

Burroughs

**B9494-5
Fixed Disk Drive**

**PRODUCT DESCRIPTION
MANUAL**

PRICED ITEM

Burroughs

**B9494-5
Fixed Disk Drive**

**PRODUCT DESCRIPTION
MANUAL**

Copyright © 1983, Burroughs Corporation, Detroit, Michigan 48232

PRICED ITEM

Burroughs cannot accept any financial or other responsibilities that may be the result of your use of this information or software material, including direct, indirect, special or consequential damages. There are no warranties extended or granted by this document or software material.

You should be very careful to ensure that the use of this software material and/or information complies with the laws, rules, and regulations of the jurisdictions with respect to which it is used.

The information contained herein is subject to change without notice. Revisions may be issued to advise of such changes and/or additions.

Correspondence regarding this publication should be forwarded using the Remarks form at the back of the manual, or may be addressed directly to Corporate Documentation-West, Burroughs Corporation, 1300 John Reed Court, City of Industry, California 91745, U.S.A.

LIST OF EFFECTIVE PAGES

Page	Issue
Title	Original
ii	Original
iii	Original
iv	Blank
v thru vii	Original
viii	Blank
1-1 thru 1-4	Original
2-1 thru 2-5	Original
2-6	Blank
3-1 thru 3-3	Original
3-4	Blank
4-1 thru 4-2	Original

TABLE OF CONTENTS

Section	Title	Page
	PREFACE	vii
1	GENERAL DESCRIPTION	1-1
	Introduction	1-1
	Formatted Capacity	1-2
	Head Disk Assembly	1-2
	Winchester Technology	1-3
	Disk Capacity	1-3
	Contact Start/Stop	1-3
	Performance Specifications	1-3
	Subsystem Complement	1-4
	Subsystem Function	1-4
2	FEATURES	2-1
	Introduction	2-1
	Capacity	2-1
	Read Only Protection	2-1
	Dual Port Interface	2-1
	Brake	2-1
	Performance Characteristics	2-3
	Reliability	2-3
	Data Error Detection and Correction	2-3
	Circuit Design	2-3
	Usage and Error Logging	2-3
	Factory Testing	2-3
	Maintainability	2-4
	Diagnostic Capability	2-4
	Fault Isolation	2-4
	Spare Sectors	2-4
	Initialize/Verify/Relocate Procedures	2-4
	Component Packaging	2-4
	Documentation	2-4
	Power Protection	2-5
	Safety	2-5
	AC Power Connection	2-5
3	INSTALLATION	3-1
	Introduction	3-1
	General Information	3-1
	Shipment	3-1
	Equipment and Data	3-1
	Site Requirements	3-1
	Physical Placement	3-1
	Process	3-1
	Initialize/Verify/Relocate Procedures	3-2
	Specifications	3-3
4	SPECIFICATIONS SUMMARY	4-1
	Introduction	4-1

LIST OF ILLUSTRATIONS

Figure	Title	Page
1-1	B9494-5 Fixed Disk Drive	1-1
1-2	Head Disk Assembly	1-2
1-3	Subsystem Hardware	1-4
2-1	Typical Dual Port Interface	2-2
3-1	Installation Planning Template	3-2

LIST OF TABLES

Table	Title	Page
4-1	Data Retrieval Times	4-1
4-2	Installation Specifications	4-1

PREFACE

This publication provides a description of the B9494-5 Fixed Disk Drive.

- Section 1 contains a general description.
- Section 2 describes disk drive features.
- Section 3 provides installation data.
- Section 4 contains a specifications summary.

The B9494-5 Fixed Disk Drive is completely supported for installation, operation, and maintenance by Burroughs Customer Service/Field Engineers and a full range of publications.

Refer to the B9494-5 Fixed Disk Drive Operator's Manual (1151891) for operation instructions.

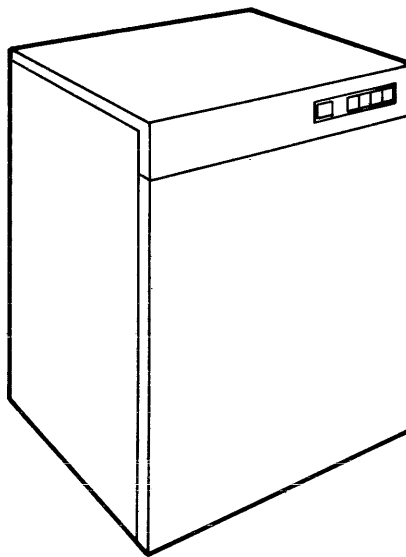
Refer to the appropriate system operation manuals, as required, based on host system attachment. Additional planning information is available in the B9494-5 Fixed Disk Drive Installation Planning Guide (IPG) and through consultation with Burroughs Sales Representatives.

SECTION 1

GENERAL DESCRIPTION

INTRODUCTION

The Burroughs B9494-5 Fixed Disk Drive (see figure 1-1) is a high capacity, random-access disk storage unit for attachment to a Burroughs B9387-5X Controller, Burroughs Bx387/B9387-2X Exchange, or equivalent.



WP1001

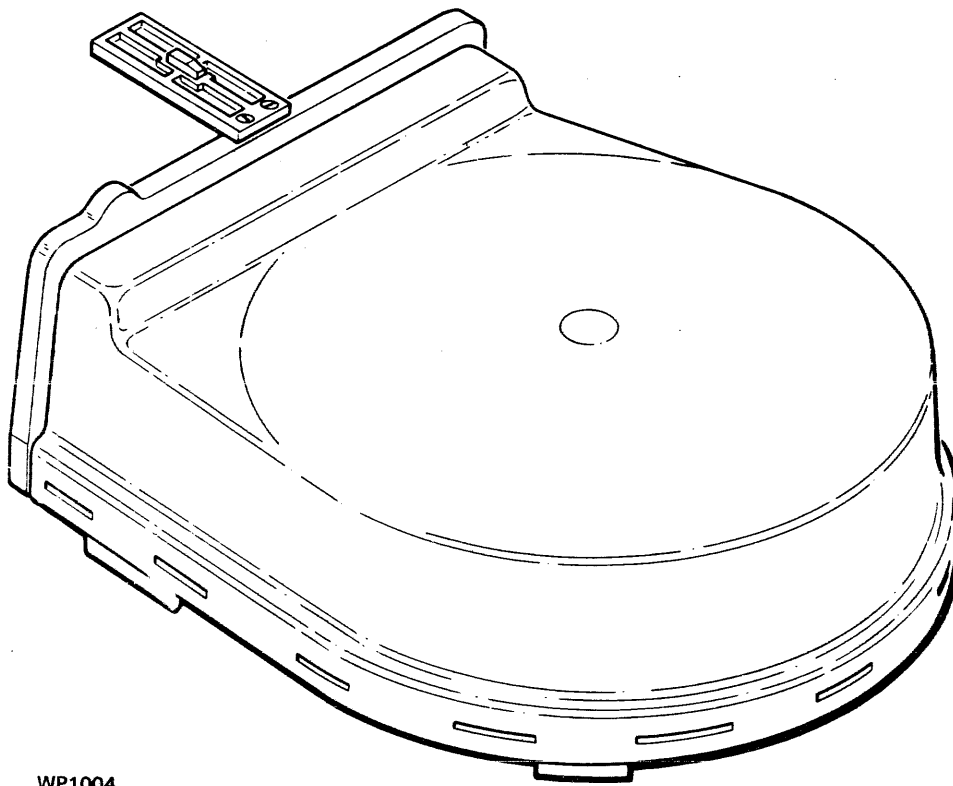
Figure 1-1. B9494-5 Fixed Disk Drive

FORMATTED CAPACITY

The B9494-5 Fixed Disk Drive contains one Head Disk Assembly with a maximum user formatted capacity of 542.3 megabytes. Disk Drive capacities for various formats are listed in performance specifications contained in this section.

HEAD DISK ASSEMBLY

The Head Disk Assembly (see figure 1-2) is a data storage module using Winchester Technology. The Head Disk Assembly is removable only by the Burroughs Customer Service/Field Engineer. It contains eight disk platters and servo and read/write heads mounted on a movable carriage.



WP1004

Figure 1-2. Head Disk Assembly

WINCHESTER TECHNOLOGY

Disk Capacity

Winchester technology increases disk capacity by increasing recording density. Data is recorded on the disk surface by magnetizing the oxide coating. Data can be packed more densely as the thickness of the oxide coating is decreased. However, when a thinner coating of oxide is used to record data, the head must be closer to the disk surface to read the data. This creates the need for closer tolerances and makes it impractical to remove the recording media.

Contact Start/Stop

Another feature of Winchester technology is Contact Start/Stop. When the disk stops spinning, the moving heads retract, come to rest on non-data areas, and remain there until the disk is brought up to speed again. This provides a simpler and more reliable way of loading and unloading heads because a cam tower assembly is not required.

PERFORMANCE SPECIFICATIONS

Disk drive performance specifications are listed below. Access time is defined as the time required to position the heads. Access to data time is defined as access time plus latency.

- Maximum User Formatted Capacities

BYTES/SECTOR	FORMAT	MEGABYTE CAPACITY*
180	INTERLACED	542.3
180	SEQUENTIAL	481.8
100	INTERLACED	469.3
100	SEQUENTIAL	395.4

* Not all Burroughs CPUs can address full capacity. Refer to the appropriate host system manual for addressing restrictions.

• Unformatted Capacity	680.4 megabytes
• Track Density	935 tracks/inch
• Bit Density	6,411 bits/inch
• Transfer Rate	
Sequential	1.2 megabytes/sec
Interlaced	605 kilobytes/sec
• Average Access Time	22 msec
• Maximum Access Time	42 msec
• Average Latency	8.33 msec
• Maximum Latency	17.13 msec
• Average Access to Data Time	30.33 msec
• Maximum Error Rates (Bits Transferred)	
First Pass Error Rate	1 X 10 ⁹
Unrecoverable Error Rate	1 X 10 ¹²

SUBSYSTEM COMPLEMENT

The subsystem is composed of combinations of the controller and B9494-5 Fixed Disk Drive (see figure 1-3). A maximum of eight disk drives can be attached directly to a controller. This configuration produces a maximum user formatted capacity of 4338.4 megabytes. With the use of an exchange, a maximum of 16 disk drives can interface with eight controllers. This configuration produces a maximum user formatted capacity of 8676.9 megabytes. Refer to the B9387/Bx387 Disk Pack Drive Controller/Exchange Technical Manual (1104114) for possible subsystem attachments.

SUBSYSTEM FUNCTION

The subsystem uses input/output instructions to identify the controller address and the disk drive to be accessed. The controller receives commands from the host system via the I/O port. It interprets the commands and executes them in sequence and time in order to position the disk drive carriage. The controller can then complete the desired transfer of data between the I/O port and the disk drive.

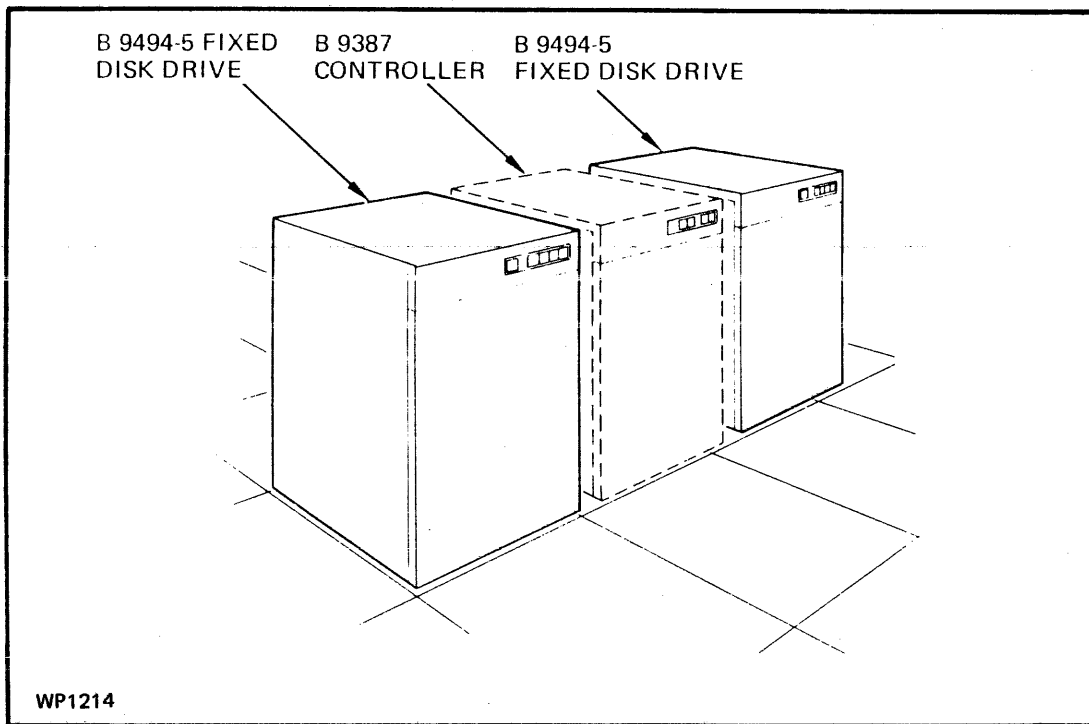


Figure 1-3. Subsystem Hardware

SECTION 2

FEATURES

INTRODUCTION

This section contains a description of disk drive features. These features are both built into the disk drive and provided as a function of the subsystem.

CAPACITY

The B9494-5 Fixed Disk Drive contains one Head Disk Assembly with a maximum user formatted capacity of 542.3 megabytes.

READ ONLY PROTECTION

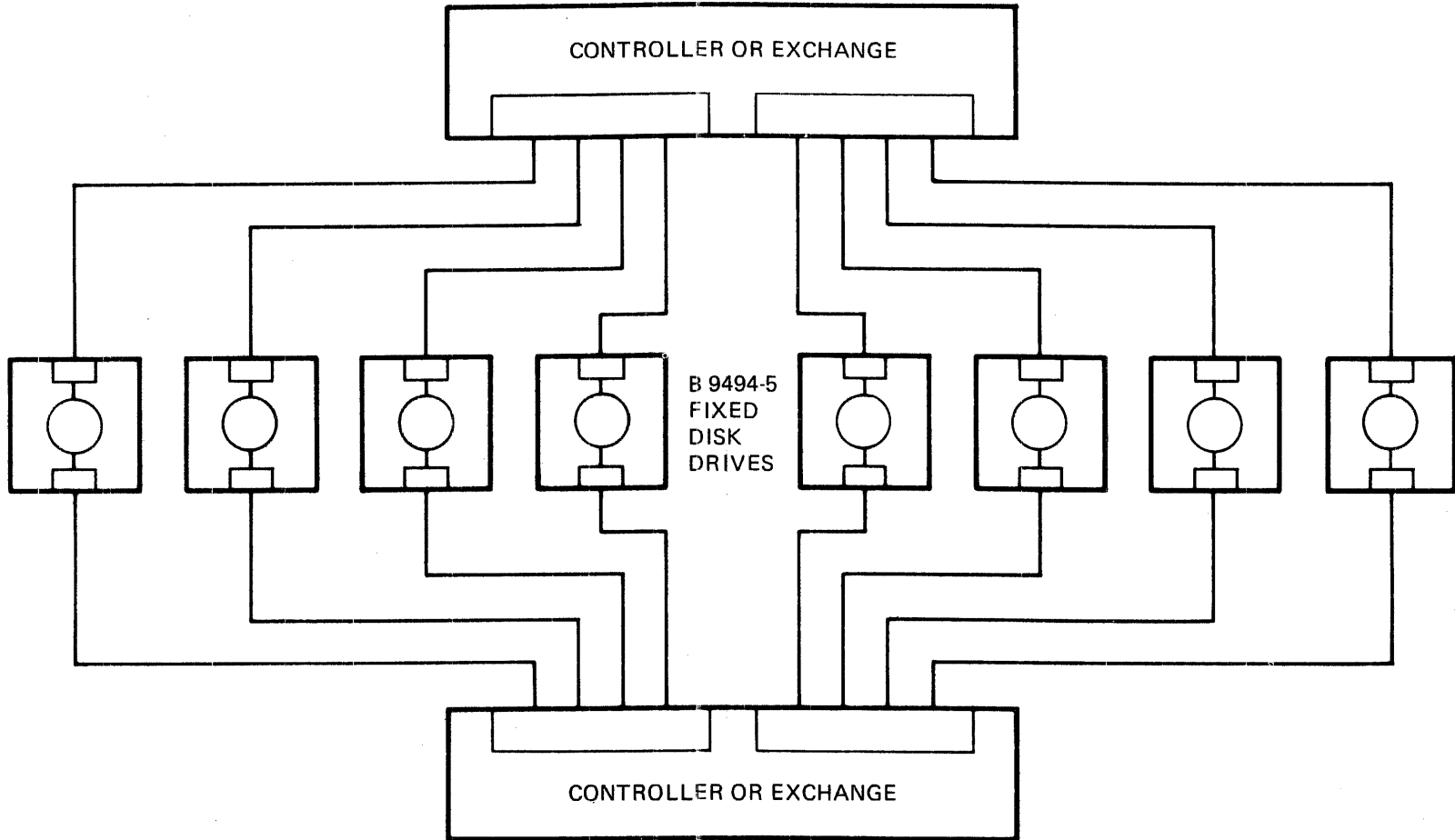
The WRITE ENABLE switch, when in the Write Disable position, protects the disk drive from being written upon or erased.

DUAL PORT INTERFACE

The Dual Port Interface feature permits two controllers, two exchanges, or one controller and one exchange to access the disk drive. A typical Dual Port Interface configuration is shown in figure 2-1.

BRAKE

The disk drive is equipped with an electro-mechanical brake to stop disk rotation within 11 seconds.



WP1216

Figure 2-1. Typical Dual Port Interface

PERFORMANCE CHARACTERISTICS

Disk drive performance characteristics are listed below.

- Average Access Time 22 msec
- Maximum Access Time 42 msec
- Average Latency 8.33 msec
- Maximum Latency 17.13 msec
- Average Access to Data Time 30.33 msec

- Single-Track Seek Time 8 msec
- Data Transfer Rate
 - Sequential 1.2 megabytes/sec
 - Interlaced 605 kilobytes/sec
- Maximum Start Time 15 sec
- Maximum Stop Time 11 sec

RELIABILITY

Data Error Detection and Correction

The controller adds 32 EPC bits to each sector of data written on the disk drive. These EPC bits provide detection of any single error burst of 32 bits or less, all error bursts of more than 32 bits, and correction of any single error burst of 11 bits or less. Each address written on the disk drive contains eight check bits for error detection. Address error correction is not performed.

Circuit Design

Hermetically-sealed integrated circuits are widely used in the disk drive. These components are very reliable and are relatively insensitive to changes in operating conditions.

Usage and Error Logging

A statistical log of usage and error occurrences is maintained by the CPU for each disk drive in the subsystem. All errors, including retries, are included as part of the log. The log also contains information from the controller buffer memory and mainframe op codes. This log is provided for the Customer Service/Field Engineer for the purpose of maintaining the disk drive in a highly reliable state.

Factory Testing

All disk drives are factory tested to ensure that all functions work properly. The disk drives and their components are also tested to Burroughs specifications. This testing increases user reliability by isolating new component/product failures at the factory.

MAINTAINABILITY

Diagnostic Capability

A fault isolation diagnostic system supports the installation and maintenance of the disk drive.

Test routines can be run at the system or controller level for problem detection. Diagnostics flow charts allow the Customer Service/Field Engineer to fault isolate to the defective card(s), module, or assembly.

When testing is performed at the controller level, the controller is taken off-line and dedicated to disk drive servicing.

Fault Isolation

The special designs of disk drive assemblies allow greater diagnostic capability. The power supply, power distribution unit, drive assemblies, and printed circuit boards have built-in fault isolation features that aid the Customer Service/Field Engineer, through LED indicators, in locating the most likely source of a problem.

Spare Sectors

Five spare sectors are provided for each logical cylinder and may not be addressed directly by the user file address. Spare sectors are provided for use only as alternate sectors for the relocation of damaged sectors. Once a damaged sector has been relocated, access to that sector is transparent to the CPU.

Initialize/Verify/Relocate Procedures

Initialize/Verify/Relocate (IVR) procedures may be used only by the Customer Service/Field Engineer to relocate defective sectors, or to change the data format on the Head Disk Assembly.

Component Packaging

Equipment maintainability is improved through the modular replacement maintenance philosophy. This enables fewer components to be stocked and allows problems to be isolated to them quickly.

Documentation

Burroughs manuals are available for Customer Service/Field Engineer training, and disk drive operation. Burroughs maintains standards in its publication of technical data, using effective publications - update and engineering - control procedures.

POWER PROTECTION

The disk drive is able to withstand up to 10 milliseconds of ac power dropout without interruption to normal operation or loss of any recorded data.

In the event of a longer ac power dropout, the Head Disk Assembly movable carriage will retract with no damage to the media or existing data.

SAFETY

The disk drive is UL Listed and CSA Certified.

AC POWER CONNECTION

The disk drive is designed to support a daisy-chained ac power configuration, with the phases rotated between successive drives. **Only two disk drives may be configured in a daisy-chain.** The possible ac power configurations are listed below.

200/208/230 VAC, 60 Hz	Delta/Balanced Wye
200 VAC, 50 Hz	Delta
220/230/240 VAC, 50 Hz	Wye (Phase-to-Neutral)

SECTION 3

INSTALLATION

INTRODUCTION

Careful planning is an important part of installation. This section contains installation data useful for planning purposes. More information is available in the B9494-5 Fixed Disk Drive Installation Planning Guide (IPG) and through Burroughs representatives.

GENERAL INFORMATION

Shipment

All disk drives are shipped using commercial carriers. Each disk drive is separately packaged for shipment according to EDP-industry standards and recommendations of the carrier.

Equipment and Data

The power cable and certain Test and Field Documents are delivered with the unit. All publications, including installation documentation, and the disk drive/controller interface cables are ordered separately.

Site Requirements

The environmental conditions, power, and floor space requirements are contained in section 4.

Physical Placement

Figure 3-1 shows the installation planning template for the disk drive. Burroughs installation specialists are available to assist the customer in site preparation and installation planning.

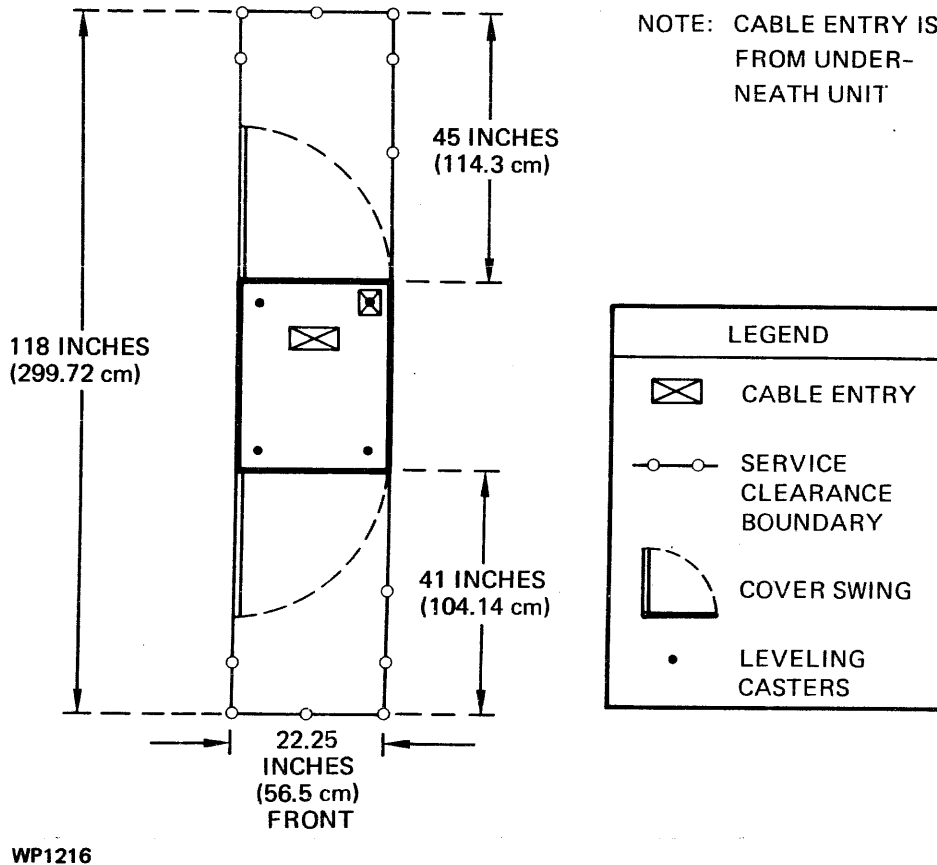


Figure 3-1. Installation Planning Template

Process

All installation activities, from unpacking to equipment handover for operation, are performed by the Burroughs Customer Service/Field Engineer (CSE). The CSE has the expertise required to properly install the disk drive and verify its performance through subsystem testing. The installation process includes:

- Unpacking and visual inspection.
- Physical placement and leveling.
- Checks to ensure that boards, connectors, cables, and hardware are not damaged.
- Power configuration verification for comparison to site power available.
- Cabling as required for interconnections from controller to disk drive.
- Mechanical preparations, as required, to remove shipping materials which protect internal assemblies from shipping vibration and loading shock.
- Electrical preparation, as required to set drive address and format, and configure power.
- Subsystem testing as needed to ensure that the drive is operational.
- Disposition of all shipping and installation materials away from local area.

Initialize/Verify/Relocate Procedures

Initialize/Verify/Relocate (IVR) procedures are used to format the Head Disk Assembly. Although IVR procedures are initially done at the factory in the 180 Byte/Sector, Interlaced format, a format change, if required, may be done in the field. IVR procedures are also used to locate possible media defects and to relocate those sectors that may contain the defects.

Specifications

Installation specifications are contained in section 4.

SECTION 4

SPECIFICATIONS SUMMARY

INTRODUCTION

This section contains a summary of disk drive specifications. Table 4-1 contains data retrieval times. Table 4-2 contains installation specifications.

Table 4-1. Data Retrieval Times

• Average Latency	8.33 msec
• Maximum Latency	17.13 msec
• Average Access Time	22 msec
• Maximum Access Time	42 msec
• Maximum Single-Track Seek Time	8 msec
• Average Access to Data Time	30.33 msec
• Data Transfer Rate	
Sequential	1.2 megabytes/sec
Interlaced	605 kilobytes/sec

Table 4-2. Installation Specifications

DIMENSIONS

Height	111.80 cm (44 inches)
Width	56.5 cm (22.25 inches)
Depth	81.28 cm (32 inches)
Weight	231.3 kg (510 pounds)

SERVICE CLEARANCES*

Front	104.14 cm (41 inches)
Rear	114.30 cm (45 inches)

CABLE LENGTHS

I/O Cables	
Controller/Drive	10 m (33 feet) maximum
Exchange/Drive	10 m (33 feet) maximum
Power Cable	4.57 m (15 feet) maximum

* The air ducts underneath the drive should be kept free of any obstruction that would affect air intake.

Table 4-2. Installation Specifications (Cont)

ENVIRONMENTAL CONDITIONS	RANGE	OPTIMUM
Operating		
Temperature	16-32°C (60-90°F)	24°C (75°F)
Relative Humidity	20-80%	50%
Maximum Wet Bulb Temperature Variation	26°C (78°F) 2.7°C/hr (5°F/hr)	
Non-Operating		
Temperature	10-49°C (50-120°F)	
Relative Humidity	10-90%	
Maximum Wet Bulb Temperature Variation	26°C (78°F) 5.4°C/hr (10°F/hr)	

POWER REQUIREMENTS

• Voltage (60 Hz)	200/208/230 Vac ±10%
Frequency	60 (±0.5) Hz
Phase	Three Phase, Delta/Balanced Wye
Branch Service	10 amperes
• Voltage (50 Hz)	200 Vac ±10%
Frequency	50 (+0.5, -1.0) Hz
Phase	Three Phase, Delta
Branch Service	10 amperes
• Voltage (50 Hz)	220/230/240 Vac ±10%
Frequency	50 (+0.5, -1.0) Hz
Phase	Three Phase, Wye (Phase-to-Neutral)
Branch Service	10 amperes
AIR INTAKE	210 CFM
MAXIMUM HEAT DISSIPATION	1,170 watts (4,000 btu/hr)
KVA	1.4 KVA

