

# **CDC® 33801/3350X DISK SUBSYSTEM**

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## **USER/ANALYST GUIDE**



83322630

**GD** CONTROL DATA  
CORPORATION



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This manual is intended for personnel involved with planning hardware and software requirements for installation of the CDC® 33801/3350X Disk Memory Subsystem. The reader should have current knowledge of the standard IBM System/360 and System 370 operating systems including DOS/VS, OS/VS1, OS/VS2, (SVS and MVS), and VM/370, and should also be thoroughly familiar with the general theory and concept of direct access storage devices.

The information is organized into five major subject headings:

- Section 1 - Introduction. Provides a general description of the purpose and organization of the manual.
- Section 2 - Hardware Description. Describes the subsystem physical and functional characteristics, standard and optional features.
- Section 3 - Hardware Planning. Provides installation data including space and power requirements, addressing limitations, etc.
- Section 4 - Software Planning. Provides information on system software,

installation, program support, optimization, fixed head usage, and data conversion.

Section 5 - Questions and Answers. Answers to commonly asked questions relating to both hardware and software.

The following manuals are recommended for those seeking supplementary information on the subject matter covered in this manual:

<u>Publication No.</u>	<u>Manual</u>
GC20-1780	IBM 3350/3344 Installation and Conversion Guide
GA26-1638	Introduction to IBM 3350 Direct Access Storage
GC26-3855	IBM OS/VS and DOS/VS Analysis Program - 1 (AP-1)
83322210	CDC 3380/3350X Disk Memory Subsystem General Information
83323420	CDC 3380/3350X Hardware Analysis Program (HAP) Reference Manual

**GENERAL INFORMATION**

The CDC 33801/3350X Disk Memory Subsystem is a high speed random access storage facility for data base, data communications, or general purpose use. The subsystem provides direct access storage for IBM System/360 Models 85 and 195, System/370 Models 135, 138, 145, 148, 155-II, 158, 165-II, 168, 195, and IBM compatible systems such as those marketed by Amdahl, Intel, and CDC.

The subsystem consists of one CDC 38302 Storage Control, and one to four strings of CDC 33801 or 3350X Disk Storage units. At the customers option, the CDC 38302 Storage Control may be replaced by an IBM 3830 Model 2 or Integrated Storage Control (ISC). In addition, one or more strings within the subsystem may be replaced by IBM 3350 Direct Access Storage.

Nine models of the 33801/3350X Disk Storage are available as follows:

33801-A2	33501-A2	33502-A2
33801-B2	33501-B2	33502-B2
33801-C2	33501-C2	33502-C2

Each unit contains two independent devices. The storage capacity of each device is determined by the compatibility mode.

The following compatibility modes are assigned to each device according to the product number:

	<u>33801</u>
2 x 3330-11	(400 megabytes)
	<u>33501</u>
1 x 3350	(317.5 megabytes)
	<u>33502</u>
2 x 3350	(635 megabytes)

The 33801/3350X A2 and C2 each contain a controller in addition to device logic. The 33801/3350X B2 contains only device logic. All models are available with or without fixed head (zero seek time) storage. Models configured with fixed head capability are identified by the letters "FHF" appended to the model designator.

The first unit in each string must be a model A2. Up to three additional Model B2 units may be attached to the A2 unit. When increased data availability is required, the dual access feature, or alternate controller

feature, or a combination of both features, may be used for device sharing. Dual access provides dynamic (online) device sharing. The alternate controller feature is manually selectable in the event of primary controller failure.

Two A2 units (two device strings) are required when dual access is selected. When alternate controller is selected the last B2 unit in the string is replaced by a C2 unit. The Model C2 functions as either a B2 or A2 depending on the setting of a manual switch located on the C2.

**OPTIONAL FEATURES**

The basic 33801/3350X subsystem may be equipped at the factory or in the field, with the following optional features:

- Two Channel Switch (STO 68426-1) - Installed in the CDC 38302 Storage Control. Permits the storage control to be shared by two block multiplexer channels. The two channels may be attached to the same system or to two different systems.
- Four Channel Switch (STO 68426-3) - Installed in the CDC 38302 Storage Control. Permits the storage control to be shared by four block multiplexer channels. A maximum of two channel may be attached to the same system. STO 68426-1 must be installed before the option can be installed.
- Register Expansion (STO 69055-1) - Installed in the CDC 38302 Storage Control. Provides additional registers for microprogram use. This feature is required when the storage control is attached to CDC 33801/3350X or IBM 3350 devices.
- Memory Expansion (STO 68428-2) - Installed in the CDC 38302 Storage Control. Expands the available microprocessor memory from 4K to 6K. This feature is required when the storage control is attached to CDC 3380/3350X or IBM 3350 devices.
- Memory Expansion (STO 69054-1) - Installed in the CDC 38302 Storage Control. Expands the available microprocessor memory from 6K or 8K. This feature is required when the storage control is attached to CDC 33801/3350X or IBM 3350 devices.



- String Switch (STO 69070-3) - Installed in the 33801/3350X A2. Permits the controller in A2 units to be dynamically shared by two storage control units. Either storage control can operate or reserve any of the online devices, but both units cannot select the controller simultaneously.
- String Switch (STO 69070-5) - Installed in the 33801/3350X C2. Permits the controller in C2 units to be dynamically shared by two storage control units. Either storage control can operate or reserve any of the online devices, but both units cannot select the controller simultaneously.
- Dual Access (STO 69082-1) - Installed in the A2, B2, C2. Permits concurrent access to separate devices in the same string from two central processor units (CPUs), or two channels on the same CPU. This feature requires two A2 units plus two storage controls. The dual access feature also permits the integrated controller in the A2 or C2 to control up to 16 devices (two strings).
- Fixed Head (STO 69071-2) - Installed in the A2, B2, C2. Adds fixed head storage with no seek time delay to the unit. Total data storage is not affected because an equivalent amount of storage under movable heads is inaccessible.
- Primary Controller Adapter (STO 69072-1) - Installed in the A2. Permits the user to manually select either the A2 or C2 as the online controller.

## MODEL CHANGES

Conversion kits for changing model types are available for field installation as shown below:

<u>From</u>	<u>To</u>	<u>STO/SPO Number</u>
33801	33502	STO 69083-1
33502	33801	STO 69083-2
33501	33801	STO 69086-1
33501	33502	STO 69087-1
33801	33501	STO 68731-1
33502	33501	STO 68732-1

IBM Utility programs are available to reformat previously initialized head and disk assemblies.

## HEAD AND DISK ASSEMBLY

The 33801/3350X uses a fixed (non removable by the operator) head and disk assembly (HDA) as a storage medium. The HDA is an enclosed disk pack containing integral read/

write heads. The heads are mechanically attached to a carriage which is moved by the device voice coil during operation. When the HDA is not in use, the heads reside in the carriage home position.

Each HDA provides a total of 400, 317.5, or 635 megabytes of direct access storage depending on mode of operation (see selective format feature) and model selected.

The optional fixed head feature (FHF) permits the user to access a portion of the total HDA capacity in lieu of the same capacity under movable heads.

## SELECTIVE FORMAT FEATURE

Each device is formatted at the factory into either of two IBM compatibility modes: 3330-11 or 3350 as specified by the customer (refer to table 2-1).

In the 400 megabyte (33801) mode, a single device contains two 3330-11 logical volumes. Each volume is equivalent to an actual IBM 3330-11 or CDC 33302 device in capacity and format.

In the 317.5 megabyte (33501) mode, a device contains one IBM 3350 logical volume. Each volume is equivalent to an actual IBM 3350 device in capacity and format.

In the 635 megabyte (33502) mode a device contains two logical volumes. Each volume is equivalent to an actual IBM 3350 device in capacity and format.

## TRACK/CYLINDER CONCEPT

Data is stored on the disk surface within the HDA. Each data surface is mated with two physical read/write heads connected to a common access mechanism.

All heads move with the access mechanism but only one head may be selected at a time. A single physical read/write head processes one logical track for each access position and disk revolution. All tracks utilize a common starting point (index) for all modes.

Figure 2-1 shows the physical relationship of the primary and secondary logical volumes to the physical access positions of the HDA.

### 3330-11 COMPATIBILITY MODE

A single logical track formatted in 3330-11 compatibility mode occupies approximately 245° of disk revolution. The cylinders are mapped two-into-one meaning that two logical cylinders are contained in each physical access position as shown in figure 2-2. All even logical cylinders are under physical

TABLE 2-1. COMPATIBILITY MODE

	33801 (2 x 3330-11)	33501 (1 x 3350)	33502 (2 x 3350)
Logical Volume Capacity (megabytes)	200	317.5	317.5
Module Capacity (megabytes)	400	317.5	635
Data Rate (kilobytes per second)	1198	1198	1198
Average Latency (milliseconds)	8.4	8.4	8.4
Access Time Per Logical Volume (milliseconds)			
Minimum	10 (a)	10 (a)	10 (a)
Average	18	18	18
Maximum	31 (b)	31 (d)	31 (c)
Access Time Per Physical Volume (milliseconds)		N/A	
Minimum	10 (a)	N/A	10 (a)
Average	24	N/A	25
Maximum	49 (d)	N/A	50 (e)
Logical Cylinders Per Module			
Primary Data	2 x 808	555	2 x 555
Alternate Data	2 x 7	5	5
CE	1	1	1
Logical Cylinders Per Physical Cylinder	2/1	4/3	4/3
Logical Track Per Logical Cylinder	19	30	30
Track Capacity (bytes)	13 030	19 069	19 069
Cylinder Capacity (bytes)	247 570	572 070	572 070
Fixed Head Logical Cylinders	1 thru 5	1 thru 3	1 thru 3
Fixed Head Data Capacity (megabytes)	1.24 <sup>1</sup>	1.72	1.72
<sup>1</sup> Fixed Head Storage associated only with primary volume (a) = 1 Track, (b) = 808 Track, (c) = 554 Track, (d) = 1615 Track, (e) = 1108 Track			

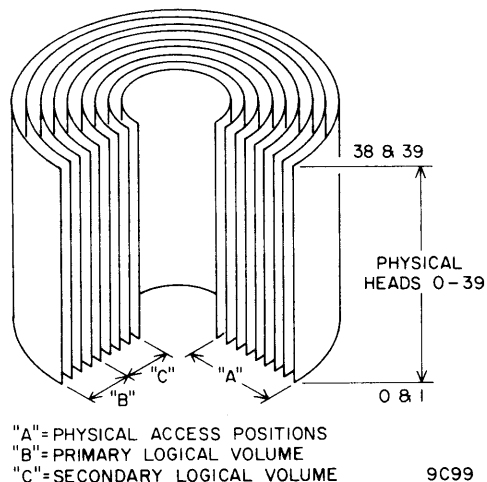


Figure 2-1. Volume Concept

read/write heads 0 through 18. Odd logical cylinders are under physical read/write heads 20 through 38.

### 3350 COMPATIBILITY MODE

A single logical track formatted in 3350 compatibility mode occupies a full 360 degrees of disk revolution. Cylinders are mapped four-into-three, meaning that four logical cylinders are contained in three physical access positions as shown in figure 2-3. Every fourth logical cylinder beginning with logical cylinder one is mapped into three access positions and utilizes physical read/write heads 30 through 39. All remaining logical cylinders are contained in a single access position and utilize physical read/write heads 0 through 29.

### FIXED HEAD STORAGE

Fixed head storage consists of 96 fixed position read/write heads. The fixed head assemblies are physically located opposite the bottom surface of disk zero (see figure 2-4). When the device is formatted in 3330-11 compatibility mode, a total of 95 read/write heads provide 1.24 megabytes of zero access storage. Overall HDA storage remains unchanged because movable head logical cylinders 001 through 005 are no longer available to the system. When the device is formatted in 3350 compatibility mode, a

total of 90 fixed read/write heads provide 1.72 megabytes of zero access storage. Overall HDA storage remains unchanged because movable head logical cylinders 001 through 003 in the primary volume are no longer available to the system.

### DATA FORMAT

The basic unit of information is the 8-bit byte. All data transfers on the channel and controller interface are one byte parallel. A group of related bytes separated by a gap is called a field. Fields are grouped into logical units of information called records. Records normally consist of three fields: The count field, the key field (optional), and the data field. A series of similar records constitutes a logical file.

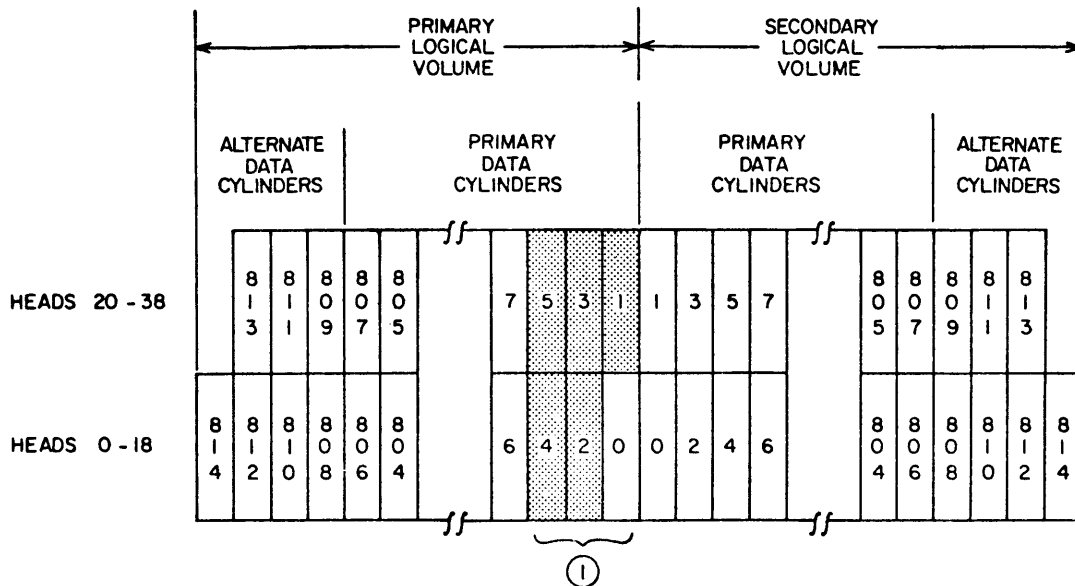
All data tracks are formatted beginning with index. Each track is then formatted in an identical manner: Home address, Record Zero (Track Descriptor Record), and one or more data records (numbered R1 through Rn). Record Zero is normally formatted without a key field.

Note: Tracks formatted in 3330-11 compatibility mode are terminated by pseudo-index which precedes true index. Tracks formatted in 3350 compatibility mode are terminated by true index. Track format is illustrated in figure 2-5.

### GAPS

All records and fields within records are separated by gaps. The gaps function as follows:

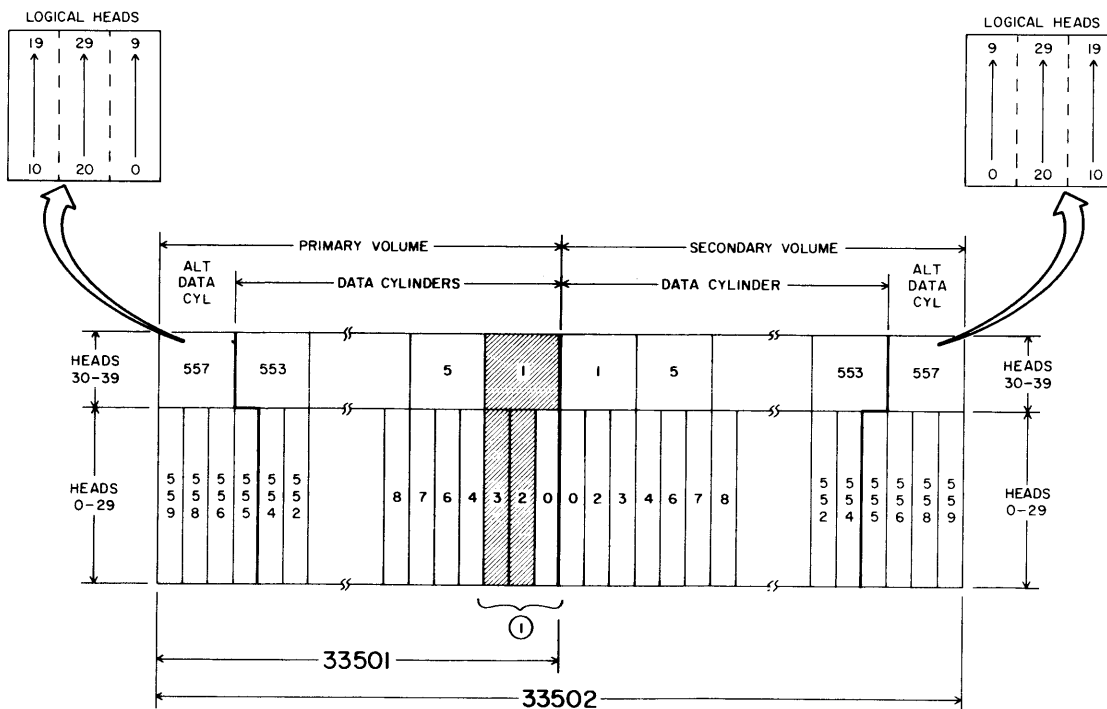
- G1 separates Index and Home Address
- G2 separates Home Address and R0 count field; count field from their associated key fields, key fields from their associated data fields.
- G3 precedes all count fields except R0. This gap contains a special area called an address mark (AM) to indicate the beginning of a data record.
- Last gap follows the end of the last data field to index.
- G4 is special gap used for defect skipping. A G4 gap may precede or split a field.



(1) CYLINDERS 1-5 IN PRIMARY VOLUME ALLOCATED TO FIXED HEAD STORAGE WHEN FIXED HEAD FEATURE IS INSTALLED.

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Figure 2-2. 3330-11 Compatibility Mapping



NOTES: (1) CYLINDERS 1-3 ARE ALLOCATED TO FIXED HEADS WHEN THE FIXED HEAD FEATURE IS INSTALLED.

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Figure 2-3. 3350 Compatibility Mapping

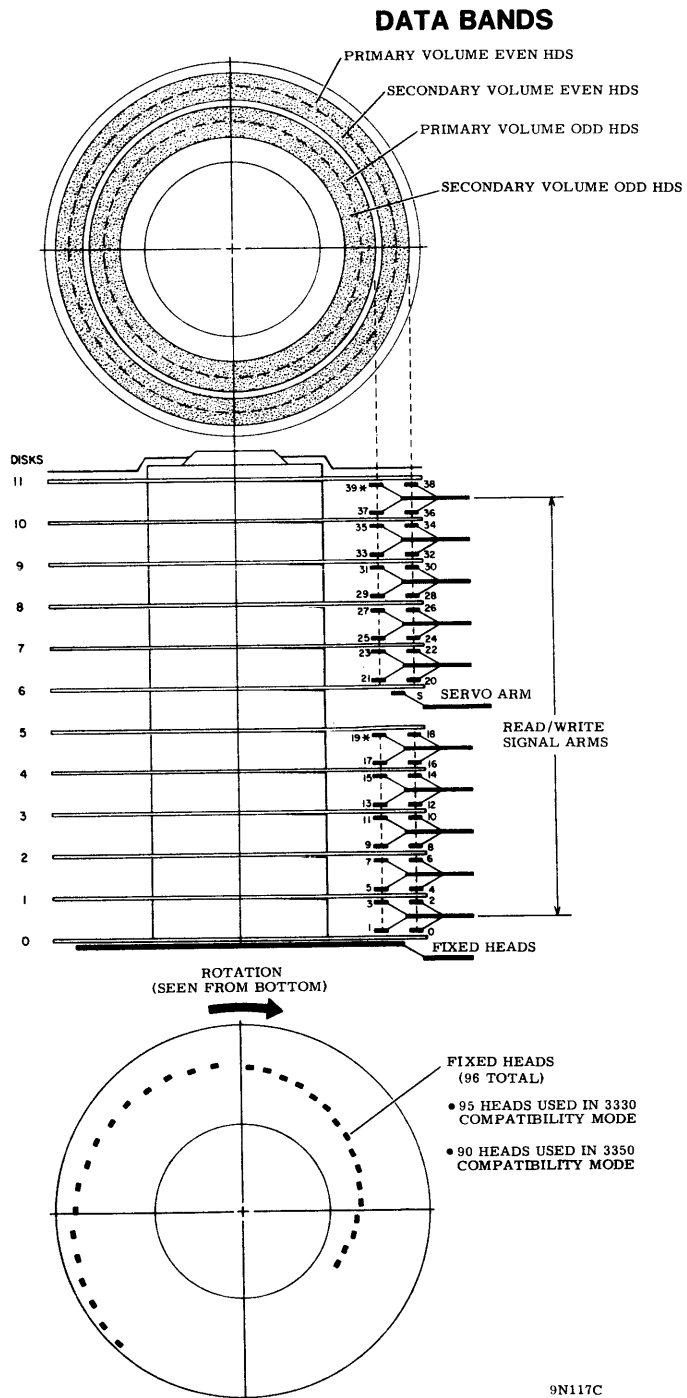
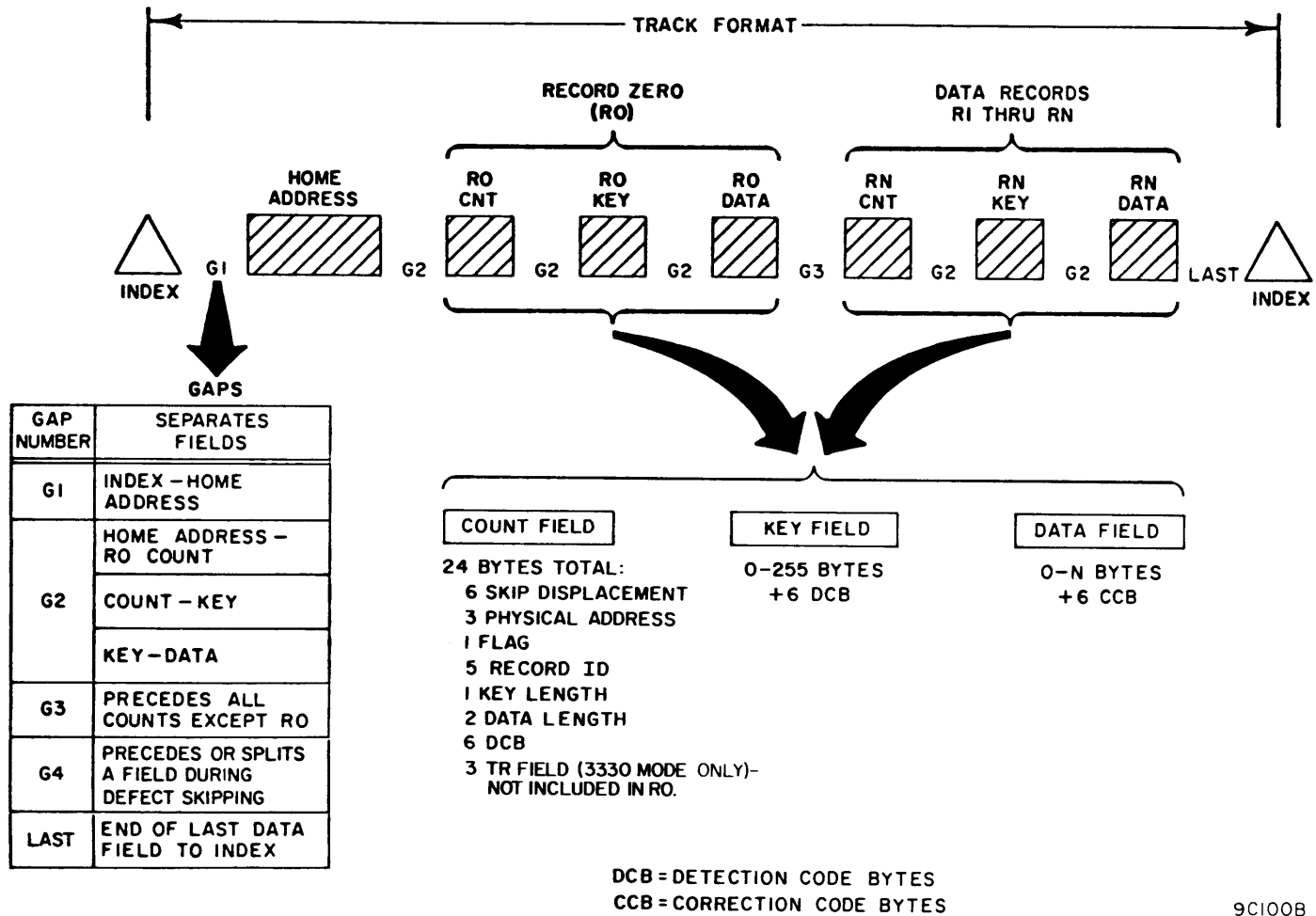


Figure 2-4. Fixed Head Storage



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Figure 2-5. Track Format

## HOME ADDRESS

The first record following Index is the Home Address record. This record identifies the track and head number. It also specifies the condition of the track. Refer to table 2-2 for record format. Home address may be used frequently by normal programming operations, however, it is not changed by these operations. It may be written or read by special instructions that operate only with this record. In addition, because it has no address marker field preceding it, it is searched by an instruction that operates only on home address.

## TRACK DESCRIPTOR RECORD

The Track Descriptor Record (record 0) follows the home address record. This record is used primarily to enable the operating system to determine the number of unused byte locations remaining on the track. A secondary use of the Track Descriptor Record is to flag the condition of the track to permit data relocation to an alternate track. On defective tracks, the record 0 count field points to the alternate track; record 0 data field will be all zeros. On alternate tracks, record 0 count field points to the defective track; record 0 data field will contain the track descriptor. Refer to table 2-3 for byte information.

Record zero is always separated from home address by a G2 fixed gap. Gaps between the R0 count field, key and/or data field are also fixed (G2).

This record is normally written by utility programs concurrent with writing home addresses. Special read and write commands are provided that operate only on R0.

## DATA RECORDS

One or more data records may follow the track descriptor record. Data records are used for recording customer generated information. Each data record has a count field, a key field (optional), and a data field. Refer to table 2-4 for byte information. The data records are numbered sequentially beginning with one.

Address marks are provided in the gap preceding each data record to provide initial orientation.

The data field of a data record may exceed the track length. Special write commands are

used to format such records; these commands cause writing to continue on the next sequential track, up to the highest numbered track. Each segment contains count and key fields, the count pertaining only to that segment of the total data record. An end of file (EOF) record is a record with a data length of zero bytes. The EOF defines the end of a logical group of records. This record is written by a Write Count, Key and Data command with the byte count set to eight. The storage control then writes one byte of zeros followed by the correction code bytes (CCB).

The count field in data records R1 through Rn is always separated from the data field of the previous record by a fixed gap (G3).

## PARITY

To check data accuracy, a parity bit is appended to each byte of information transmitted on the channel and controller interface. When a byte is formed, the parity bit is set to either 1 or 0 to maintain an odd number of 1-bits within the byte (i.e., odd parity). Each byte of data is checked for correct parity by the receiving unit.

## ERROR CORRECTION CODE

The ECC logic in the controller appends a six byte error code to the end of each field of information written. During subsequent read or search operations, the error code is recomputed and compared against the error bytes.

The error correction code bytes added to a Home Address, Count or Key field are defined as Detection Code Bytes (DCBs) and provide error detection capability only.

The error correction code bytes added to a Data field are defined as Correction Code Bytes (CCBs) and provide error detection and error correction capability.

The DCB and CCB can detect an error burst of ten bits or less. The CCB can correct an error burst of four bits or less.

The CCB information relating to a correctable error in a data field is transmitted to the central processor unit (CPU) to affect a correction. An uncorrectable error is handled by the system error recovery procedure.

TABLE 2-2. HOME ADDRESS BYTES

Byte Configuration:	SD 0-5	PA 6-8	F 9	C 10-11	H 12-13	DCB 14-19
Byte Number	Byte Name		Function			
0-5	Skip Displacement (SD)		Provides information on the number and location of defects.			
6-8	Physical Address (PA)		Supplied by storage control for address verification.			
9	Flag (F)		<p>Defines track condition</p> <p>Bit 0 - Turned on by storage control if skip displacement indicates R0 count field is moved.</p> <p>Bit 1 - Not used = 0</p> <p>Bit 2 - Set to "1" when HA is moved to skip a defect</p> <p>Bit 3 thru 5 - Not used - 0</p> <p>Bits <u>6 and 7</u></p> <p>0 0 = good normal track                      0 1 = good alternate track                      1 0 = defective normal                      1 1 = defective alternate track</p> <p>The flag byte in the HA field may be transferred to or from the using system.</p>			
10,11	Cylinder Address (C)		<p>Logical cylinder of the track as follows:</p> <p>3330-11 Mode: 0 thru 807</p> <p>3350 Mode: 0 thru 554</p>			
12,13	Head Address (H)		<p>Logical head of the track as follows:</p> <p>3330-11 Mode: 0 thru 18</p> <p>3350 Mode: 0 thru 29</p>			
14 thru 19	Detection Code Bytes (DCB)		Used for error detection. Bytes are generated and checked by the controller without program intervention.			



TABLE 2-3. TRACK DESCRIPTOR RECORD BYTES

Count Field			
Byte Configuration:	SD	PA	F C H R KL DL DCB
	0-5	6-8	9 10-11 12-13 14 15 16-17 18-23
Byte Number	Byte Name	Function	
0-5	Skip Displacement (SD)	Provides information on the number and location of defects. These bytes are transparent to the using system.	
6-8	Physical Address (PA)	Supplied by storage control for address verification. These bytes are transparent to the system.	
9	Flag (F)	Defines track condition  Bit 0 - Defect in next count field  Bit 1 - Defect in key field of this record  Bit 2 - Defect in data field of this record  Bit 3 - Not used = 0  Bit 4 - Logical record continues on next track (overflow)  Bit 5 - Not used = 0  Bits <u>6 and 7</u>  0 0 = Good normal track 0 1 = Good alternate 1 0 = Defective normal track 1 1 = Defective alternate track	
10, 11	Cylinder Address (C)	Logical cylinder of the track. Same as cylinder address in home address field when bits 6 and 7 in flag byte of this field = 00 or 11  Address of the defective track for which this track is an alternate when bits 6 and 7 in flag byte of this field = 01. Address of alternate track when bits 6 and 7 in flag byte of this field = 10.	
12, 13	Head Address (H)	Logical head of the track as follows:  3330-11 Mode: 0 thru 18  3350 Mode: 0 thru 29	
14	Record Number (R)	Sequential number of the record on the track (zero for record R0)	
15	Key Length (KL)	Specifies the number of bytes (excluding DCB bytes) in the key field (normally zero for R0)	
16, 17	Data Length (DL)	Specifies the number of bytes (excluding CCB bytes) in the data field.	
18-23	Detection Code Bytes (DCB)	Used for error detection. Bytes are generated by controller without program intervention	

Table continued on next page

TABLE 2-3. TRACK DESCRIPTOR RECORD BYTES (Contd)

Key Field		
Byte Configuration:		
	Key	DCB
Byte Number	Byte Name	Function
(0-255)	Key	Key field information (normally zero for R0)
(6)	Detection Code Bytes (DCB)	Used for error detection. Bytes are generated and checked by controller without program intervention.
Data Field		
Byte Configuration:		
	Data	CCB
0 - 13 030 3330-11)	Data	Data field information
0 - 19 069 (3350)		
(6)	Correction Code Bytes (CCB)	Used for error detection and correction. Bytes are generated and checked by controller without program intervention.

TABLE 2-4. DATA RECORD BYTES

Count Field										
Byte Configuration:	SD	PA	F	C	H	R	KL	DL	DCB	TR
	0-5	6-8	9	10-11	12-13	14	15	16-17	18-23	24-26
Byte Number	Byte Name		Function							
0-5	Skip Displacement (SD)		Provides information on the number and location of defects. These bytes are normally transparent to the system.							
6-8	Physical Address (PA)		Supplied by storage control for address verification. These bytes are normally transparent to the system.							
9	Flag (F)		Defines track condition. Refer to flag byte description in track descriptor record.							
10, 11	Cylinder Address (C)		Logical cylinder of this track. Refer to cylinder address description in track descriptor record.							
12, 13	Head Address (H)		Logical head of the track as follows:  3330-11 Mode: 0 thru 18  3350 Mode: 0 thru 29							
14	Record Number (R)		Sequential number of the record on the track.							
15	Key Length (KL)		Specifies the number of bytes (excluding DCB bytes) in the key field							
16, 17	Data Length (DL)		Specifies the number of bytes (excluding CCB bytes) in the data field.							
18-23	Detection Code Bytes (DCB)		Used for error detection. Bytes are generated by controller without program intervention.							
24-26	TR Count (3330-11 Mode only)		Count of number of bytes that would be used if this were a genuine 3330-11 device. Used to generate a pseudo index.							
Key Field										
Bytes Configuration:	Key				DCB					
Byte Number	Byte Name		Function							
(0-255)	Key		Key field information							
(6)	Detection Code Bytes (DCB)		Used for error detection. Bytes are generated by controller without program intervention.							
Data Field										
Byte Configuration	Data				CCB					
0-13 030 3330-1 or 3330-11 0-19 069 (3350)	Data		Data field information							
(6)	Correction Code Bytes (CCB)		Used for error detection and correction. Bytes are generated and checked by controller without program intervention.							

## DEFECT SKIP

The defect skipping feature permits the fixed module drive to record data immediately ahead of and following a surface defect thereby eliminating the need to move the read/write heads to an alternate track.

When writing a track containing a defect, a special gap is written over the defective area to prevent data from being recorded. If a defect is too large or if there are more than three defects on a track, the track is flagged and an alternate track is assigned. The HDA is shipped from the factory flag free. Total data capacity is not changed by defect skipping. Defect skipping is transparent at the channel level.

## HARDWARE ANALYSIS PROGRAM (HAP)

HAP is a problem isolation utility program similar in content to the IBM Analysis Program - 1 (AP-1). The program checks to determine if these are device problems or storage media problems.

The program may be run under any of the following operating systems:

<u>Operating System</u>	<u>Minimum Release Level</u>
DOS/VS	34.0
OS/VS1	6.0
OS/VS2 (SVS)	1.7
OS/VS2 (MVS)	3.7

Additional information may be found in the HAP manual listed in section 1 of this manual.

**STORAGE CONTROL CONFIGURATIONS**

The 33801/3350X Model A2 interfaces with the computer system via any of the following storage control units:

- CDC 38302 Storage Control
- IBM 3830-2 Storage Control
- IBM System/370 Model 145 and 148 Integrated Storage Control (ISC)
- IBM System/370 Model 145 Storage Control Frame 3345 Models 3, 4 and 5
- IBM System-370 Models 158 and 168 Integrated Storage Control (ISC)

When attached to the CDC 38302 or IBM 3830-2, the 33801/3350X subsystem provides direct access storage for IBM System/360 Models 85 and 195 and System-370 Models 135, 138, 145, 148, 155-II, 158, 165-II, 168 and 195 computer systems. Attachment to the System/360 Models 85 and 195 and System/370 Models 165-II, 168 and 195 is made via the IBM 2880 Block Multiplexer Channel. Attachment to the System/370 Models 135, 138, 145, 148, 155-II, and 158 is made via the system block multiplexer channel.

Each 38302 or 3830-2 Storage Control is capable of interfacing up to four strings of CDC 33801/3350X, CDC 3301/2 (equivalent to IBM 3330 Models 1 and 11), or IBM 3350 type device strings in any combination. Different device types (CDC 3330X, CDC 33801/3350X, IBM 3330-1, -11, 3350) do not attach to the same string.

When attached to an ISC, the subsystem provides direct access storage via a block multiplexer channel for System/370 Models 145, 148, 158 and 168 computer systems. The System/370 Models 145 and 148 ISC provides a single storage and control path. The System/370 Models 158 and 168 ISC provides a dual storage and control path. Each storage and control path on the ISC is capable if interfacing up to four CDC 33801/3350X or CDC 33301/2 (equivalent to IBM 3330 Models 1 and 11) type drive strings in any combination.

Table 3-1 contains a listing of the features required by IBM storage control units when interfacing 33801/3350X device strings. Different device types (CDC 3330X, CDC 33801/3350X, IBM 3330-1, -11, 3350) do not attach to the same string.

TABLE 3-1. IBM STORAGE CONTROL FEATURES

Storage Control	CDC DASD Feature	IBM Control Store Extension Feature	IBM Expanded Control Store Feature	IBM Word Buffer Feature	IBM Register Expansion Feature	Max. No. of Controllers	Max. No. of devices
ISC on 3345 Storage and Control Frame Models 3, 4 and 5	①	--	#2152	#8810	#6111	4	32
ISC Feature #4660 on S/370 Model 145 and 148	①	--	#2152	#8810	#6111	4	32
ISC Feature #4650 on S/370 Model 158 and 168	①	#2150	#2151	--	#6111	8	64
3830-2 Storage Control	①	#2150	#2151	--	#6111	4	32

NOTE: ① Functional microprogram provided by CDC.

## SUBSYSTEM SOURCE POWER

The 38302 Storage Control requires three-phase 15 ampere power from either a wye or delta source. The 33801/3350X Model A2 requires three-phase, 60 ampere power from either a wye or delta source. Selectable source voltage options are listed below.

38302 Storage Control					
60 Hz		50 Hz			
200 V } 208 V } 230 V }	4-Wire	200 V } 210 V } 220 V } 235 V }	5-Wire		
33801/3350X-A2 Fixed Module Drive					
200 V } 208 V } 230 V }		4-Wire		200/208 V } 220 V } 230/235 V }	5-Wire
	380 V } 398/400 V } 408/415 V }		5-Wire		

## ELECTRICAL SPECIFICATIONS

Function	38302 Storage Control	33801/3350X A2, C2	33801/3350X B2
Apparent Power	1.8 kVA	2.7 kVA	2.4 kVA
Power Factor	0.9	0.87	0.85
Heat Dissipation	5500 Btu/h (1619 W)	8000 Btu/h (2360 W)	7000 Btu/h (2060 W)

## INSTALLATION REQUIREMENTS

All channel and controller inter-unit cabling including the cabling between the A2 and C2 unit must be routed underneath the false floor. Interdrive unit I/O power cables are routed inside the drives (all units are bolted together).

Figures 3-1 and 3-2 illustrate the floor space requirements for the 38302 Storage Control and the 33801/3350X Disk Storage unit. Figure 3-3 shows the service clearance requirement for a sample subsystem incorporating a 38302 Storage Control.

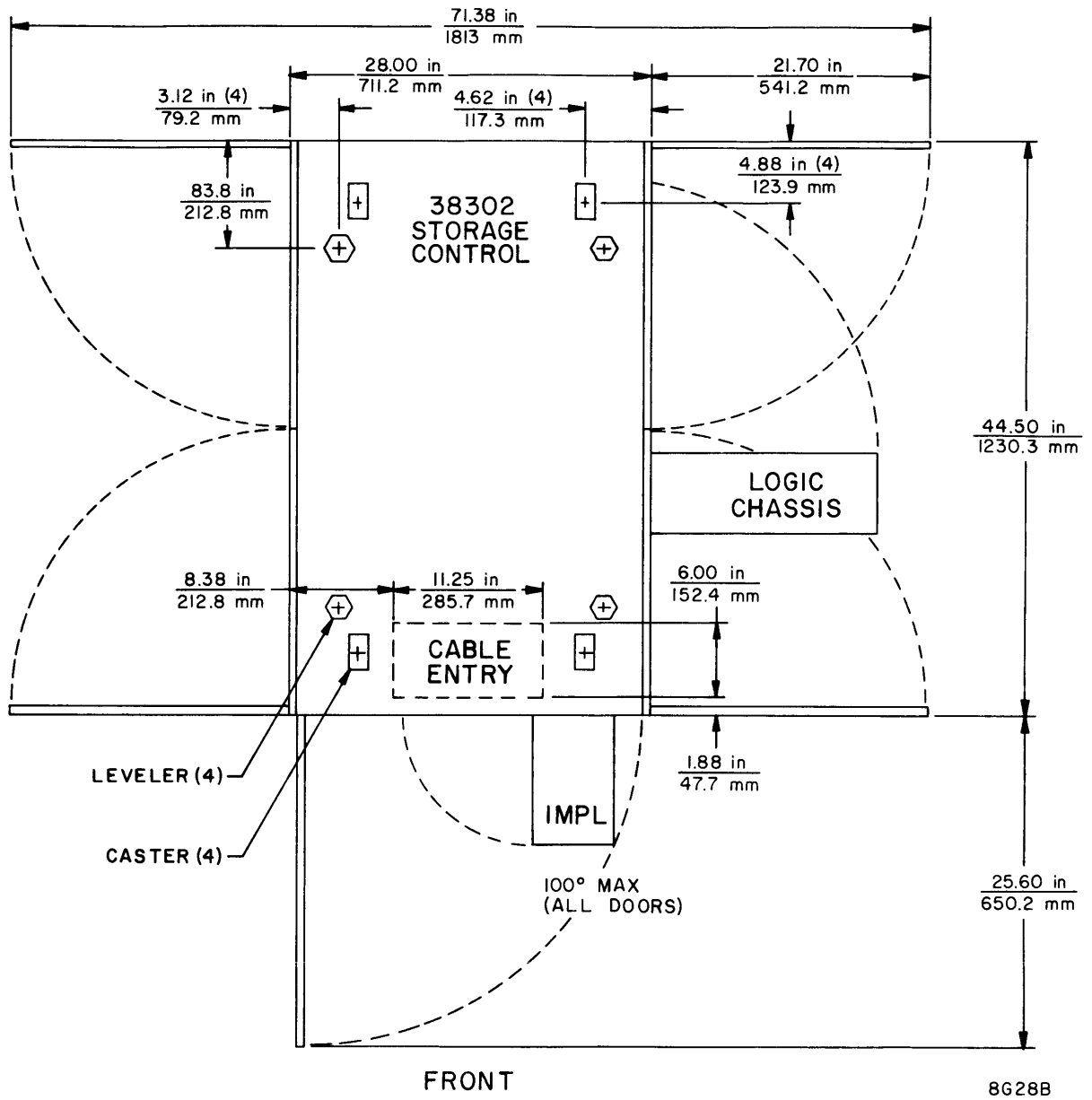
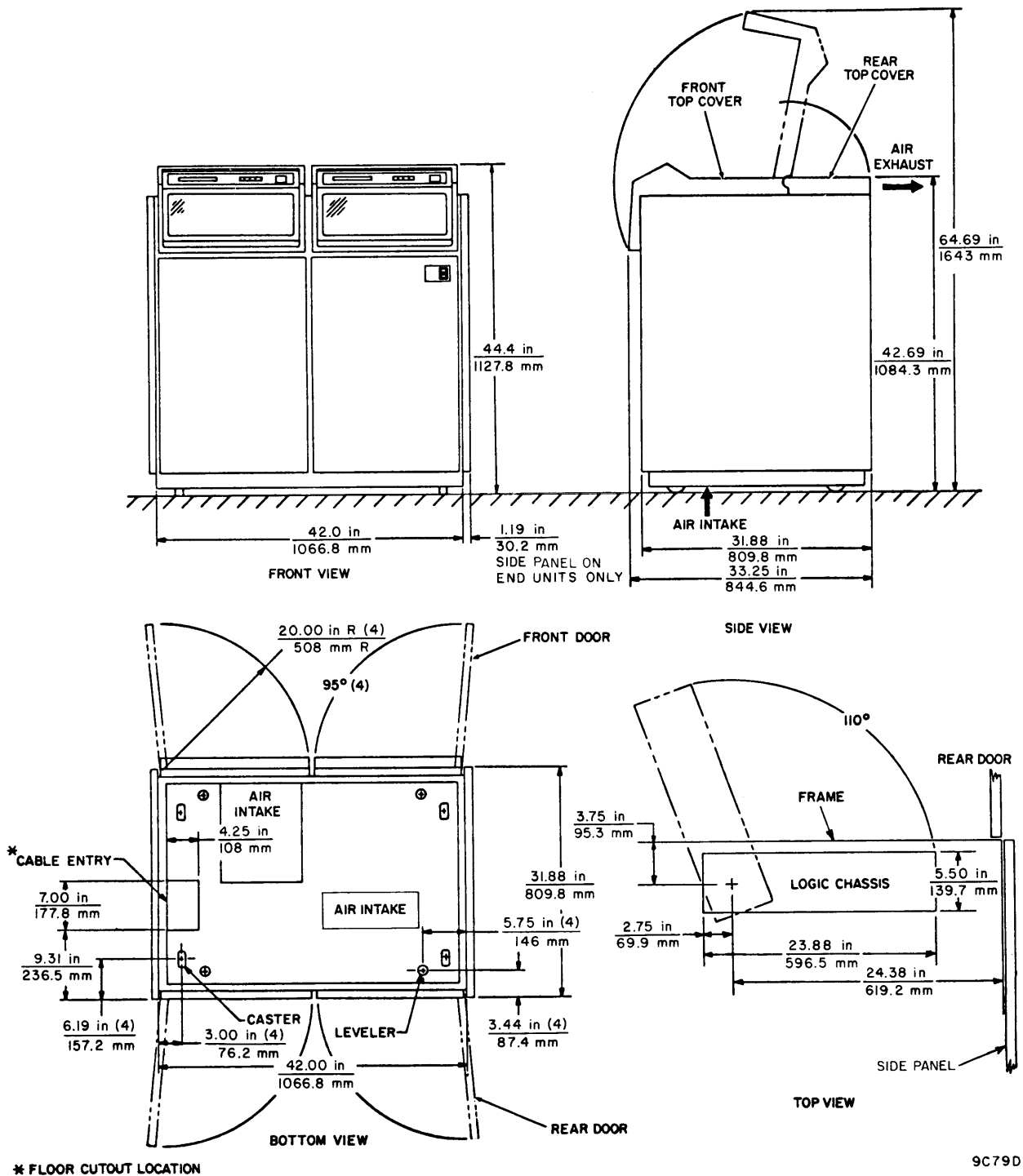


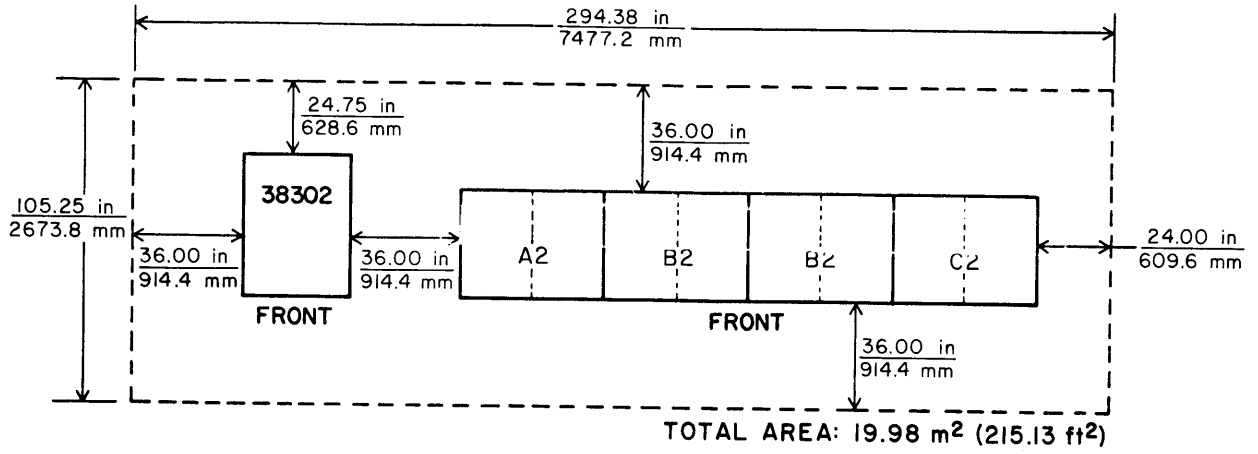
Figure 3-1. 38302 Space Requirements



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Figure 3-2. 33801/3350X Space Requirements





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Figure 3-3. Sample Subsystem Service Clearances

**SUBSYSTEM ADDRESSING**

The subsystem logical address is contained in a single 8-bit byte. Decoding of this byte is determined by the operating mode.

If the storage control is interfaced to one or more 33801 or 33502 devices, the address decoding for all attached devices is as follows:

Bits							
0	1	2	3	4	5	6	7
Storage Control Address		Drive Logical Volume "0" = Primary "1" = Secondary (set to zero on single volume drives)	String Address		Drive Address		

If the storage control is interfaced only to actual CDC 33301 or 33302 drives (equivalent to IBM 3330 models 1 and 11), IBM 3350 devices or to 33501 devices, then address decoding for all attached devices is as follows:

Bits							
0	1	2	3	4	5	6	7
Storage Control Address			String Address		Drive Address		
First Hex Digit				Second Hex Digit			

Addresses for storage control, controller and device are established by the user during subsystem installation. When addressing 33801 or 33502 units a total of 64 logical addresses may be required. When attached to actual 33301, 33302, IBM 3350 devices or to 33501 units a total of 32 logical addresses may be required. Smaller configurations of 8 and 16 logical addresses can also be configured. The smaller configurations require fewer unit control words (UCWs) in the channel. The range of device addresses for each configuration is shown in table 3-2.

TABLE 3-2. DEVICE ADDRESSING RANGES

DUAL VOLUME MODES			SINGLE VOLUME MODE		
Primary Addresses	Secondary Addresses	Addresses Required	Address Ranges from 00 to 7F	Addresses Required	Address Ranges from 80 to FF
00-07	20-27	16	00-07	8	80-87
00-07,10-17	20-27,30-37	32	00-07,10-17	16	80-87,90-97
00-0F	20-2F	32	00-0F	16	80-8F
00-1F	20-3F	64	00-1F	32	80-9F
08-0F	28-2F	16	08-0F	8	88-8F
08-0F,18-1F	28-2F,38-3F	32	08-0F,18-1F	16	88-8F,98-9F
10-17	30-37	16	10-17	8	90-97
10-1F	30-3F	32	10-1F	16	90-9F
18-1F	38-3F	16	18-1F	8	98-9F
40-47	60-67	16	20-27	8	A0-A7
40-47,50-57	60-67,70-77	32	20-27,30-37	16	A0-A7,B0-B7
40-4F	60-6F	32	20-2F	16	A0-AF
40-5F	60-7F	64	20-3F	32	A0-BF
48-4F	68-6F	16	28-2F	8	A8-AF
48-4F,58-5F	68-6F,78-7F	32	28-2F,38-3F	16	A8-AF,B8-BF
50-57	70-77	16	30-37	8	B0-B7
50-5F	70-7F	32	30-3F	16	B0-BF
58-5F	78-7F	16	38-3F	8	B8-BF
80-87	A0-A7	16	40-47	8	C0-C7
80-87,90-97	A0-A7,B0-B7	32	40-47,50-57	16	C0-C7,D0-D7
80-8F	A0-AF	32	40-4F	16	C0-CF
80-9F	A0-BF	64	40-5F	32	C0-DF
88-8F	A8-AF	16	48-4F	8	C8-CF
88-8F,98-9F	A8-AF,B8-BF	32	48-4F,58-5F	16	C8-CF,D8-DF
90-97	B0-B7	16	50-57	8	D0-D7
90-9F	B0-BF	32	50-5F	16	D0-DF
98-9F	B8-BF	16	58-5F	8	D8-DF
C0-C7	E0-E7	16	60-67	8	E0-E7
C0-C7,D0-D7	E0-E7,F0-F7	32	60-67,70-77	16	E0-E7,F0-F7
C0-CF	E0-EF	32	60-6F	16	E0-EF
C0-DF	E0-EF	64	60-7F	32	E0-FF
C8-CF	E8-EF	16	68-6F	8	E8-EF
C8-CF,D8-DF	E8-EF,F8-FF	32	68-6F,78-7F	16	E8-EF,F8-FF
D0-D7	F0-F7	16	70-77	8	F0-F7
D0-DF	F0-FF	32	70-7F	16	F0-FF
D8-DF	F8-FF	16	78-7F	8	F8-FF

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## OS/VSI & OS/VS2

All releases of OS/VSI and OS/VS2 (SVS and MVS) can support the 33801, which operates in 2x3330-11 compatibility mode. To utilize the 33501 or 33502 which operate in 3350 compatibility mode, the user may either order a release of OS/VSI or OX/VS2 that supports the 3350 or install the appropriate independent component release (ICR). See IBM reference GC20-1780, section 5.2 for more detailed information.

The device is transparent to OX/VSI and OS/VS2 in all compatibility modes. Each logical volume is treated in the same manner as real 3330-11 or 3350 devices; however, because the 33801/3350X is a fixed media device, the user should utilize the PRESRES and VATLST options to avoid mount/dismount requests.

## SYSTEM GENERATION

The user must perform a system generation utilizing a starter system that corresponds to the compatibility mode of the device. If the device is to be operated in 3350 compatibility mode, the following restrictions apply:

- OS/VSI: Starter system supported addresses are 48 thru 4B on channels 1, 2 and 3 only.
- OS/VS2 (SVS): Starter system does not support 3350 drives. A second SYSGEN must be performed if system residence on the device is desired.
- OS/VS2 (MVS): Starter system supported addresses are 48 thru 4B on channel 1 thru 6 only.

## PROGRAM PRODUCTS

The program products and user programs supported on the device are the same as those supported by IBM on the 3350. See IBM reference GC20-1780, section 5.2.1 for a listing. The information given in section 5.2.1 regarding standard access methods also applies to the 3380X. The precautions given in section 5.2.1 to avoid arm contention problems also apply when operating the device in 2x3330-11 or 2x3350 compatibility modes.

## JCL CHANGES

JCL requirements for the device operated in 3350 compatibility modes are the same as those stated in the IBM reference GC20-1780, section 5.2.3.

## VM/370

The device can operate in any compatibility mode under VM/370 environment i.e. paging and spooling, CMS system residence, parent for CMS mini-disks (115 cylinders maximum), RSCS system residence, and/or a dedicated device to a virtual machine. If installed, the user may want to consider allocation of the paging and spooling to the fixed head cylinders on the device. Also, because of possible volume/arm contention, the user must evaluate the amount of space that would be wasted by using one volume of a dual volume device as a SYSRES paging or spooling location with no allocation of data to the remaining volume.

## DOS & DOS/VS

DOS/VS release 30 and above can support the 33801 (2x3330-11 compatibility mode) provided IBM program product 5799-WHZ is installed. DOS/VS release 34 and above can support the device in all modes of operation.

All valid compatibility modes are transparent to DOS and DOS/VS. Each 3330-11 or 3350 logical volume is treated in the same manner as an actual 3330-11 or 3350 device. Because the 33801/3350X is a fixed media device, the user must avoid mount/dismount requests. This may be accomplished by using the specific address or address list for the volume(s) required, or by requesting a device assignment by type (i.e. 3330). Each logical 3330 device on a 33801 should be permanently assigned to a dummy logical unit block (LUB) to prevent mount/dismount requests.

## SYSTEM GENERATION

The user must perform a system generation that identifies each volume as an independent 3330 or 3350 type device.

**EXAMPLE:** To SYSGEN two 3330-11 volumes on a 33801 device with addresses of 250 and 270, place the following macros in the supervisor generation deck:

```
DVCGEN CHUN=X'250',DVCTYP=3330B
DVCGEN CHUN=X'270',DVCTYP=3330B
```

## PROGRAM PRODUCTS

Most programs in use on actual 3350 type devices need not be modified for use on the 3350X. See IBM reference GC20-1780, section 5.1.1 for a listing. The information given in section 5.1.1 regarding standard access methods also applies to the 33801/3350X as well as similar precautions to avoid arm contention problems.

## JCL CHANGES

The ASSGN statements must be changed if the devices are not replacing actual 3330 type devices at the same addresses or they are replacing actual 3330 type devices at different addresses. Also, EXTENT information must be changed to reflect any new volume labels.

## FIXED HEAD OPERATION

The fixed head feature may be installed on all 33801/3350X devices regardless of operating mode. When operating in 2x3330-11 or 2x3350 compatibility mode, however, the fixed head cylinders are available only to the primary volume.

Because of the zero access time advantage of the fixed head feature, it is to the user's benefit to allocate or place the most highly used or volatile data sets within the fixed head areas of the module. Suggested fixed head applications given in IBM reference GC20-1780, sections 6.4 and 6.4.1 are also applicable to the 33801/3350X.

## DUAL VOLUME OPERATION

Arm contention must be minimized whenever the device is operated in 2x3330-11 or 2x3350 compatibility mode. Care should be taken when deciding on the type of data to reside on each volume. Generally, a technique for optimal pairing should not be difficult to develop using information such as device select and seek frequencies on actual 3330 or 3350 type devices. Data should be allocated to achieve the maximum imbalance thereby preventing one single physical device from becoming a bottleneck for the entire system.

## CONVERSION CONSIDERATIONS

Most 33801/3350X users will probably select the 2x3330-11 compatibility mode during initial installation. All existing 3330 type conversion utilities are applicable to the 33801/3350X.

Some users may want to operate in 3350 compatibility mode immediately. Careful planning is required for conversion to 3350 mode. The user must consider several factors including CPU scheduling, time required to obtain supporting utilities, operating system modifications, and the time required to perform JCL modifications. Following installation, additional time must be allocated to perform overall system tuning and develop backup procedures.

The multiple compatibility modes provided by available 33801/3350X allow the user flexibility to develop a conversion schedule uniquely tailored to his individual requirements. Installation can then proceed with a minimal amount of disruption with provision for gradual conversion to 3350 mode as time and workload allow. For additional information on 3350 conversion, see IBM reference GC20-1780, section 6.

## GRADUAL FIELD CONVERSION

A gradual conversion from 3330-11 compatibility mode to 3350 compatibility mode is possible, but each time a device is converted, it is necessary to change the operating system control program to support the new device configuration. Two methods are available to implement this conversion: I/O system generation or the Superzap Program. It may be advantageous to use the I/O system generation if a large number of devices are to be converted at one time. The Superzap approach may be used if only a few devices are to be converted at a time.

### NOTE

A customer contemplating compatibility mode conversions on installed 33801/3350X subsystems should contact a CDC sales representative. Field changes to existing compatibility modes require one of the STO/SPO conversion kits listed in the Selective Format Feature discussion in section 2.

## OS/VS1 AND OS/VS2 (SVS)

A gradual conversion from 3330-11 compatibility mode to 3350 compatibility mode is possible if at least one 3350 device has been specified in the system generation. The Superzap program may be used in place of an I/O system generation as one or more devices are converted to 3350 compatibility mode. After converting the device to 3350

compatibility mode, the Superzap program may be used to change the unit control blocks (UCBs) and device mask table to reflect the converted devices.

### Conversion of UCB

The only field in the UCB that must be changed is the UCB Unit Type field (UCB + 19). This field is 0D for a 3330-11 and must be changed to 0B for 3350.

### Conversion of Device Mask Table

The device mask table must be changed to recognize the generic name groups and user defined name groups of the converted devices. This is done by removing two references in each group that point to the device that is being converted for 3330-11 compatibility mode, adding one reference to each group that is to point to the device being converted to 3350 compatibility mode, and changing the count of the number of devices in each group.

For further information on the above changes, refer to IBM Reference GC20-1780, Section 6.3.1.

Note: The above conversion does not apply if the resulting 3350X in 3350 compatibility mode is to be used as a paging device. In this case, a nucleus generation must be performed.

### OS/V52 (MVS)

The conversion procedure is different than that for OS/V51 and OS/V52 (SVS). The conversion of the UCB is the same, but, instead of modifying the device mask table, the group mask table (MASKTAB), the generic table (GENTAB) and the group descriptor table (GDTAB) are modified. For a detailed description, see IBM Reference GC20-1780, Section 6.3.2.

### OS/V51 AND OS/V52 CONVERSION TO 3350 COMPATIBILITY MODE

Performance considerations, conversion methods and applications must be definite concerns of the user, especially in the conversion period. Standard techniques and principles for good DASD subsystem performance under OS/V5 operating systems also apply to the 33801/3350X subsystem.

It is normally possible to convert existing data sets from other DASD devices to the device compatibility modes using available IBM utilities. Some examples are shown below:

- QSAM and BSAM data sets can be moved using IEHMOVE
- ISAM data sets using IEBISAM

- BDAM data sets using IEMOVE

Consideration must be given to writing and using simple BAL, RPG, COBOL and/or PL/I programs if the user requires specific functions other than those supported by IBM utilities. Time dependencies of certain user programs must also be evaluated. The device in 3350 compatibility mode supports all CCWs except those programs that are channel or device/time dependent. When using customer generated EXCP programs, RPS commands must be added by the user if this type of support is required. Other factors to be considered include block size, record lengths, JCL space parameters, and overall DASD space organizations. Failure to take all of the preceding factors into account may prevent effective utilization of DASD space and result in less than optimum system performance.

### DOS-DOS/V5

#### Program Products

See Section 6.1 of the IBM 3350/3344 Installation and Conversion Guide (GC20-1780) for a list of DOS-DOS/V5 programs which can be used to copy existing data sets onto the 33801/3350X.

#### Data Set Placement

The main consideration when attempting to place data sets on a 33801/3350X is minimization of arm contention and seek time. If these are minimized, performance (i.e. throughout) will be maximized. Some of the factors to be considered when deciding where a data set should be placed are: (1) data set organization (and thus the access method to be used), (2) the number and types of data sets to be accessed concurrently, (3) volatility of the data set and (4) whether the data set is dynamic or static in nature. In addition to these, two guidelines should be followed:

- A. Data sets should be spread out over the entire 33801/3350X subsystem as evenly as possible so that no single physical spindle becomes a bottleneck for the whole system.
- B. In general, the most volatile data sets should be placed in the middle of the device head disk assembly (HDA) and the least volatile data sets at the extremes. Regardless of compatibility mode, the physical middle of the HDA corresponds to logical cylinders close to zero. By placing data sets in this manner seek time should be minimized. For further details consult Section 6.1 of the IBM 3350/3344 Installation and Conversion Guide (GC20-1780).

## CONVERSION EXAMPLES

See Section 8 of the IBM 3350/3344 Installation and Conversion Guide (GC20-1780).

## PERFORMANCE COMPARISONS

Figure 4-1 illustrates the relative performance capabilities of the CDC 33801/3350X compared to the IBM 3350 or actual 3330 type devices.

Figure 4-1 compares record accesses versus response time of the CDC 3350X (3350 compatibility mode) and the IBM 3350 in native mode using a sample record size of 4096 bytes. Example: at a response time of 68

milliseconds, the 3350 is capable of 17 record accesses per second while the 3350X is capable of 24 record access per second.

Figure 4-2 compares usable capacity versus response time of the CDC 33801 (3330-11 compatibility mode) and an actual IBM 3330-11 for a range of record accesses per second. Example: a user has an actual 3330-11 (200 megabyte) device which is receiving 10 record accesses per second. To determine the amount of usable storage capacity on the 33801 device (3330-11 compatibility mode) with equal response time, follow the 10 access-per-second line to its intersection with the equal performance line and read down. For this example the answer is 349 megabytes (approximately).

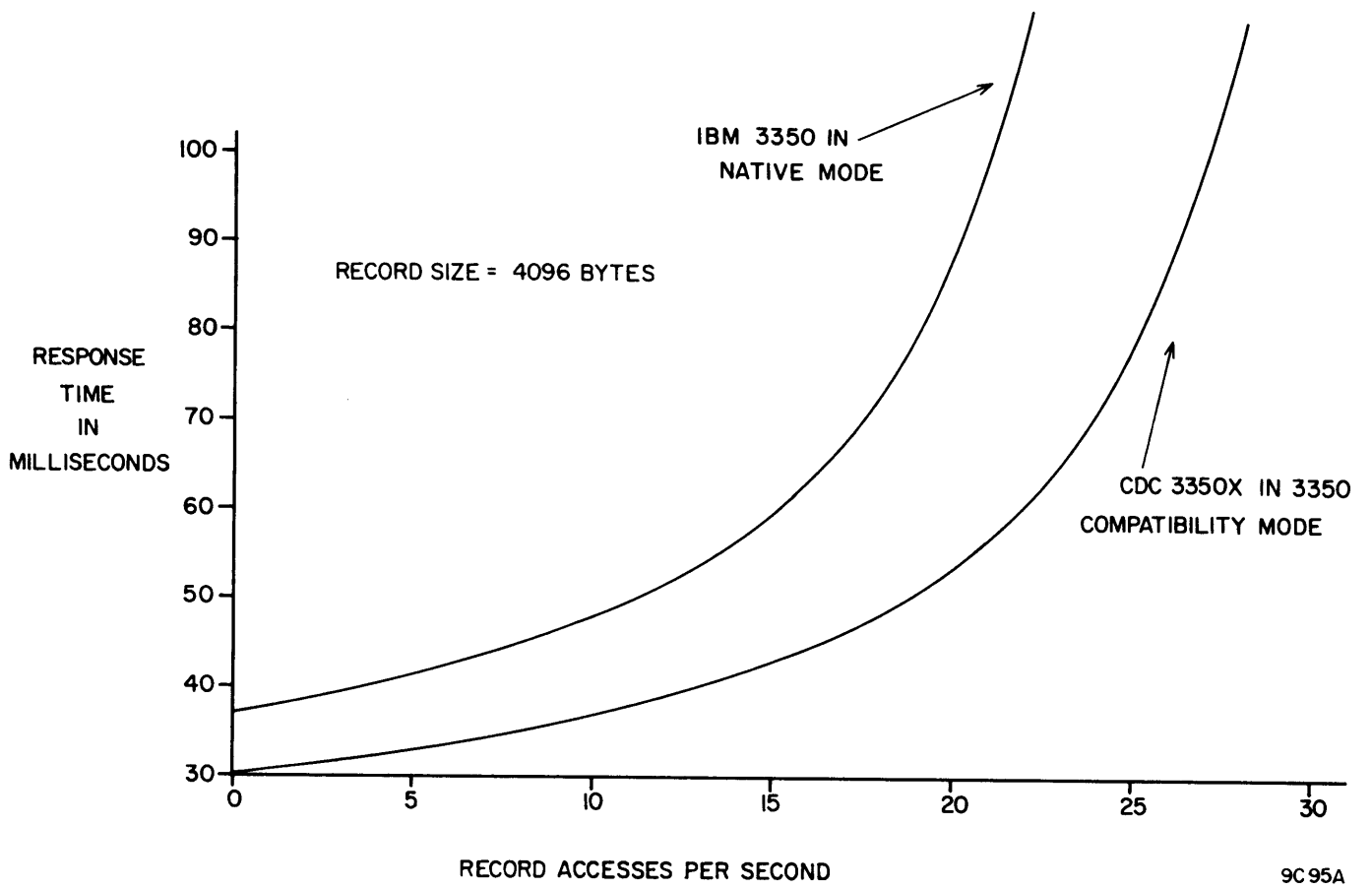


Figure 4-1. 3350 Native Mode and CDC 3350X Response vs Addresses.

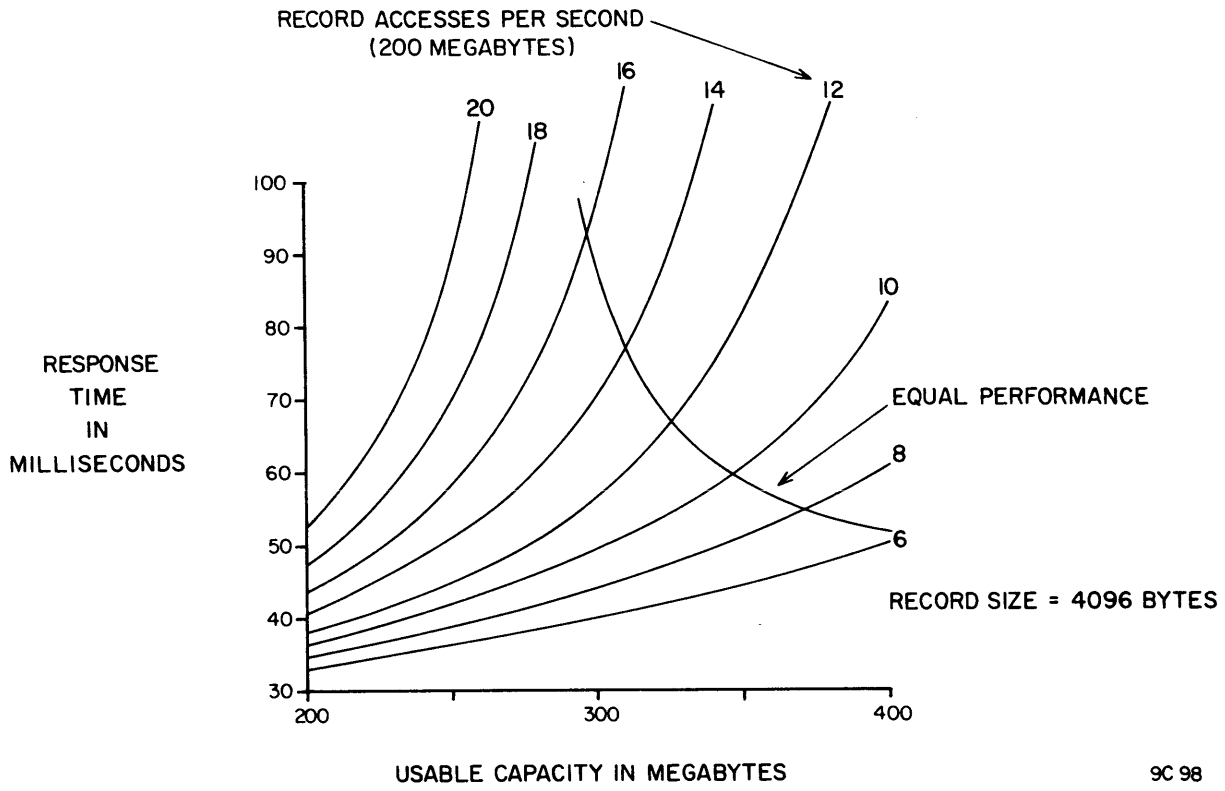


Figure 4-2. IBM 3330-11 and CDC 33801 Response vs Usable Capacity.



TABLE 4-1. 3330-TO-3350 CONVERSION RECORD  
SIZE vs UTILIZATION CAPACITY

CURRENT RECORD SIZE		# OF 3350 REC/TRK	STORAGE CAPACITY UTILIZATION	
MIN	MAX		MIN	MAX
9443	13030	1	.50	.68
6234	9442	2	.65	.99
4629	6233	3	.73	.98
3666	4628	4	.77	.97
3025	3665	5	.79	.96
2566	3024	6	.81	.95
2222	2565	7	.82	.94
1955	2221	8	.82	.93
1741	1954	9	.82	.92
1566	1740	10	.82	.91
1420	1565	11	.82	.90
1297	1419	12	.82	.89
1191	1296	13	.81	.88
1099	1190	14	.81	.87
1019	1098	15	.80	.86
948	1018	16	.80	.85
885	947	17	.79	.84
829	884	18	.78	.84
778	828	19	.78	.83
732	777	20	.77	.82
691	731	21	.76	.81
653	690	22	.75	.80
618	652	23	.75	.79
586	617	24	.74	.78
556	585	25	.73	.77
529	555	26	.72	.76
503	528	27	.71	.75
479	502	28	.70	.74
457	478	29	.70	.73
437	456	30	.69	.72
417	436	31	.68	.71
399	416	32	.67	.70
382	398	33	.66	.69
366	381	34	.65	.68
350	365	35	.64	.67
336	349	36	.64	.66
322	335	37	.63	.65
309	321	38	.62	.64
297	308	39	.61	.63
285	296	40	.60	.62
274	284	41	.59	.61
263	273	42	.58	.60
253	262	43	.57	.59
243	252	44	.56	.58
234	242	45	.55	.57
225	233	46	.54	.56
217	224	47	.54	.55
208	216	48	.53	.54
201	207	49	.52	.53
193	200	50	.51	.52
186	192	51	.50	.51
179	185	52	.49	.51
172	178	53	.48	.50
166	171	54	.47	.49
159	165	55	.46	.48
153	158	56	.45	.47
147	152	57	.44	.46
142	146	58	.43	.45
136	141	59	.42	.44
131	135	60	.41	.43
126	130	61	.40	.42
121	125	62	.40	.41
116	120	63	.39	.40

Use of table 4-1:

1. Find record size (bytes) in first (left most) column that is closest in size to current usage.
2. Column three describes the number of 3350 size records in use.
3. The fourth and fifth columns describe the storage capacity minimum and maximum utilization range.
4. To achieve the maximum utilization, the current record size must be changed to the size shown in column two.

Use of Tables 4-2 and 4-3: Find range of current 3330-11 record lengths and read across to determine percentage of pack utilization.

TABLE 4-2. 3330-11 TRACK/CYLINDER CAPACITIES (WITH KEY FIELDS)

RECORD LENGTH		REC PER	REC PER	TRACK CAPACITY		CYLINDER CAPACITY		UTILIZATION	
FROM	TO	TRK	CYL	FROM	TO	FROM	TO	FROM	TO
6392	12974	1	19	6392	12974	121448	246506	.49	1.00
4198	6391	2	38	8396	12782	159524	242858	.65	.99
3101	4197	3	57	9303	12591	176757	239229	.72	.97
2443	3100	4	76	9772	12400	185668	235600	.75	.96
2004	2442	5	95	10020	12210	190380	231990	.77	.94
1690	2003	6	114	10140	12018	192660	228342	.78	.93
1455	1689	7	133	10185	11823	193515	224637	.79	.91
1272	1454	8	152	10176	11632	193344	221008	.78	.90
1126	1271	9	171	10134	11439	192546	217341	.78	.88
1006	1125	10	190	10060	11250	191140	213750	.78	.87
907	1005	11	209	9977	11055	189563	210045	.77	.85
822	906	12	228	9864	10872	187416	206568	.76	.84
750	821	13	247	9750	10673	185250	202787	.75	.82
687	749	14	266	9618	10486	182742	199234	.74	.81
632	686	15	285	9480	10290	180120	195510	.73	.79
584	631	16	304	9344	10096	177536	191824	.72	.78
541	583	17	323	9197	9911	174743	188309	.71	.76
502	540	18	342	9036	9720	171684	184680	.70	.75
468	501	19	361	8892	9519	168948	180861	.69	.73
436	467	20	380	8720	9340	165680	177460	.67	.72
408	435	21	399	8568	9135	162792	173565	.66	.70
382	407	22	418	8404	8954	159676	170126	.65	.69
358	381	23	437	8234	8763	156446	166497	.63	.68
336	357	24	456	8064	8568	153216	162792	.62	.66
316	335	25	475	7900	8375	150100	159125	.61	.65
297	315	26	494	7722	8190	146718	155610	.60	.63
280	296	27	513	7560	7992	143640	151848	.58	.62
263	279	28	532	7364	7812	139916	148428	.57	.60
248	262	29	551	7192	7598	136648	144362	.55	.59
234	247	30	570	7020	7410	133380	140790	.54	.57
221	233	31	589	6851	7223	130169	137237	.53	.56
208	220	32	608	6656	7040	126464	133760	.51	.54
197	207	33	627	6501	6831	123519	129789	.50	.53
186	196	34	646	6324	6664	120156	126616	.49	.51
175	185	35	665	6125	6475	116375	123025	.47	.50
165	174	36	684	5940	6264	112860	119016	.46	.48
156	164	37	703	5772	6068	109668	115292	.44	.47
147	155	38	722	5586	5890	106134	111910	.43	.45
139	146	39	741	5421	5694	102999	108186	.42	.44
131	138	40	760	5240	5520	99560	104880	.40	.43
123	130	41	779	5043	5330	95817	101270	.39	.41
116	122	42	798	4872	5124	92568	97356	.38	.39
109	115	43	817	4687	4945	89053	93955	.36	.38
102	108	44	836	4488	4752	85272	90288	.35	.37
96	101	45	855	4320	4545	82080	86355	.33	.35
90	95	46	874	4140	4370	78660	83030	.32	.34
84	89	47	893	3948	4183	75012	79477	.30	.32
78	83	48	912	3744	3984	71136	75696	.29	.31
73	77	49	931	3577	3773	67963	71687	.28	.29
68	72	50	950	3400	3600	64600	68400	.26	.28
63	67	51	969	3213	3417	61047	64923	.25	.26
58	62	52	988	3016	3224	57304	61256	.23	.25
53	57	53	1007	2809	3021	53371	57399	.22	.23
49	52	54	1026	2646	2808	50274	53352	.20	.22
45	48	55	1045	2475	2640	47025	50160	.19	.20
40	44	56	1064	2240	2464	42560	46816	.17	.19
36	39	57	1083	2052	2223	38988	42237	.16	.17
33	35	58	1102	1914	2030	36366	38570	.15	.16
29	32	59	1121	1711	1888	32509	35872	.13	.15
25	28	60	1140	1500	1680	28500	31920	.12	.13
22	24	61	1159	1342	1464	25498	27816	.10	.11
18	21	62	1178	1116	1302	21204	24738	.09	.10
15	17	63	1197	945	1071	17955	20349	.07	.08
12	14	64	1216	768	896	14592	17024	.06	.07
9	11	65	1235	585	715	11115	13585	.05	.06

TABLE 4-3. 3330-11 TRACK/CYLINDER CAPACITIES (WITHOUT KEY FIELDS)

RECORD LENGTH		REC PER TRK	REC PER CYL	TRACK CAPACITY		CYLINDER CAPACITY		UTILIZATION	
FROM	TO			FROM	TO	FROM	TO	FROM	TO
6448	13030	1	19	6448	13030	122512	247570	.49	1.00
4254	6447	2	38	8508	12894	161652	244986	.65	.99
3157	4253	3	57	9471	12759	179949	242421	.73	.98
2499	3156	4	76	9996	12624	189924	239856	.77	.97
2060	2498	5	95	10300	12490	195700	237310	.79	.96
1746	2059	6	114	10476	12354	199044	234726	.80	.95
1511	1745	7	133	10577	12215	200963	232085	.81	.94
1328	1510	8	152	10624	12080	201856	229520	.82	.93
1182	1327	9	171	10638	11943	202122	226917	.82	.92
1062	1181	10	190	10620	11810	201780	224390	.82	.91
963	1061	11	209	10593	11671	201267	221749	.81	.90
878	962	12	228	10536	11544	200184	219336	.81	.89
806	877	13	247	10478	11401	199082	216619	.80	.87
743	805	14	266	10402	11270	197638	214130	.80	.86
688	742	15	285	10320	11130	196080	211470	.79	.85
640	687	16	304	10240	10992	194560	208848	.79	.84
597	639	17	323	10149	10863	192831	206397	.78	.83
558	596	18	342	10044	10728	190836	203832	.77	.82
524	557	19	361	9956	10583	189164	201077	.76	.81
492	523	20	380	9840	10460	186960	198740	.76	.80
464	491	21	399	9744	10311	185136	195909	.75	.79
438	463	22	418	9636	10186	183084	193534	.74	.78
414	437	23	437	9522	10051	180918	190969	.73	.77
392	413	24	456	9408	9912	178752	188328	.72	.76
372	391	25	475	9300	9775	176700	185725	.71	.75
353	371	26	494	9178	9646	174382	183274	.70	.74
336	352	27	513	9072	9504	172368	180576	.70	.73
319	335	28	532	8932	9380	169708	178220	.69	.72
304	318	29	551	8816	9222	167504	175218	.68	.71
290	303	30	570	8700	9090	165300	172710	.67	.70
277	289	31	589	8587	8959	163153	170221	.66	.69
264	276	32	608	8448	8832	160512	167808	.65	.68
253	263	33	627	8349	8679	158631	164901	.64	.67
242	252	34	646	8228	8568	156332	162792	.63	.66
231	241	35	665	8085	8435	153615	160265	.62	.65
221	230	36	684	7956	8280	151164	157320	.61	.64
212	220	37	703	7844	8140	149036	154660	.60	.62
203	211	38	722	7714	8018	146566	152342	.59	.62
195	202	39	741	7605	7878	144495	149682	.58	.60
187	194	40	760	7480	7760	142120	147440	.57	.60
179	186	41	779	7339	7626	139441	144894	.56	.59
172	178	42	798	7224	7476	137256	142044	.55	.57
165	171	43	817	7095	7353	134805	139707	.54	.56
158	164	44	836	6952	7216	132088	137104	.53	.55
152	157	45	855	6840	7065	129960	134235	.52	.54
146	151	46	874	6716	6946	127604	131974	.52	.53
140	145	47	893	6580	6815	125020	129485	.50	.52
134	139	48	912	6432	6672	122208	126768	.49	.51
129	133	49	931	6321	6517	120099	123823	.49	.50
124	128	50	950	6200	6400	117800	121600	.48	.49
119	123	51	969	6069	6273	115311	119187	.47	.48
114	118	52	988	5928	6136	112632	116584	.45	.47
109	113	53	1007	5777	5989	109763	113791	.44	.46
105	108	54	1026	5670	5832	107730	110808	.44	.45
101	104	55	1045	5555	5720	105545	108680	.43	.44
96	100	56	1064	5376	5600	102144	106400	.41	.43
92	95	57	1083	5244	5415	99636	102885	.40	.42
89	91	58	1102	5162	5278	98078	100282	.40	.41
85	88	59	1121	5015	5192	95285	98648	.38	.40
81	84	60	1140	4860	5040	92340	95760	.37	.39
78	80	61	1159	4758	4880	90402	92720	.37	.37
74	77	62	1178	4588	4774	87172	90706	.35	.37
71	73	63	1197	4473	4599	84987	87381	.34	.35
68	70	64	1216	4352	4480	82688	85120	.33	.34

## QUESTIONS AND ANSWERS

Q: Are special disk packs required for use with the 33801/3350X subsystem?

A: The 33801/3350X uses a pack that incorporates heads and disks in an enclosed assembly. Data written by a head will always be read by the same head thus eliminating alignment problems. The assembly is nonremovable by the customer.

Q: What is the start/stop time of the 33801/3350X?

A: Start/stop time is 20/20 seconds.

Q: Are there logic plugs on 33801/3350X Subsystems similar to those on 3330 Subsystems?

A: No. Device addressing is selected at installation time.

Q: Must both devices within a unit have the Fixed Head Feature?

A: Yes.

Q: When the 33801/3350X device is configured in a dual volume mode, where is the fixed head area located?

A: Logical cylinders 1-5 (3330) or 1-3 (3350) of the primary volume are allocated to the fixed head storage.

Q: Can the fixed head option be installed in the field?

A: Yes. Order STO 69071-2.

Q: Can the fixed heads and non fixed heads operate simultaneously?

A: No, the fixed heads are included as a part of the total addressing of the logical volume.

Q: How are the fixed head cylinders accessed when in 3350 mode?

A: Logical cylinders 1-3 are assigned to the fixed head storage.

Q: In what mode does the 33801/3350X leave the factory?

A: The device will be shipped in the mode matching the product that the customer orders. The correlation of product versus mode is as follows:

<u>Product</u>	<u>Mode</u>
33801	2x3330-11
33501	1x3350
33502	2x3350

Q: How does a customer change compatibility modes on site?

A: The customer must order one of the conversion STOs specified in the Selective Format Feature discussion in section 2. After that, CDC Customer Engineering will make the necessary modifications.

Q: When two logical volumes are placed on the same spindle are the cylinders interleaved or separate?

A: Separate. The primary logical device is placed in a band outside the secondary logical device (see figure 2-1).

Q: How is it determined what addresses are valid for 33801/3350X device string?

A: Refer to table 3-2 in this guide to select valid address ranges.

Q: Can a 38302 Storage control address 32 physical 33801/3350X spindles; and therefore, 64 logical volumes?

A: Yes.

Q: How will future IBM changes in operating systems effect the 33801/3350X compatibility modes?

A: They should have no effect on any of the available mode selections.

Q: If string switch is used on the A2 is it necessary on the C2?

A: No. From an operational viewpoint, however, you may want to consider having string switch on both.

Q: Is it possible to switch the 33801/3350X subsystem from one channel to another (i.e. two/four channel switch)?

A: Yes.

Q: What are the steps that must be taken to switch in a C2 alternate controller?

A: Power down the string, set the primary alternate switch on the C2 operator panel to alternate, and power up.

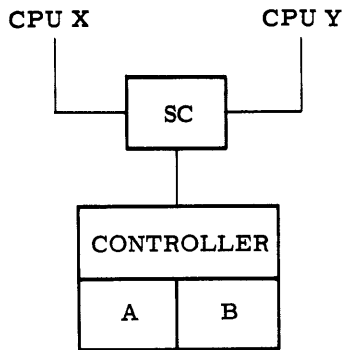
Q: What is the effect on logical device "A" when logical device "B" on the same spindle is reserved?

A: The operating system performs reserve/release operations on a volume basis and the Storage Control maintains this information for the subsystem.

NOTE

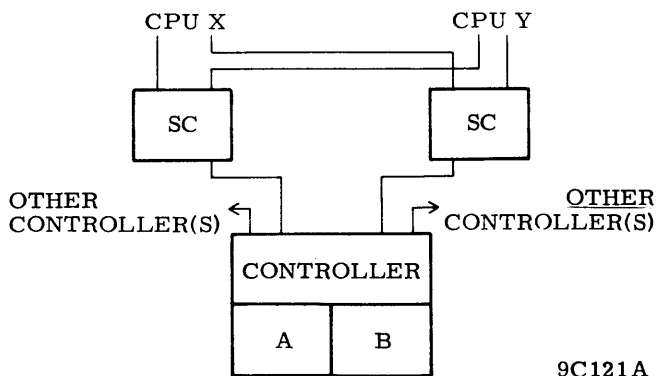
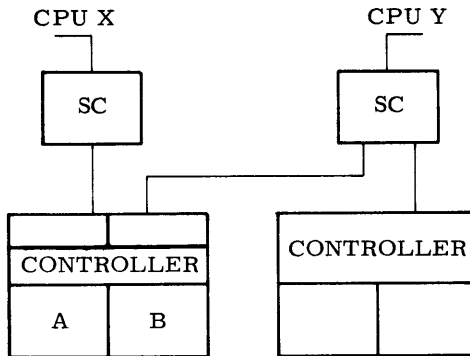
The symbols "A" and "B" in the illustrations to the left represent logical volumes on one spindle.

Either volume A and/or B can be reserved by CPU X or Y as shown in the illustration at the left. Only one volume can transmit data at a time.



X	Y
$A \cdot B$	$\bar{A} \cdot \bar{B}$
$A \cdot \bar{B}$	$\bar{A} \cdot B$
$\bar{A} \cdot \bar{B}$	$A \cdot B$
$\bar{A} \cdot B$	$A \cdot \bar{B}$

If we add a second storage control and string switch as shown in the illustration at the left, CPU X can reserve A and/or B; however, if CPU X reserves A then both A and B appear reserved to CPU Y.



A solution to multiple CPU, multiple storage control situations would be the addition of Two Channel Switch option as shown in the illustration at the left. If CPU X reserves A, CPU Y can now reserve B thru the same storage control.

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- Q: As far as the software (i.e. operating system) is concerned, each 33801/3350X dual volume spindle is treated as two completely separate devices with two different device addresses?
- A: Yes. On a multiple disk subsystem with eight physical spindles, 16 logical units can be addressed individually.
- Q: When using OS, how can one have two logical devices (on the same spindle) mounted on the same spindle? Assume you do not insist that a user always uses absolute device allocation. (Unit = Device Address.)
- A: Use the mount characteristic of the PRESRES list in SYS1.PARMLIB or the mount command via the operator console.
- Q: To what extent is it possible to share a logical or physical device between two channels on the CPU?
- A: Logical volumes within a physical device can be shared via channel options on the storage control as if each logical volume were an actual 3330-11 or 3350 device. With two channel switch, four channel switch, or string switch features installed, the logical devices function in the same manner as an IBM 3330-11 or 3350.
- Q: Is it possible, with the flexibility of OS JCL, to specify that one logical volume be separated by channel SEP from the other logical volume even though they are on the same spindle?
- A: With the two or four channel switch feature, the logical volume can be separated using channel SEP. In a single channel environment, unit SEP will achieve the same results.
- Q: Is it feasible to attach two channels to one 33801/3350X subsystem with less than 4 spindles?
- A: Yes. Note that 4 spindles constitute 8 logical devices in 3330-11 compatibility mode.
- Q: In which areas could subsequent releases of operating systems software affect 33801/3350X operation?
- A: IBM has a significant investment in hardware and software in support of the 3350. The CDC 33801/3350X is hardware and software compatible with the IBM 3350 in all significant areas. It is, therefore, anticipated that subsequent IBM operating system releases will be compatible with the 33801/3350X subsystem.
- Q: Is the 33801/3350X subsystem transparent to both OS and DOS?
- A: Yes, when the proper release level is installed.
- Q: Are two VTOCs written on the disk when the 33801/3350X device is configured in a dual volume mode?
- A: Yes, one VTOC per logical device.
- Q: What decisions must a customer make before assigning his data sets?
- A: 1. What use will be made of the fixed heads?  
2. How may contention be avoided when operating in 2x3330-11 or 2x3350 compatibility mode?
- Q: How does the IBM operating system know there are two logical volumes contained on one physical device?
- A: The IBM operating system addresses each logical device as though it were a physical device.
- Q: On System 370's with dual ISC's (158 and 168's), can the 33801/3350X be attached to one ISC and the IBM 3350 on the other?
- A: The system software will interface with both subsystems. Manual intervention is required when the system is powered on to load the proper functional microcode into each storage control.
- Q: Are there any differences between the methods used to assign data sets to an IBM 3350 to maximize performance versus what is recommended on the 33801/3350X?
- A: No.
- Q: What type of data sets should be assigned to a fixed head area?
- A: The user should assign the most active data sets to the fixed head areas. Example: Page data set.
- Q: The CDC 33801/3350X has more fixed head storage than IBM 3350. What impact does this have on system operation?
- A: None. The additional fixed head storage is transparent to the operating system. It makes available more zero seek time storage and hence improved system throughput if the fixed head storage is properly utilized.

- Q: If a seek that causes arm movement has been initialized from one logical device queue (Channel End received for a stand-alone seek but not Device End), what happens when a seek is initiated from the other logical queue for the same spindle?
- A: The other channel will get a "Control Unit Busy" signal.
- Q: If a stand-alone seek is processing on one logical unit and a seek is attempted for the mated logical unit, what status is returned by the hardware?
- A: If any seek is active the other volume gets a "Control Unit Busy".
- Q: Does the 33801/3350X alter the normal use of Reserve/Release in any way?
- A: No.
- Q: Does the Attention pushbutton send a Device End interrupt for both logical devices?
- A: Yes.
- Q: What are the advantages of dual access feature (DAF) over string switch?
- A: 1. An additional level of redundancy is provided (i.e. a failure of one integrated controller does not prevent communications with the device string).
2. Additional performance is achieved because two devices in the same string can be accessed simultaneously through separate controllers.
- Q: Will sending a Device End interrupt for both logical devices cause problems if one device has begun execution of a command chain?
- A: No.
- Q: When a spindle becomes ready (two devices), does it produce two interrupts (Device End), one for each device?
- A: Yes.
- Q: Can program packages such as MIGRATOR or UCC3 be used when going from 3330 to 3350.
- A: Yes.
- Q: Can the EREP program print LOGREC information in the same format for the 33801/3350X emulation modes as for real 3330-11 devices?
- A: No. LOGREC information on the 33801/3350X is provided in 3350 emulation mode only regardless of the mode selection.
- Q: Can IBM 3350-type devices be intermixed with CDC 33801/3350X devices in the same subsystem?
- A: Yes, although not in the same string.
- Q: What is the maximum number of devices that may communicate with the controller in an A2 or C2 unit?
- A: In units not equipped with the dual access feature (DAF): 8. In units equipped with DAF: 16. Note: all units in the string must be equipped with DAF.
- Q: What is the minimum number of device strings required for dual access configurations?
- A: Two.
- Q: Can the HDAs within a single unit be set to different compatibility modes?
- A: Absolutely not. The product number (33801/33501/33502) automatically defines the compatibility mode. The "boxes" in a string can be different 33801/3350X products; therefore, the string can contain devices operating in different compatibility modes.
- Q: Whom do I contact if I have any further questions?
- A: Contact your CDC sales representative.

**COMMENT SHEET**

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