standard cable materials.
- Plenum-rated cable materials.

## Connecting to IBM Systems

StorageTek's 9490 and SD-3 Cartridge Subsystems attach to IBM's AS/400 and RS-6000 using input/output processors (IOPs) for the SCSI connections.

- The AS/400 uses a 6501 IOP

Table 3-21 list the unique cables to connect to an AS/400.

- The RS-6000 uses a 2416 IOP

Table 3-22 list the unique cables to connect to an RS-6000.

**Note:** When connecting the CTUs to an IBM system, a 2.5 m (8ft.) long SCSI-3 P-cable, part number 310723001, *must* be used to meet electromagnetic regulatory agency requirements for connecting SCSI interface cards to external cables.

Length		Cable Type	
Meters	Feet	CL2 <sup>1</sup>	CL2P <sup>2</sup>
4	13	100821102	100821111
6	20	100821103	100821112
15	49	100821106	100821115
21	69	100821108	100821118
1. Standard cable materials			
2. Plenum-rated cable materials.			

Length		Cable Type	
Meters	Feet	CL2 <sup>1</sup>	CL2P <sup>2</sup>
3	10	10083385	10083394
6	20	10083386	10083395
15	49	10083389	10083398
21	69	10083391	10083400
1. Standard cable materials			
2. Plenum-rated cable materials.			

## 9490 and SD-3 Configuration Features

The following pages list the features, accessories and structure kits for the 9490 and SD-3 Cartridge Subsystems:

<b>Feature #</b>	<b>Description</b>
2511	Cartridge Scratch Loader (M32, or H31 and H32 only)
4412	4410/9310 library storage module attach
4414	9360 library storage module attach
4415	Non-library operation
9414	Subsystem support unit (SSU)
9415	Overhead display (optional for libraries)

## 9490 and SD-3 Interface Adapters

All 9490 and SD-3 Cartridge Subsystems are shipped *without* an interface adapter. You must order the type of adapter for each controller transport unit within the subsystem.

<b>CTU</b>	<b>Description</b>	<b>Feature Code</b>	<b>Part Number</b>	<b>Card</b>
1	1 ESCON adapter	3T11	310734201	TDA
	2 ESCON adapters	3T12	310734301	TCI
	1 SCSI-2 adapter	3T13	310734401	RSI
2	1 ESCON adapter	3T21	310734201	TDA
	2 ESCON adapters	3T22	310734301	TCI
	1 SCSI-2 adapter	3T23	310734401	RSI
3	1 ESCON adapter	3T31	310734201	TDA
	2 ESCON adapters	3T32	310734301	TCI
	1 SCSI-2 adapter	3T33	310734401	RSI
4	1 ESCON adapter	3T41	310734201	TDA
	2 ESCON adapters	3T42	310734301	TCI
	1 SCSI-2 adapter	3T43	310734401	RSI

## 9490 and SD-3 Power Cables

There are four types of power cables available for the 9490 and SD-3 Cartridge Subsystems. You must order the correct power cable for each cartridge drive within the subsystem.

<b>Accessory #</b>	<b>Description</b>
410573402	Power cord, <i>export</i> , harmonized, 10 ft with HUBBELL 320P6W connector
410573502	Power cord, <i>North American</i> , 10 ft with HUBBELL 320P6W connector
411063701	Power cord, <i>North American</i> , 14 ft with Russellstoll 3720 connector
411063901	Power cord, <i>export</i> , harmonized, 4.3 m, no connector

## 9490 and SD-3 Structure Kits

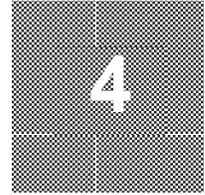
Structure kits are required to attach the 9490 and SD-3 Cartridge Subsystem to one of StorageTek's automated cartridge subsystems (also known as a library). The structure kits are different depending on the model and type of subsystem being installed.

<b>Kit PN</b>	<b>Description</b>
309502401	4410/9310 attachment kit (M32)
309502501	4410/9310 attachment kit (M34)
309502601	9360 attachment kit (M32)
309502701	9360 attachment kit (M34)

<b>Kit PN</b>	<b>Description</b>
309718401	4410/9310 attachment kit (H31)
309502401	4410/9310 attachment kit (H32)
309718501	4410/9310 attachment kit (H33)
309502501	4410/9310 attachment kit (H34)
309718601	9360 attachment kit (H31)
309502601	9360 attachment kit (H32)
309718701	9360 attachment kit (H33)
309502701	9360 attachment kit (H34)

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# Remote Maintenance



This chapter lists part numbers and specifications for the equipment required to remotely maintain StorageTek products.

## ■ Central Support Remote Center

StorageTek's Central Support Remote Centers (CRSCs) are an exclusive service of StorageTek. The CSRC is available 24 hours, seven days a week, to both customers and customer services engineers (CSEs) in most countries. During the initial order and installation planning, make sure to inform the customer about StorageTek's local and remote support.

The CSRC is staffed by diagnostic experts who have access to history files for solutions about previous equipment problems. With the remote equipment installation, the CSRC can:

- Connect to your account using a modem and an optional MARS+ box
- Test and diagnose the equipment problems
- Provide suggestions for operator repairable problems
- Dispatch a CSE with repair parts

Table 4-1 lists the remote support hardware and cables to provide remote support for the customer.

<b>Equipment</b>	<b>Description</b>	<b>Part Number</b>	<b>Ref Number</b>
Modem	9600 Baud	4953	1
Modem Switches	16 Port MARS+	4954	5
	32 Port MARS+	4955	5
Cable RJ-45 to RJ-45	20 ft MARS/UUT interconnect	410828902	7
	50 ft MARS/UUT interconnect	410828905	7
	100 ft MARS/UUT interconnect	410828910	7
	150 ft MARS/UUT interconnect	410828915	7
	200 ft MARS/UUT interconnect	410828920	7
	250 ft MARS/UUT interconnect	410828925	7
Modem/MARS Interconnect Cable	4 ft modem to MARS interconnect (DB-25 to DB-9)	4895	9

## ■ MARS+ Specifications

An optional machine activated routing switch (MARS+) allows remote selection of StorageTek equipment by the CSRs. The following are the specifications of the MARS+ box:

Power: 115 VAC @ 4.2A (483 Watts) 50/60 Hz  
230 VAC @ 2.4A (552 Watts) 50/60 Hz

Voltage ranges: 90–130 VAC or 180–250 VAC.

Frequency range: 47–63 Hz.

Operating temperature: 0°C to 50°C.

Dimensions (w,l,h): 178 mm x 406 mm x 330 mm (7" x 16" x 13")

Weight (in shipping carton): 16 port = 10.45 kg (23 lb)  
32 port = 11.36 kg (23 lb)

## ■ Modem Specifications

Specifications for the MICROCOM QX/4232bis modem.

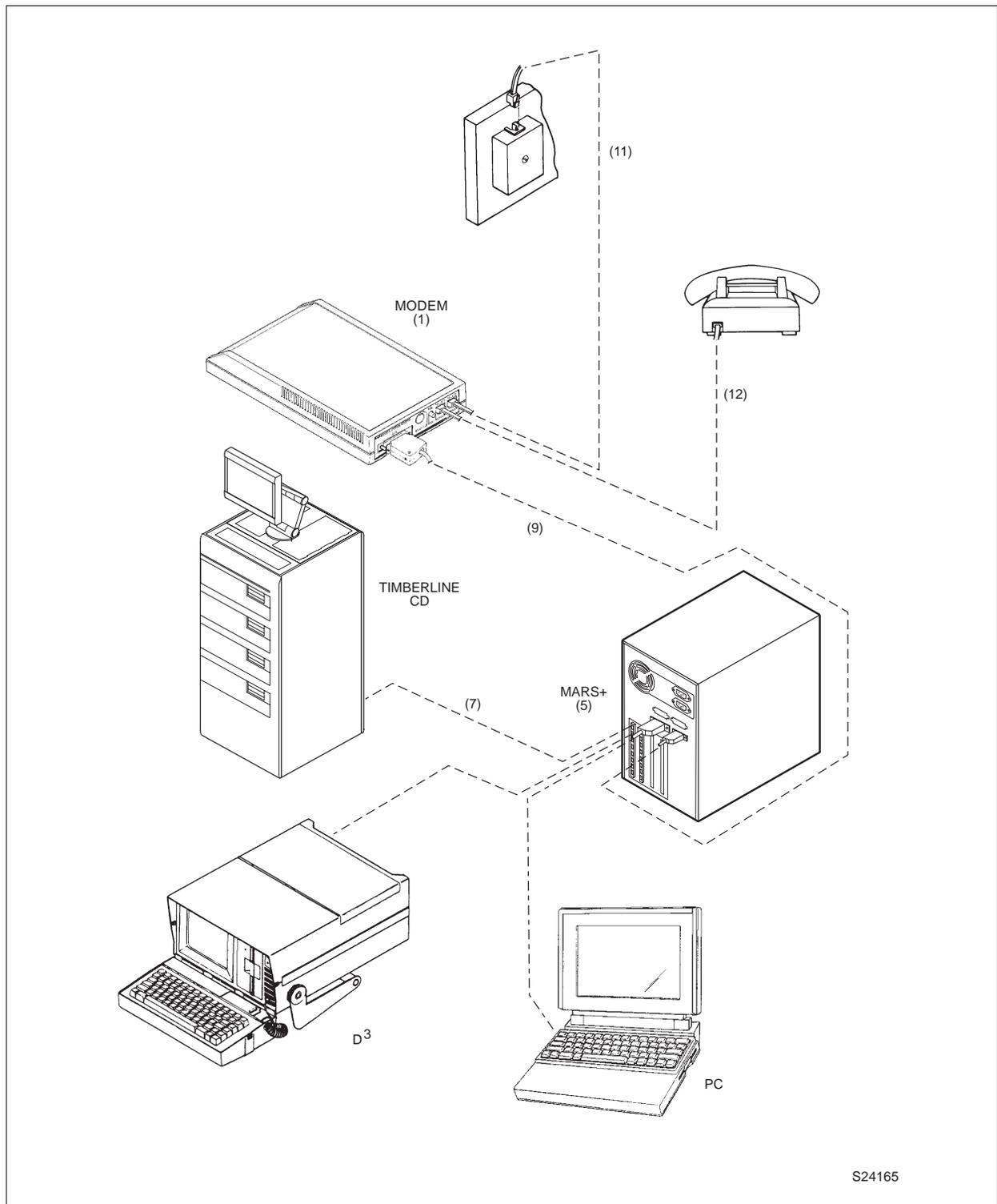
Protocols: MNP Class 2, 3, 4, 5, and 10.  
CCITT V.42, V.32bis, V.32, V.22bis, V.22, Bell 212A,  
and Bell 103 functions for normal ASCII  
communications.  
CCITT V.42bis data compression

Power requirements: 117 VAC (nominal) to the QX power pack

Telephone connector: RJ11  
RJ45 to 2-wire switched or leased line

Operating environment: 0–40°C (32–105°F)  
0–95% relative humidity

Physical dimensions: 292 mm x 165 mm x 51 mm (11.5" x 6.5" x 2")



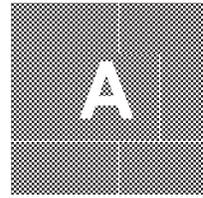
S24165

**Figure 4-1. Local Configuration Terminal Attachment to MARS+**

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# Planning Templates

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This appendix contains scale drawings of the various components of the Nearline library. Photocopy the templates to use when creating floor plan diagrams.

**Note:** Some photocopy machines automatically reduce. Before using the image, make sure that the photocopy image is the same size as the template image.

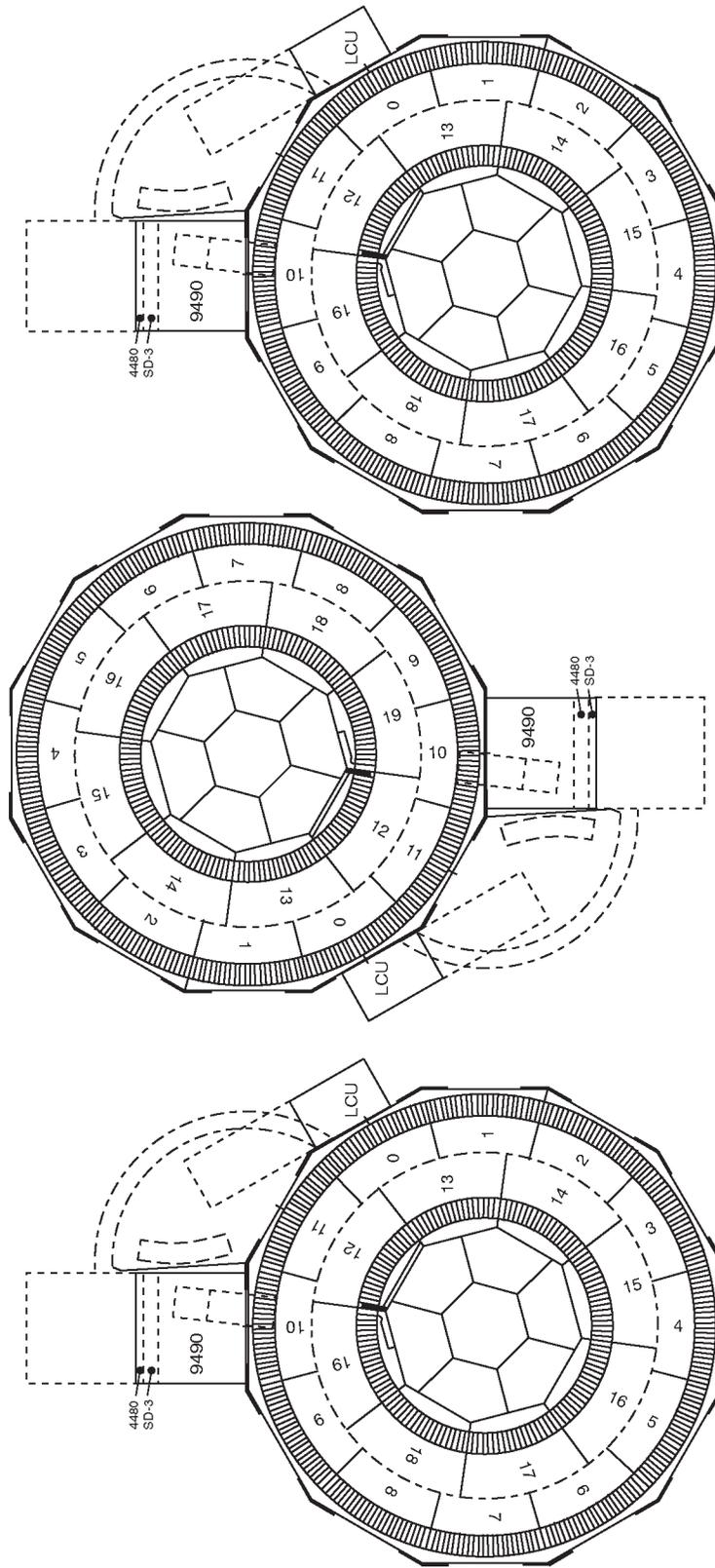
Because a Nearline library can include many different components, it is unlikely that any single template will accurately represent your particular configuration; however, you should be able to pick elements from the collection of templates to plan for each of the devices you are acquiring.

Templates are provided in both metric and English measurements for these devices:

- Large LSM with LCU, PTP, and Cartridge Drive
- 4480/4490 CU and CD
- Large LSM Drive Panel
- 4430 LMU
- Small LSM with Cartridge Drive
- 9330 LMU

STORAGE TECHNOLOGY CORPORATION  
AUTOMATED CARTRIDGE SYSTEM  
PHYSICAL PLANNING TEMPLATE

**StorageTek**



SCALE: 1 CENTIMETER = 1/2 METER

C24207

Figure A-1. 4410/9310 Template (Metric)

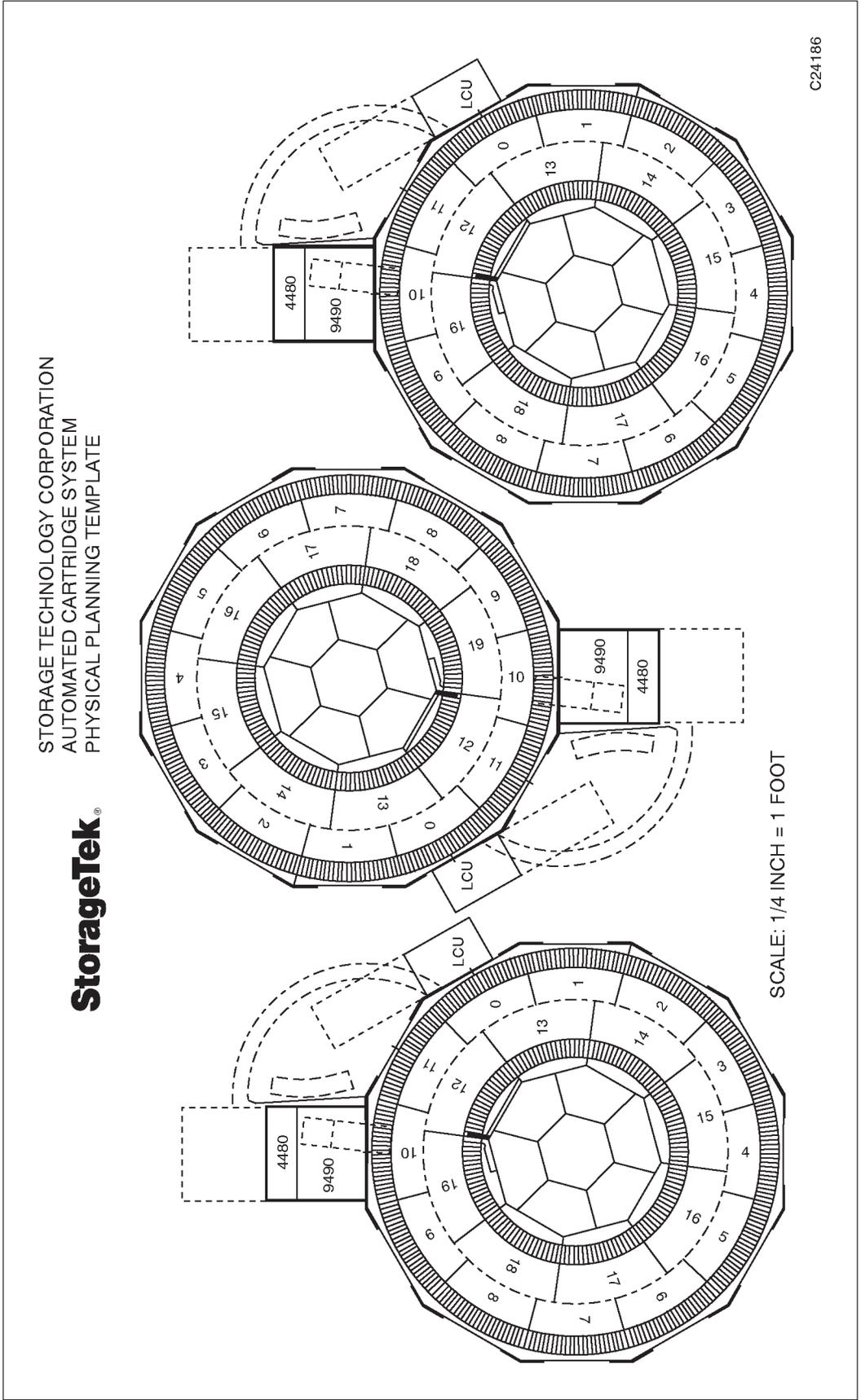


Figure A-2. 4410/9310 Template (English)

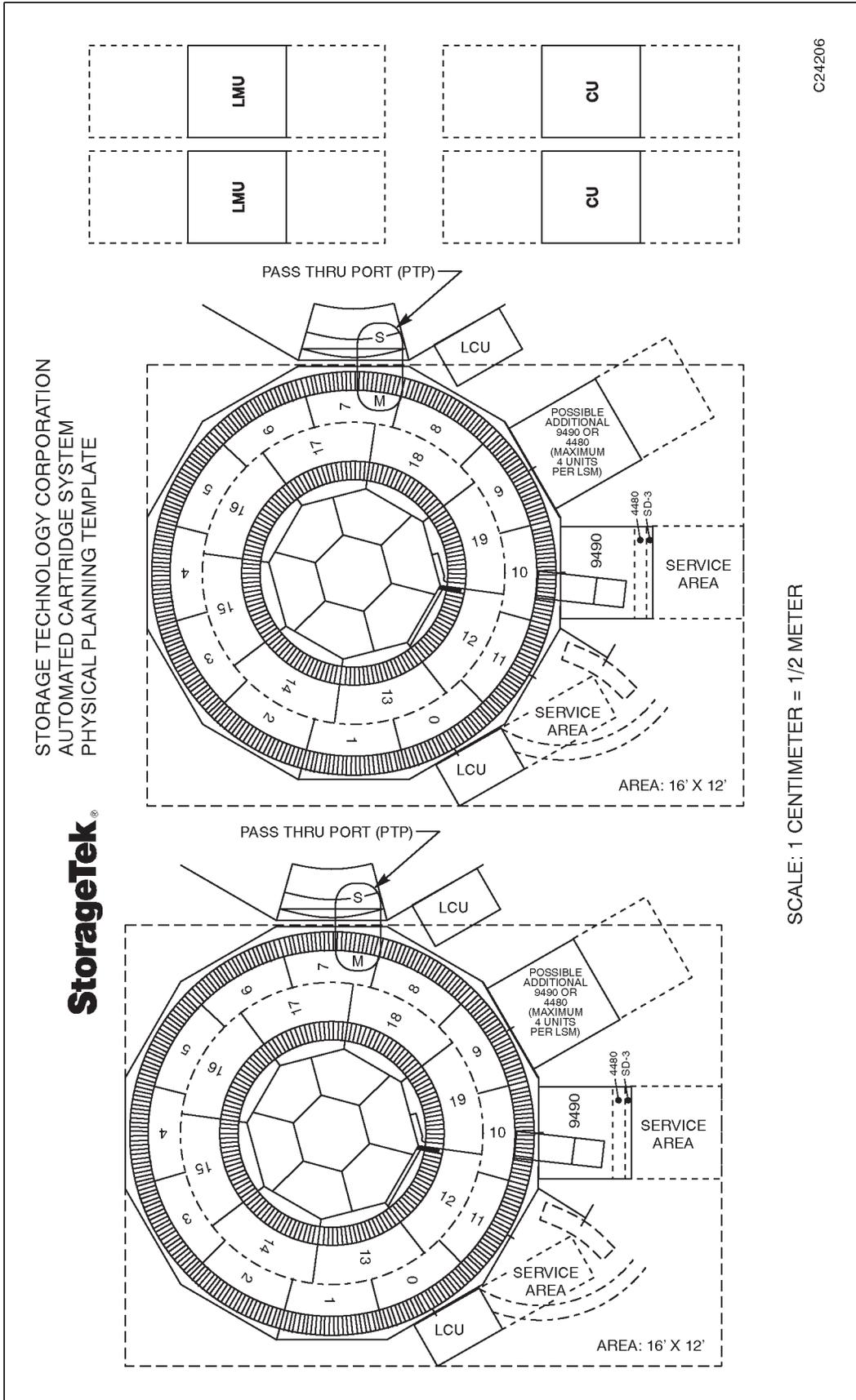
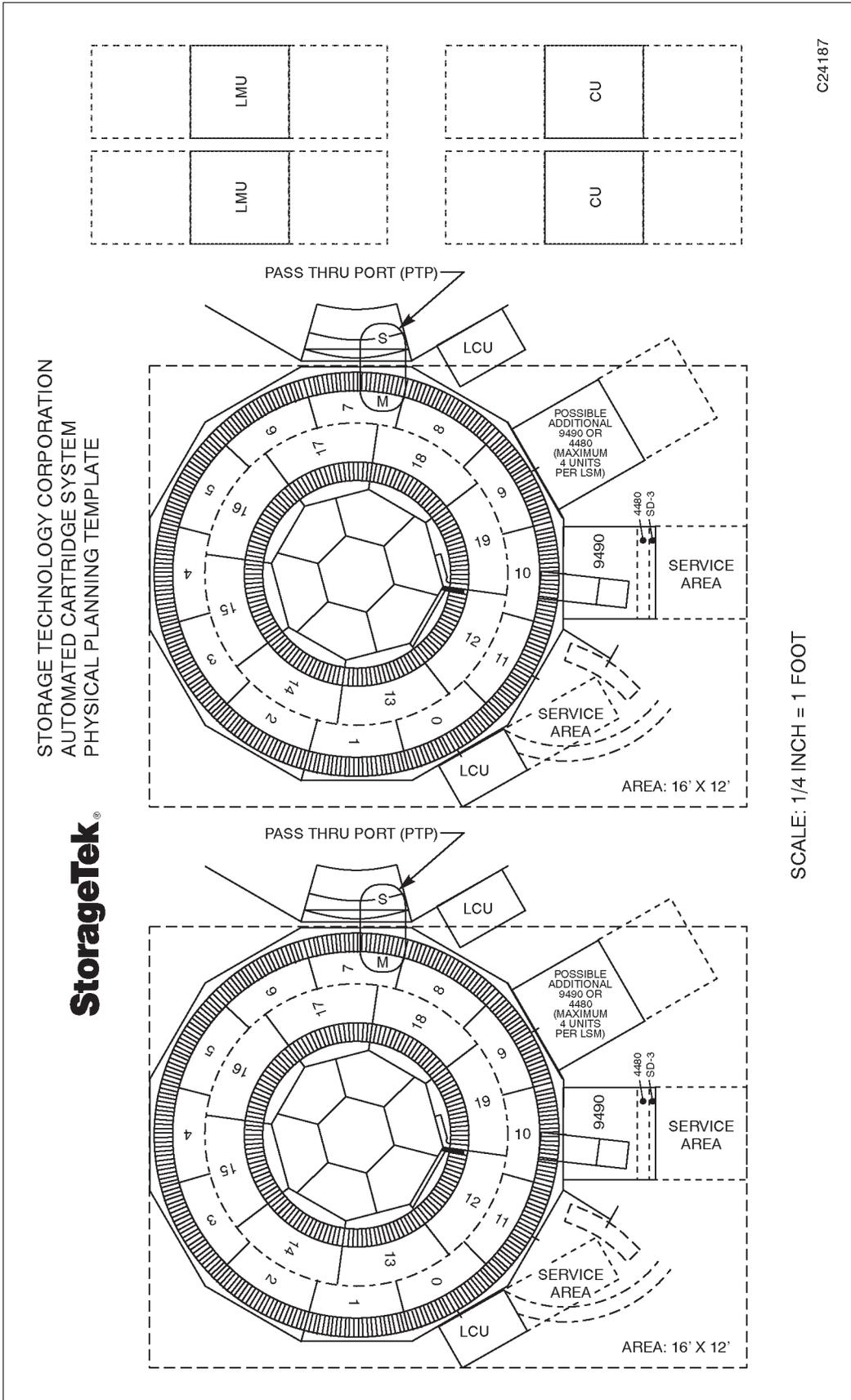


Figure A-3. 4410/9310 with PTP Template (Metric)



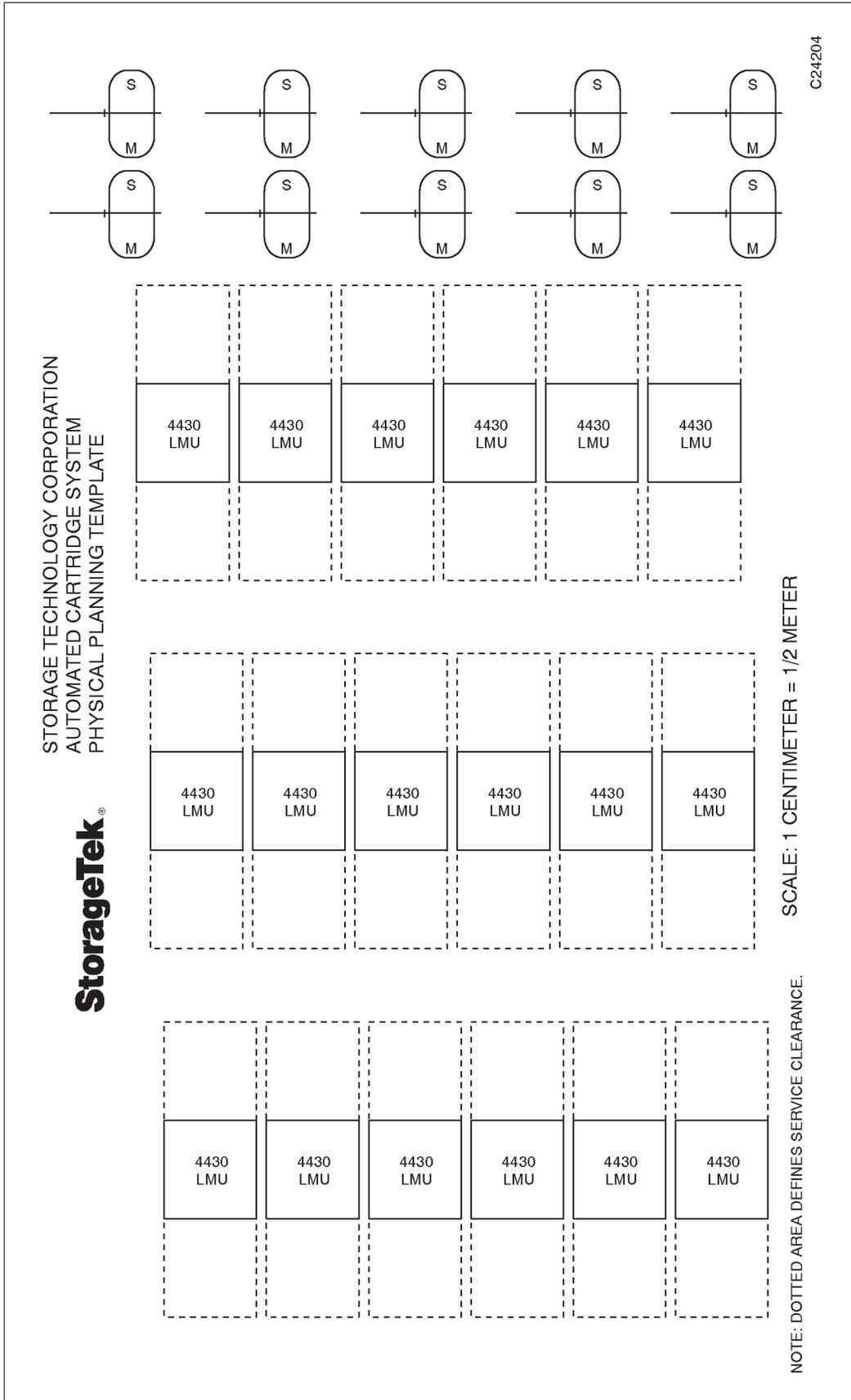


Figure A-5. PTP, 4430 LMU, CU Template (Metric)

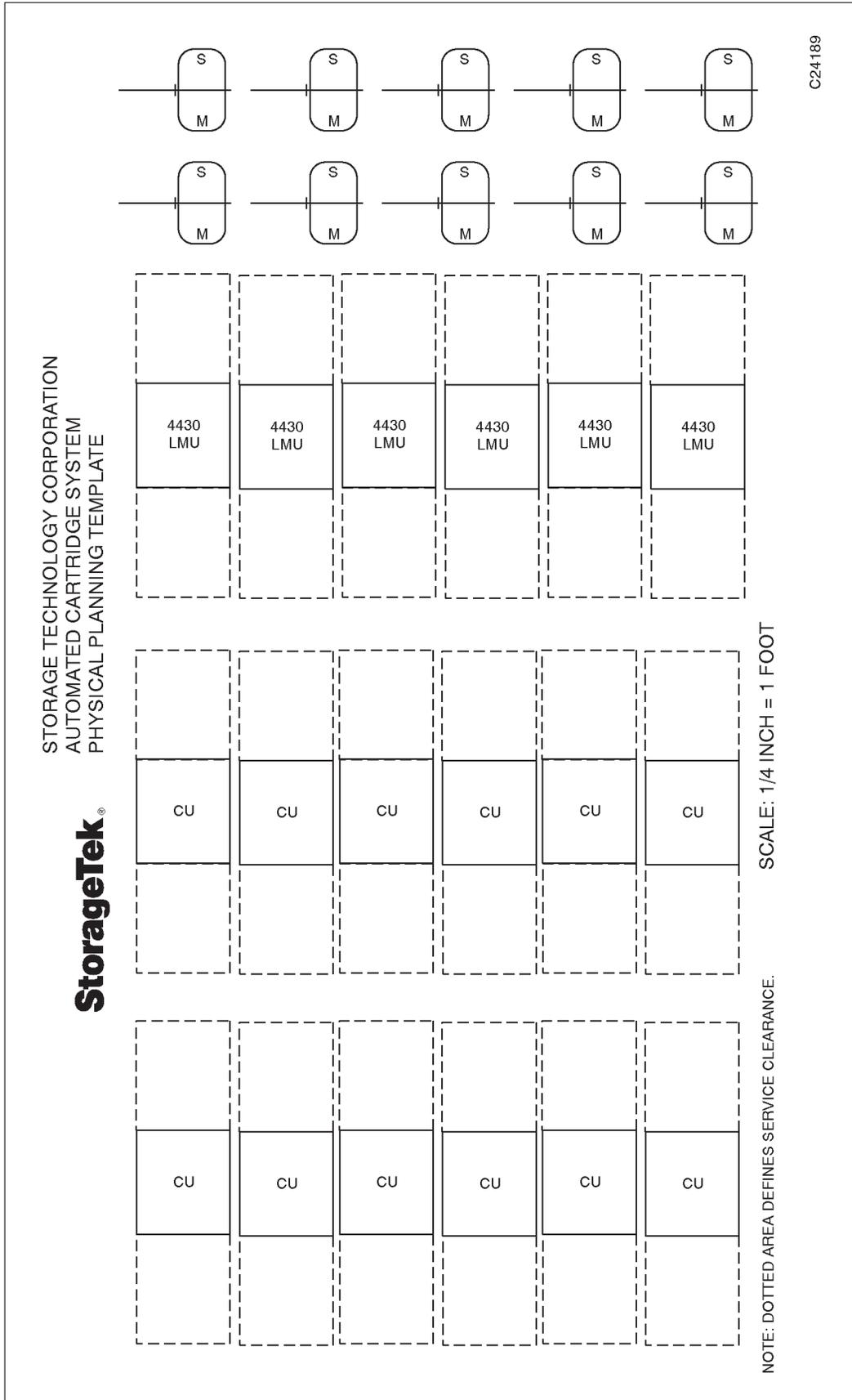
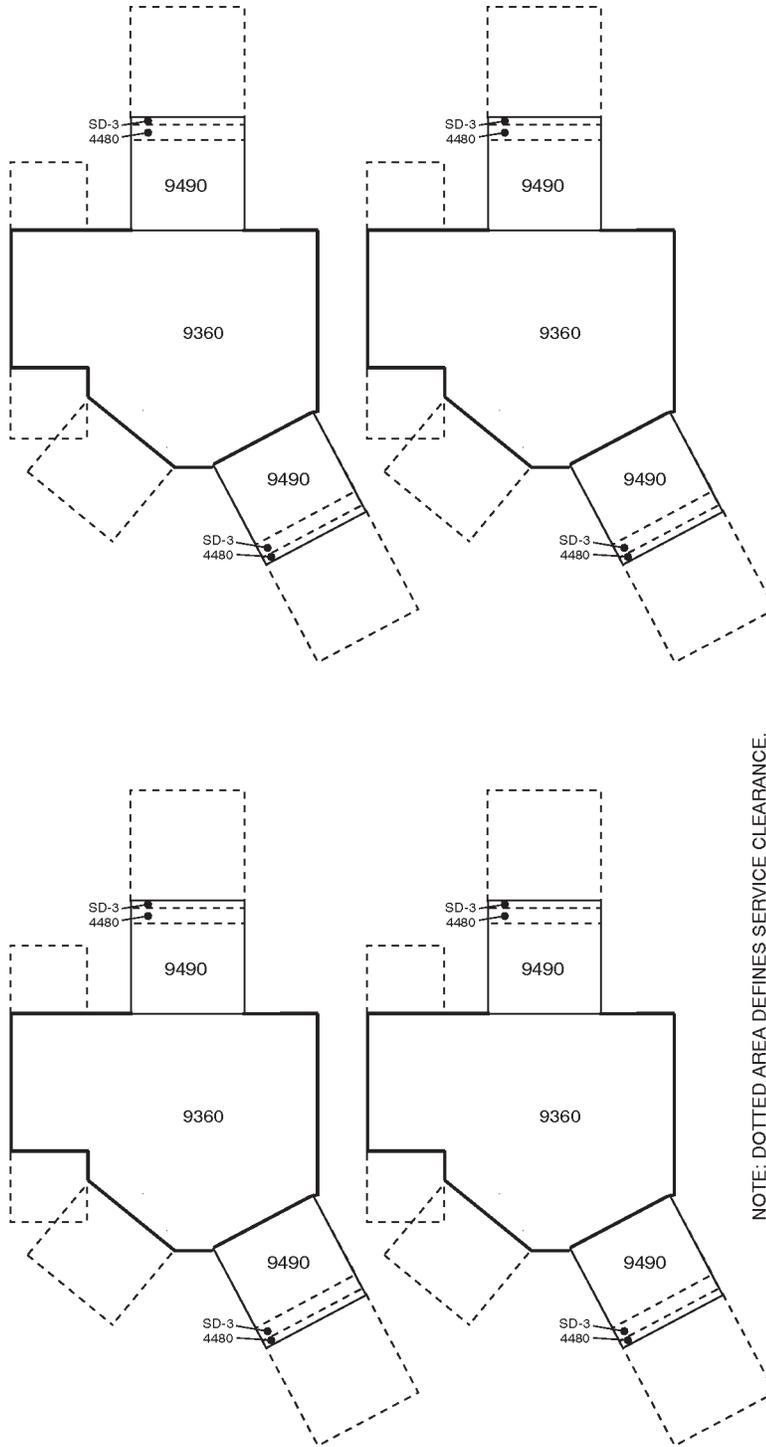


Figure A-6. PTP, 4430 LMU, CU Template (English)

STORAGE TECHNOLOGY CORPORATION  
AUTOMATED CARTRIDGE SYSTEM  
PHYSICAL PLANNING TEMPLATE

**StorageTek**<sup>®</sup>



NOTE: DOTTED AREA DEFINES SERVICE CLEARANCE.

SCALE: 1 CENTIMETER = 1/2 METER

C24208

**Figure A-7. Small Library Template (Metric)**

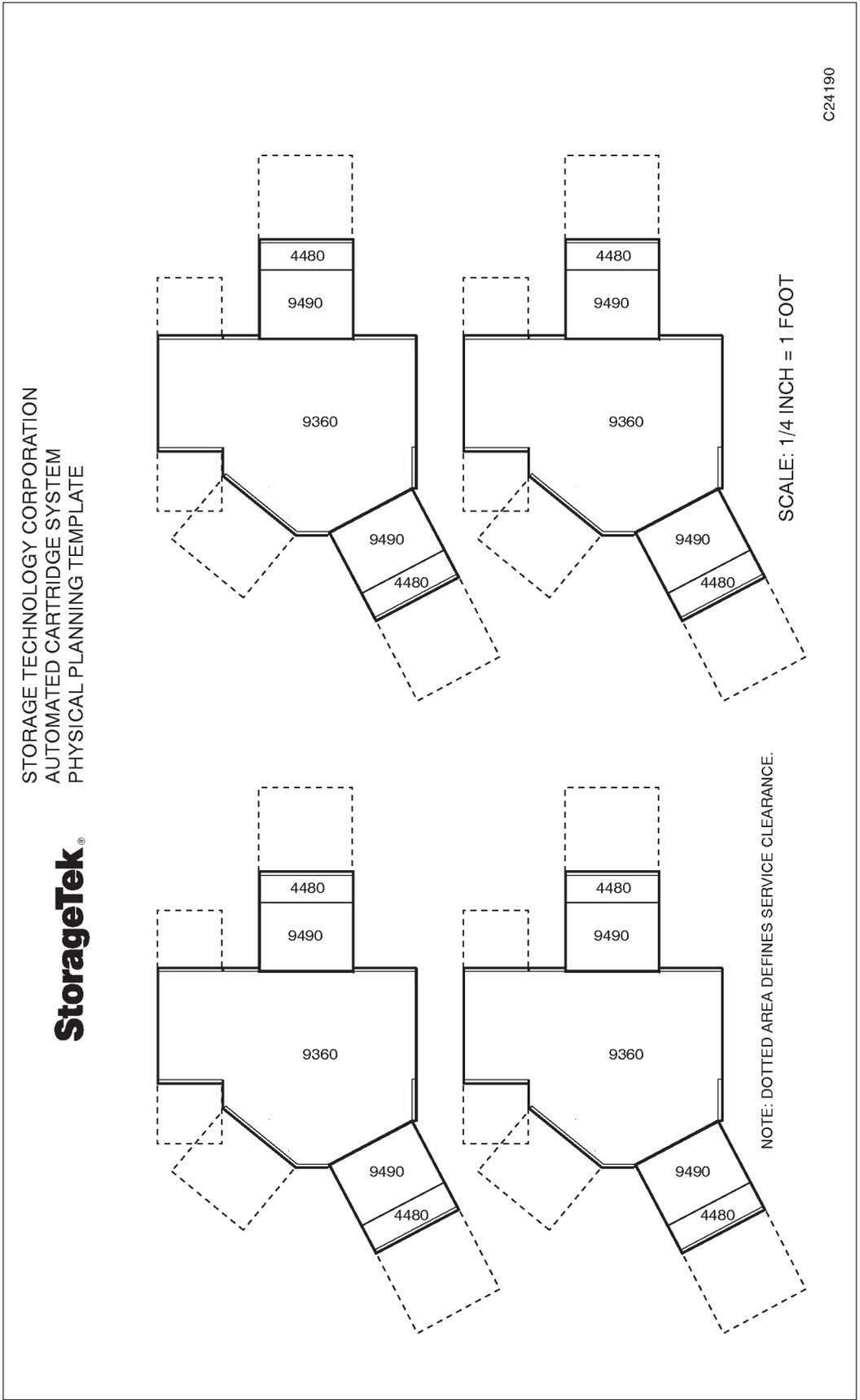


Figure A-8. Small Library Template (English)









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# Index

---

## Numbers

- 18-track subsystems, 3-2
- 2511 Cartridge Scratch Loader, feature number, 3-6, 3-24
- 36-track subsystems, 3-2, 3-9
- 44xx libraries, specifications, 2-2
- 9312 specifications, 2-12
- 9315 specifications, 2-12
- 9330 specifications, 2-12
- 9360 library
  - cables, 2-14
  - configuration restrictions, 2-19
  - floor cutouts, 2-17
  - floor-space requirements, 2-16
  - LAN cables, 2-15
  - overview, 2-12
  - specifications, 2-12
- 93xx library, specifications, 2-2
- 9490 Cartridge subsystem
  - AS/400 connection, 3-23
  - configuration feature numbers, 3-24
  - ESCON cables, 3-21
  - interface adapters, 3-24
  - overview, 3-9
  - power cables, 3-25
  - RS-6000 connections, 3-23
  - SCSI cables, 3-22

## A

- about this guide, ix
- ACSLs
  - cable requirements, 2-4
  - LAN cables, 2-5
- address, Literature Distribution mailing, xi
- air conditioning, 1-5
- altitude specifications, 3-12
- AS/400 connections, 3-23
- automated cartridge systems
  - See also* libraries

- large libraries, 2-2
- small libraries, 2-12

## B

- branch circuits, 1-11

## C

- cable
  - 4781/4791 SCSI interface, 3-5
  - cartridge subsystem, 3-5
  - digital/analog, 3-5
  - FIPS, 3-5
  - FIPS vs ESCON, 3-4
  - I/O cables, 1-4
  - length guidelines, 1-3
  - part numbers
    - external, 9330/9312/9315, 2-15
    - remote support, 4-1
  - subsystem, 3-5
  - subsystem layout, 1-4
- carbon dioxide extinguisher, 1-15
- Cartridge subsystem
  - See also* 9490 Cartridge subsystem; SD-3
  - Cartridge subsystem
    - overview, 3-1
    - planning, 3-1
    - structure kits, 3-6
    - types of, 3-2
- Cartridge tape, specifications, 3-12
- caster locations, 3-19
- channel extender options, 3-6
- checklist, site planning, 1-16
- clearance required for servicing, 1-3
- configuration restrictions for small libraries, 2-19
- connectors, power supply, 3-11
- controller transport units. *See* 9490 Cartridge subsystem
- convenience outlets, 1-12

CSRC, 4–1  
 Customer Services Remote Center, 4–1

## D

daisy–chain cables (SCSI), 3–22  
 depth. *See* subsystem specifications  
 detachable power cords (library), 2–14  
 distribution system, power, 1–9

## E

electrical power, 1–6  
 electronics module, 2–12  
 emergency power control, 1–12  
 environmental limits. *See* subsystem specifications  
 environmental specifications, 2–3, 3–12  
 EPO, cable part numbers, 3–5  
 ESCON channels  
   cable part numbers, 3–21  
   feature numbers, 3–6  
   subsystems with, 3–2

## F

failures, caused by power source, 1–10  
 features. *See* optional features  
 feeders, power panel, 1–11  
 fiber optic cables (ESCON), 3–21  
 fiber optic channel extenders, 3–6  
 FIPS channels  
   features, 3–6  
   number of, 3–4  
   subsystems with, 3–2  
 fire precautions  
   carbon dioxide attachment, 1–15  
   Halon type for 4400 ACS, 1–15  
 fire prevention, 1–15  
 floor cutouts  
   44xx library, 2–7  
   9360 library, 2–17  
   93xx library, 2–7

cartridge subsystems, 3–7, 3–8  
   Version 1 controllers, 3–7  
   Version 2 controllers, 3–8

floor loading, 1–4

floor–space requirements  
   44xx library, 2–6  
   9360 library, 2–16  
   93xx library, 2–6  
   9490 Cartridge Subsystem, 3–13  
   cartridge subsystems, 3–7, 3–8  
   RedWood, 3–18  
   SD–3 Cartridge subsystem, 3–18  
   TimberLine, 3–13  
   Version 1 control units, 3–7  
   Version 2 control units, 3–8

frequency limits, 1–8

## G

grounding, 1–6  
   power cord, 1–11  
 guidelines  
   cable length, 1–3  
   priority assignment, 1–3

## H

Halon fire extinguisher, 1–15  
 harmonic content, 1–8  
 heat output, 3–12  
   *See also* subsystem specifications  
 height, 3–10  
   *See also* subsystem specifications  
 helical–scan subsystems, 3–14  
 How to  
   order cartridge subsystems, 3–1  
   order libraries, 2–1  
   order publications, xi  
 HUBBLE connectors, 3–11

## I

I/O cables, 1–4  
 IBM interposers, 3–23

ICRC option, 3–6  
 imbalance, line-to-line voltage, 1–8  
 Improved Cartridge Recording Capability, 3–6  
 installation planning schedule, 1–1  
 interface adapters, 3–24  
 interposers, 3–23

## J

jumper cables (ESCON), 3–21

## L

LAN cables  
   9360 library, 2–15  
   9490/SD–3, 3–20  
   LMU to LSM, 2–5  
   LMU to workstation, 2–5  
   TimberLine/RedWood, 3–20  
 layout, subsystem, 1–2  
 LCU, specifications, 2–2  
 library  
   *See also* automated cartridge systems  
   configuration restrictions, 2–19  
   overview, 2–1  
   specifications, 2–2  
 library kits  
   9490 Cartridge subsystem, 3–25  
   cartridge subsystems, 3–6  
   SD–3 Cartridge subsystem, 3–25  
 lightning protection, 1–12  
 limits  
   frequency, 1–8  
   voltage, 1–8  
 line-to-line voltage imbalance, 1–8  
 Literature Distribution address and phone number, xi  
 LMU, specifications, 2–2  
 load, power load specs, 1–9  
 load/unload time, 3–11  
 local area network. *See* LAN cables  
 LSM, specifications (44xx/93xx), 2–2

## M

M44, 3–14  
 mailing address, Literature Distribution, xi  
 MARS+, 4–2  
 modem, 4–2

## O

operating heat output, 3–12  
 operating temperature, 1–5  
 optional features, 3–10  
   AS/400 connections, 3–23  
   cartridge subsystems, 3–6  
   RS–6000 connections, 3–23  
 ordering publications, xi  
 organization of this guide, ix

## P

part numbers  
   9360 LAN cables, 2–15  
   ACSLs LAN cables, 2–5  
   additional manuals, x  
   ESCON cables, 3–21  
   LAN cables, 3–20  
   library LAN cables, 2–5  
   library power cords, 2–14  
   related publications, x  
 phase rotation, 1–11  
 planning  
   automated cartridge systems, 2–1  
   site checklist, 1–16  
   installation schedule, 1–1  
   preinstallation, 1–1  
   subsystem layout, 1–2  
 Power  
   consumption, 3–11  
   specifications, 3–11  
 power  
   *See also* subsystem specifications  
   9360 cables, 2–14  
   load specs, 1–9  
   primary problem areas, 1–9

specifications, 1–7

power distribution system, 1–9

- branch circuits, 1–11
- convenience outlets, 1–12
- emergency power control, 1–12
- grounding, 1–11
- lightning protection, 1–12
- phase rotation, 1–11
- power load, 1–9
- power panel feeders, 1–11
- power source, 1–10
- primary power problem areas, 1–9

power panel feeders, 1–11

power source, 1–10

Power supplies

- specifications, 3–11
- types of connectors, 3–11

preinstallation planning, 1–1

priority assignment guidelines, 1–3

problem areas, power, 1–9

publications, other related, x

## R

reading speed, 3–11

RedWood

- See also* SD–3 Cartridge subsystem
- overview, 3–14

related publications, x

relative humidity levels, 3–12

remote support

- cables, 4–1
- center, 4–1
- hardware, 4–1

requirements

- electrical power and grounding, 1–6
- floor loading, 1–4
- machine grounding, 1–7
- operating temperature, 1–5
- power quality, 1–6
- static electricity, 1–5
- voltage and frequency, 1–7

restrictions for small library configurations, 2–19

rewind speed, 3–11

RS–6000 connections, 3–23

Russellstoll connectors, 3–11

## S

schedule, installation planning, 1–1

SCSI–1 interfaces

- cable part numbers, 3–5
- subsystems with, 3–2

SCSI–2 interface

- cable part numbers, 3–22
- external cable part numbers, 3–22
- transfer rates, 3–9

SD–3 Cartridge subsystem

- AS/400 connections, 3–23
- configuration feature numbers, 3–24
- ESCON cables, 3–21
- interface adapters, 3–24
- overview, 3–14
- power cables, 3–25
- RS–6000 connections, 3–23
- SCSI cables, 3–22

search speed, 3–11

service area

- 9490 cartridge subsystem, 3–13
- cartridge subsystems, 3–7, 3–8
- SD–3 cartridge subsystem, 3–18

service clearance. *See* subsystem specifications

service clearances, 1–3

site planning checklist, 1–16

site requirements, 1–4

- air conditioning, 1–5
- electrical power and grounding, 1–6
- fire precautions, 1–15
- floor loading, 1–4
- Halon fire extinguisher, 1–15
- machine grounding, 1–7
- power quality, 1–6
- static electricity, 1–5
- storage areas, 1–12
- voltage and frequency, 1–7

site survey, wiring comments, 1–14

size, 3–10

small library, configuration restrictions, 2–19

Specifications

- environmental, 3–12
- heat output, 3–12

power consumption, 3–11

specifications

44xx/93xx library

electrical, 2–2

environmental, 2–3

frequency, 1–8

harmonic content, 1–8

MARS+, 4–2

modem, 4–2

power, 1–7

voltage, 1–8

static electricity, 1–5

storage areas, 1–12

structure kits

9490 Cartridge subsystem, 3–25

cartridge subsystems, 3–6

SD–3 Cartridge subsystem, 3–25

subsystem layout, 1–2

cable length, 1–3

I/O cables, 1–4

priority assignment, 1–3

service clearances, 1–3

Subsystem specifications

4480/4780/4781, 3–3

4490/4791, 3–3

9490 Cartridge subsystem, 3–10

RedWood, 3–16

SD–3 Cartridge subsystem, 3–16

TimberLine, 3–10

subsystem specifications

44xx library, 2–2

93xx library, 2–2

support, remote, 4–1

temperature limits, 3–12

terminators (SCSI), 3–22

TimberLine

*See also* 9490 Cartridge subsystem

overview, 3–9

trademarks used in this guide, x

transfer rates, 3–11

## V

velocity option, 3–6

Version 1 control units, cartridge subsystems,  
3–7

Version 2 control units, cartridge subsystems,  
3–8

voltage

*See also* Power

specifications, 3–11

voltage imbalance, line-to-line, 1–8

voltage limits, 1–8

## W

weight, 3–10

*See also* subsystem specifications

wet bulb limits, 3–12

wiring comments site survey, 1–14

WolfCreek. *See* 9360 library

writing speed, 3–11

## T

temperature. *See* subsystem specifications

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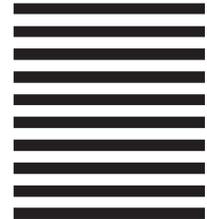


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