IBM Systems Reference Library

IBM Disk Pack and Cartridge Handling Procedures

This manual is a guide for handling IBM Disk Packs and Cartridges. The information contained in this manual applies to IBM 1316 and 2316 Disk Packs and 2315 Disk Cartridges.
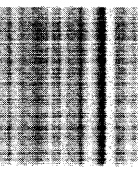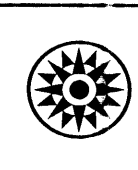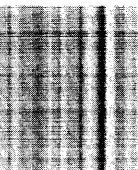
This is a major revision of and obsoletes Form A26-5756-5.
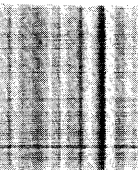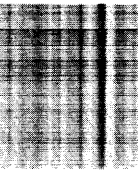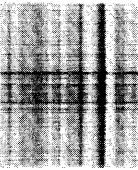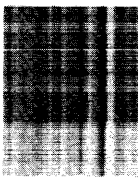Extensive changes have been made throughout the manual, including
information on error free disk packs, labeling, and packaging of
IBM Disk Packs and Cartridges. Other changes to the text, and
small changes to illustrations, are indicated by a vertical line to
the left of the change; changed or added illustrations are denoted by
the symbol ● to the left of the caption.

Significant changes or additions to the specifications contained in
this publication are continually being made. When using this pub-
lication in connection with the operation of IBM equipment, check
the latest SRL Newsletter for revisions or contact the local IBM
branch office.

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corner. This is a publishing control number and is not related to
the subject matter.

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IBM Branch Offices.

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In 1953 the introduction of IBM magnetic tape provided data processing systems with the ability to process large volumes of input and output data at high speeds; in addition, it provided virtually unlimited storage. Entire jobs and master record files were accessible simply by changing a reel of tape. In 1956, the introduction of the IBM RAMAC® Disk File presented another new concept in data processing by permitting mass storage of data that could be accessed in either a random or a sequential manner. In 1961, the IBM 1311 Disk Storage Drive, with its removable disk pack, introduced new dimensions of usefulness by combining the large storage and sequential processing advantages of magnetic tape and the random access ability of disk storage.

Disk Characteristics

The individual recording surfaces are made from precisely finished aluminum disks coated with magnetic iron oxide particles suspended in a plastic binder. Each pack is contained within its own cover to protect the disks from dust and other contaminants and mechanical damage.

Information is written on the recording surfaces by creating selected combinations of closely spaced magnetic spots on the iron oxide coating. During reading, these magnetic spots induce electrical pulses in the read/write head, which flies on a self-induced air bearing a few microinches thick. These pulses are amplified and interpreted as characters of information—numbers, letters, or special symbols.

Removable disk packs of different sizes as well as the respective drive mechanisms for these packs have been developed by IBM to allow the customer to tailor his data processing system to present needs, with room to grow as needs increase. On most systems, a disk drive with removable disk pack can be added conveniently as an external input/output device. On some systems, the drive can be exchanged for a larger and more powerful drive.

Three different removable disk packs are available:

1. IBM 2316 Disk Pack—11 stacked disks providing 20 recording surfaces mounted on a central hub (Figure 1).
2. IBM 1316 Disk Pack—six stacked disks providing 10 recording surfaces mounted on a central hub (Figure 2).
3. IBM 2315 Disk Cartridge—a single disk with an integral protective cover providing two recording surfaces (Figure 3).
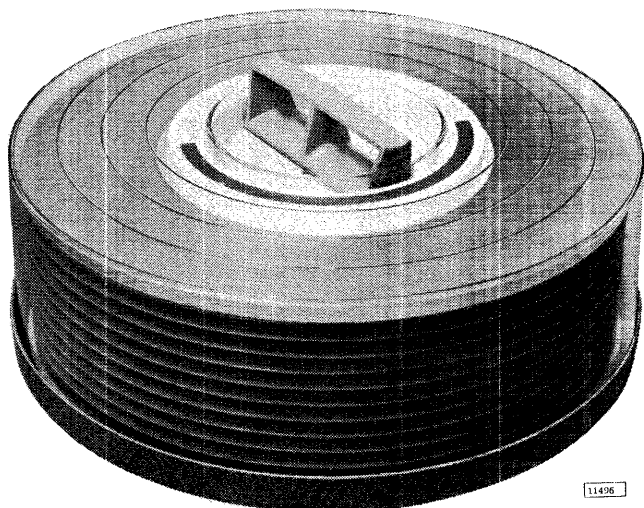
Figure 1. IBM 2316 Disk Pack
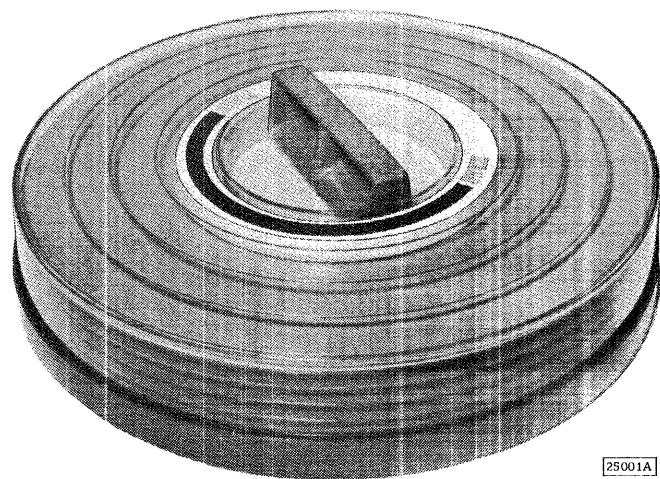
Figure 2. IBM 1316 Disk Pack
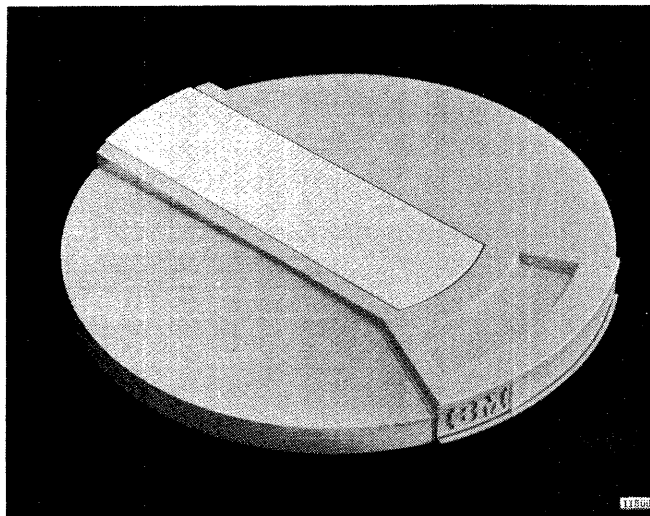
Figure 3. IBM 2315 Disk Cartridge

Disk packs and cartridges are precision devices that require careful handling procedures to ensure data integrity. The following precautions are recommended to maintain the quality and lengthen the life of the disk pack or cartridge:

1. Reassemble the disk pack bottom and top protective covers. This should be done even when no disk pack is contained in the cover so dust and dirt do not accumulate inside the covers.
2. Clean the protective covers periodically to remove any buildup of dust. Use a soft lint-free cloth or paper wipe.
3. Replace cracked, distorted, or otherwise damaged covers.
4. Keep hands, pencils, or other objects off the disk surfaces. The disk surfaces can be distorted or damaged through impact or excessive pressure or abrasion. Should a pack be suspected of damage, have it inspected by an IBM Customer Engineer before attempting to use it.
5. Don't stop the pack from turning by pressing on the top disk. This can be dangerous and can damage the disk.
6. Coffee or other beverages spilled on the pack and/or covers may require that the pack be reconditioned. Keep beverages off the drive and away from the pack storage area.

7. Ashes and tobacco are a prime source of disk pack and cartridge contamination. Tobacco and all smoking accessories should be kept away from areas where disk packs are in use or disk drives in operation.

Remember, the disk pack or cartridge may contain information that is vital to the installation, and should be protected as much as possible.

8. Pack air filters should be replaced at least once a year when operated in a normal environment. For filters and/or replacement contact your local IBM Branch Office.

9. Vacuum or wet-mop the machine room daily. Do not raise dust with such cleaning implements as brooms or feather dusters.

Storing the Disk Pack and Cartridge

Short-Term Storage

Disk packs and cartridges that are in frequent use are best stored in the machine room or similar environment. The ideal environment is 60-90° (15.6 - 32.2°C) and 10-80% relative humidity.

Cabinets that are clean and free of dust and made of metal or other fire-resistant material provide the best storage medium. Such a cabinet should have metal doors to provide better protection.

Disk packs should never be stored in direct sunlight. They should also never be exposed to intense magnetic fields (high-current bus bars, cables, welding transformers, etc.). A field intensity of more than 50 gauss may cause loss of information. The

IBM Installation Planning Engineer should be consulted if high-intensity fields are suspected.

Disk packs should be stored flat, i.e. resting on the bottom cover. They cannot be stacked on top of each other or stored on edge. Cartridges are specifically designed to be stacked on top of each other or stored on edge.

Long-Term Storage

For long-term storage the disk packs and cartridges are best stored in the original shipping containers. When stored in this manner, they may be stored on top of each other. Figure 4 gives the specifications for the packs and cartridge and their shipping containers.

The temperature for long-term storage must remain within the following limits: -40°F to 150°F (-40°C to 66°C).

High-Security Storage

Vitally important data or duplicate master records should be stored in fire-resistant cabinets or in a separate storeroom that provides protection against catastrophic damage. The storage facilities provided should be insulated in such a manner that the internal temperature of the room or cabinet cannot rise above 150°F in case of fire.

A sprinkler system is recommended as additional fire protection. If a sprinkler system is used, it should be of the pre-action type, which guards

Disk with cover			Shipping container		Temperature range		
Type	Weight pounds	Diameter	Height	Length	Height	Shipping or long storage	Operating or short storage	RH
2316	14 1/8	14.7 in.	6.0 in.	19.2 in. sq.	9.6 in.	-40°F to 150°F	60°F to 90°F	8-80%
1316	9 3/8	14.5 in.	4.0 in.	19.2 in. sq.	8.4 in.	-40°F to 150°F	60°F to 90°F	8-80%
2315	4 1/8	15.0 in.	1.5 in.	19.9 in. sq.	6.5 in.	-40°F to 150°F	50°F to 105°F	8-80%

Disk with cover			Shipping container		Temperature range		
Type	Weight (kg)	Diameter	Height	Length	Height	Shipping or long storage	Operating or short storage	RH
2316	6,407	373,4 mm	152,4 mm	487,7 mm	243,8 mm	-40°C to 66°C	15.6°C to 32.2°C	8-80%
1316	4,252	368,3 mm	101,6 mm	487,7 mm	213,4 mm	-40°C to 66°C	15.6°C to 32.2°C	8-80%
2315	1,871	381 mm	38,1 mm	505,5 mm	165,1 mm	-40°C to 66°C	10°C to 42°C	8-80%

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● Figure 4. Disk Pack and Cartridge Storage and Shipping Specifications

against the possibility of accidental head seal breakage.

The 1316 and 2316 disk pack top covers shipped prior to September 15, 1968 are made of a plastic material. This plastic material deforms rapidly at temperatures in excess of 180°F (82.2°C).

All 1316 and 2316 disk pack top covers shipped after September 15, 1968, and all 2315 disk cartridges are made of a high impact resistant, self extinguishing, polycarbonate material that provides protection against dust and impact. The new disk pack top cover and the disk cartridge deform at 270°F (132°C). The new cover can be identified by a small "IBM" stamped in the top near the handle. (See figure 7.)

All 1316 and 2316 disk pack bottom covers are made of a flame retardent, medium impact resistant styrene. The bottom cover deforms at 200°F (93°C).

Receiving and Shipping the Disk Pack

Upon receiving the disk pack, examine each container for possible shipping damage. If the container shows damage, the pack or cartridge must be inspected prior to installation on the disk storage drive. IBM Customer Engineers are available to make this inspection. By inspecting the pack or cartridge, the Customer Engineer can eliminate the possibility of further damage to the disks and damage to the drive.

The disk pack or cartridge is shipped in a specially designed packaging assembly. This shipping container provides double protection for the disk pack to essentially assure safe arrival to the customer.

The disk pack is secured in its two-piece cover. Although the cover is a positive dust proof seal, the pack could become contaminated with dust from the cover when the cover is removed. Therefore, the pack or cartridge is enclosed in a polyethylene bag. The disk pack or cartridge is then placed in a corrugated folder. Polyurethane foam packing material is attached directly to the folder to protect the pack from freight handling or shipping damage. The disk pack thus packaged, is then placed in a corrugated carton and sealed for shipment to the customer.

When a disk pack is to be shipped from one location to another, it is advisable to reuse the original shipping container. Improper packaging may cause severe damage to the pack during shipping.

If the original packaging assembly is lost or damaged, replacements are available free of charge from your local IBM Branch Office. Branch offices may order packaging assemblies from:

For domestic source:

IBM Corporation
Dept. 679, Bldg. 50I
Monterey and Cottle Roads
San Jose, Calif. 95114 USA

Part numbers for new packaging assemblies are:

7350614 for 2315 Disk Cartridges
7350520 for 1316 Disk Packs
7350521 for 2316 Disk Packs

For World Trade source:

IBM Deutschland
Dept. 349
7032 Sindelfingen -- Germany
Tuebinger Allee 49/51

Part numbers for new packaging assemblies are:

7353040 for 2315 Disk Cartridge
4688169 for 1316 Disk Packs
4688252 for 2316 Disk Packs

All other containers previously used for shipment of IBM disk packs and cartridges are obsolete.

Disk Pack Handling Precautions

The IBM 1316 and 2316 disk packs are specifically designed to prevent removal of the top cover when the pack is not on the disk storage drive. A disk pack should never be handled without its cover.

Care must be exercised in installing the 1316 and 2316 Disk Packs. If the hub of the disk storage drive receives a sharp impact from the disk pack, the contour of the hub and/or the pack drum can be altered and cause misalignment of the disk surfaces to the read/write heads. Foreign objects must never be placed between the disks or where they can fall or be pushed against the disk surfaces.

Although the disk cannot be removed from the IBM 2315 cartridge, the operator should check the cartridge door to make sure that it is closed. If it is open, slight manual pressure will prove sufficient to close the door and thus provide a dust seal.

The IBM 2315 Disk Cartridge must always be placed on a table or other flat surface that is free of other objects. If the cartridge is placed on a small hard object, the die cast aluminum hub can be damaged.

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Error Free Disk Packs

All 1316 disk packs shipped after September 15, 1968 are error free using the following IBM utilities as a test:

OS-"DASDI"-360S-UT-507
DOS-"Initialize Disk"-360P-UT-206
(formerly 069)

IBM will continue to identify those tracks on each pack that have been found, under stringent testing, to be marginal. In a critical operating environment these tracks should be flagged using options in the above initialization programs.

The error free disk packs can be recognized by a new flagged track label. (See figure 5.)

Disk Pack Labeling

For ease in identification, the center trim shield and bottom cover flange of IBM 1316 and 2316 Disk Packs should be labeled. Care should be taken to ensure disk packs are placed in their respective containers after use. Always refer to the trim cover label on the disk pack for positive identification of information contained on the disk pack.

Never use an eraser to alter the identification on a label. Rubber or paper particles from the erasure could contaminate the disk pack. Use only IBM recommended I.D. labels on disk packs, because unrecommended labels could work loose and cause severe damage to heads and/or disk surfaces. The customer and volume identification labels shown in

Figure 6 are available for use with the 1316 and 2316 Disk Packs. Use proper labels, and proper application, to minimize pack exposure to label or glue contamination.

The volume identification label is placed on the pack bottom cover so the pack can be easily recognized when in storage.

Sets of volume and customer I.D. labels are available free of charge from your local IBM Branch Office. Part number is 2267763.

The branch offices may order the labels from:

For domestic source:

IBM Corporation
Dept. 622, Bldg. 007
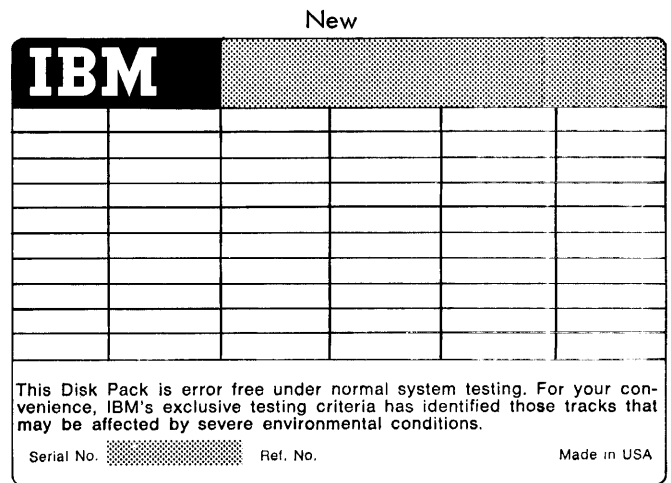Monterey and Cottle Roads
San Jose, Calif. 95114 USA

For World Trade source:

IBM-Duetschland
Dept. 349
7032 Sindelfingen - Germany
Tuebinger Allee 49/51

The 2315 cartridge is provided with a molded frame (on the front edge) that is designed to hold labels without the use of adhesives. The label is inserted through the right hand side of the frame.

General Operating Procedures

Before a disk pack or a cartridge is used it should be conditioned to the machine-room temperature for two hours prior to use. The ideal environment for disk

Old

New
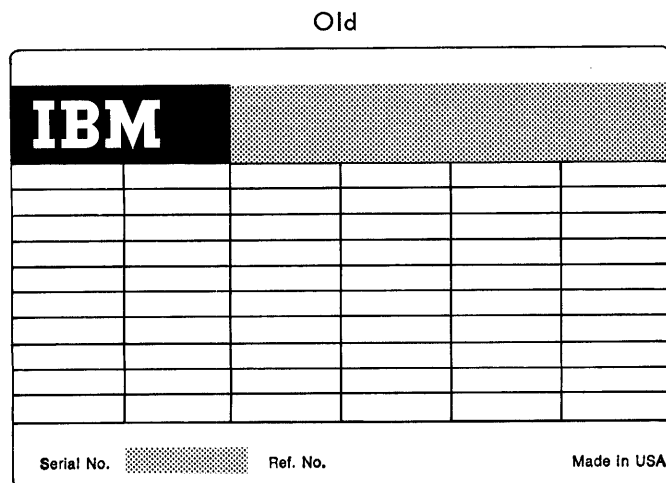
● Figure 5. Flagged Track Labels

A coller exclusivement au centre du disque
Oter lancienne étiquette

Nur in Abdeckteller des Stapelskleben
altes Schildentfernen

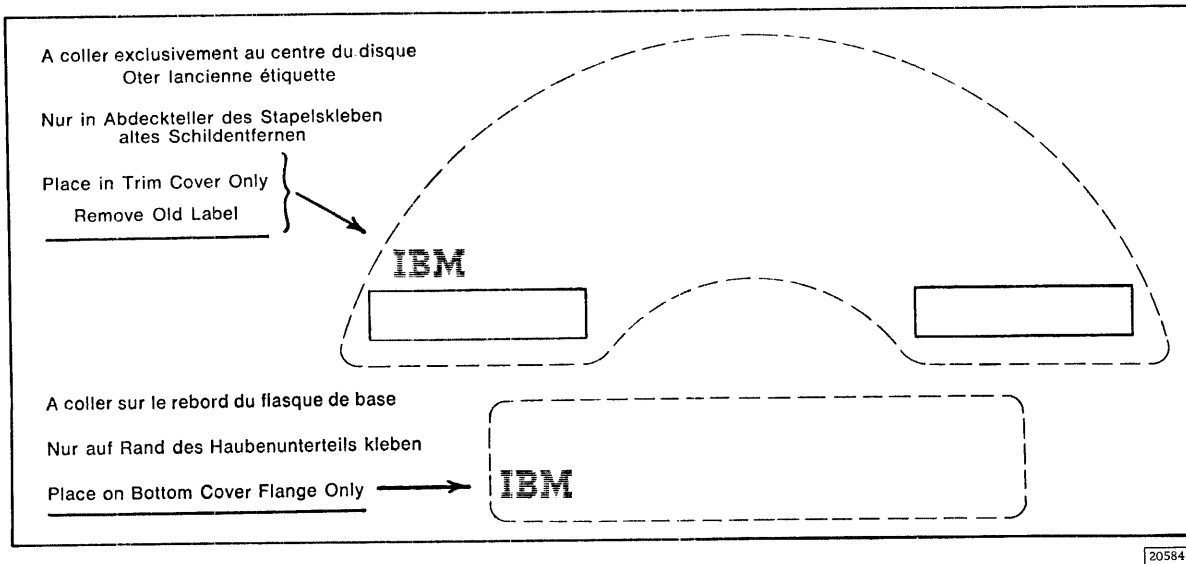Place in Trim Cover Only
Remove Old Label

IBM

A coller sur le rebord du flasque de base

Nur auf Rand des Haubenunterteils kleben

Place on Bottom Cover Flange Only

IBM

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● Figure 6.   Volume and Customer I.D. Labels

packs and cartridges is the same as that recommended for the machine room, i.e., a temperature of 60-90°F (15.6-32.2°C) and a relative humidity of 10-80%. The conditioning time is required to ensure correct track registration and data recording and retrieval.

Inspect the pack cover and remove any dust or dirt before installing the pack on the machine. Reassemble the two piece cover and store in a clean, dry location.

On the drive, the disk pack or cartridge is supplied with air that is taken from the room and filtered on the intake of the drive unit. The cover of the disk drive should always be kept closed while the drive is in operation to keep dust from bypassing the filter.

Disk Pack Installation and Removal

Placing the IBM 1316 and 2316 Disk Pack on the Drive

The IBM 1316 and 2316 Disk Packs are enclosed in a dustproof cover that consists of a transparent dome-shaped top and a flat bottom. The top of the cover is used as a mounting tool and handle which permits the operator to secure the disk pack to the disk drive.

To install the disk pack on the disk storage drive, unscrew and remove the bottom cover from the disk pack using the bottom cover knob. Place the disk pack on the disk drive spindle. Turn the top cover in a clockwise direction until it comes to a full stop. Even though the cover might become

disengaged before the full stop point is reached, continue to turn the cover to ensure the activation of the "pack on" safety switch. This switch must be activated before the drive mechanism can be started. The top cover can then be removed, leaving the disk pack locked on the spindle.

While the disk pack is on the drive, reassemble the top and bottom covers and store in a clean, dry location.

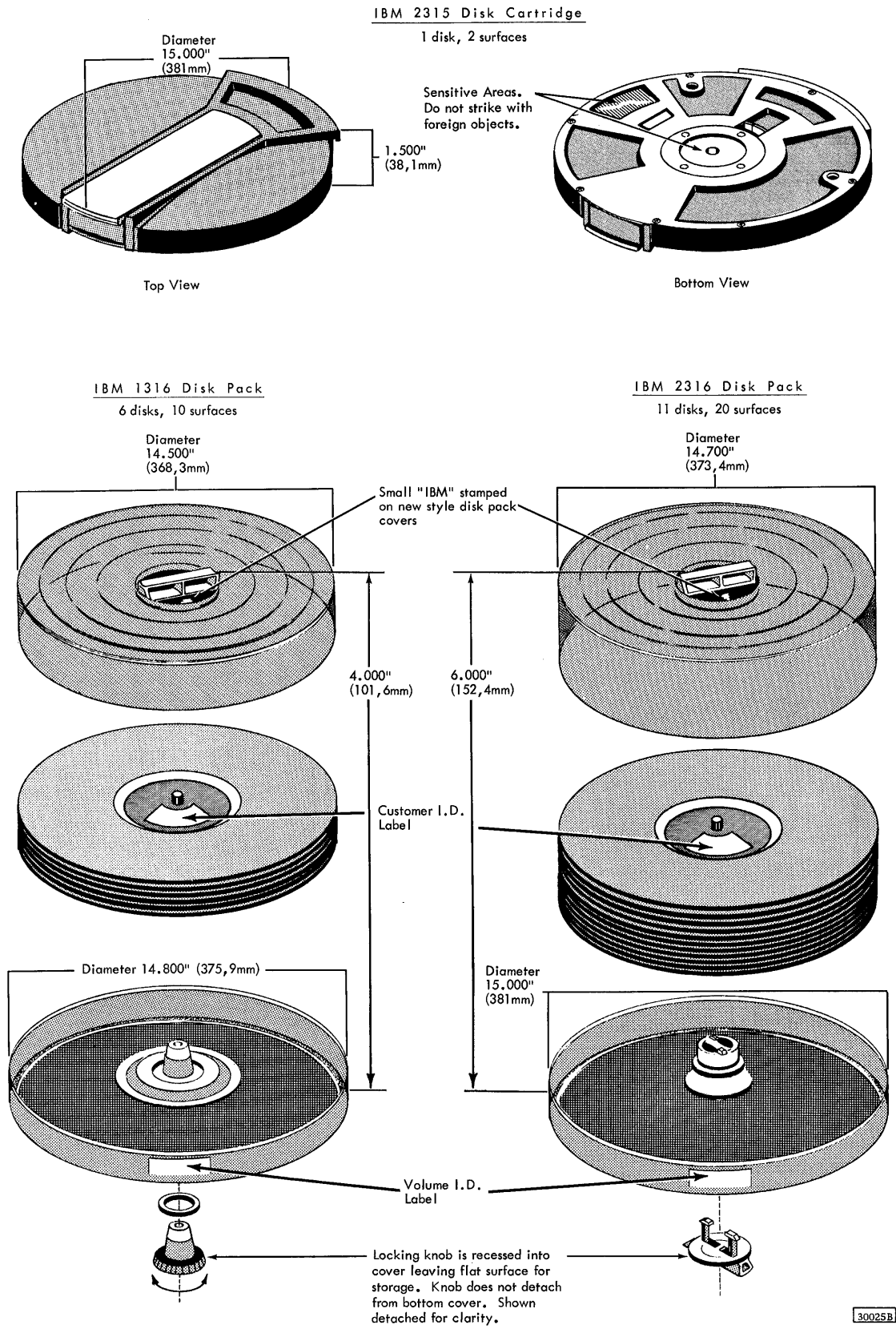Removal of the IBM 1316 and 2316 Disk Packs from the Drive

After pressing the stop key, wait until the disk pack has stopped before proceeding. Never open the disk storage drive cover until after the pack has come to a complete stop.

Remove the disk pack from the disk drive by replacing the top cover on the pack, engaging the cover pins, and turning the cover in a counterclockwise direction for two full turns. The cover has then been securely fastened to the disk pack so that both the pack and the top cover can be removed as a unit from the spindle of the drive. Immediately attach the bottom cover.

Disk Cartridge Installation and Removal

Placing the IBM 2315 Disk Cartridge on the Drive

To install the cartridge, pull down the interlock handle on the drive. This clears the opening into which the cartridge is inserted. Pick up the

IBM 2315 Disk Cartridge
1 disk, 2 surfaces

Diameter
15.000"
(381mm)

Sensitive Areas.
Do not strike with
foreign objects.

1.500"
(38,1mm)

Top View

Bottom View

IBM 1316 Disk Pack
6 disks, 10 surfaces

Diameter
14.500"
(368,3mm)

IBM 2316 Disk Pack
11 disks, 20 surfaces

Diameter
14.700"
(373,4mm)

Small "IBM" stamped
on new style disk pack
covers

4.000"
(101,6mm)

6.000"
(152,4mm)

Customer I.D.
Label

Diameter 14.800" (375,9mm)

Diameter
15.000"
(381mm)

Volume I.D.
Label

Locking knob is recessed into
cover leaving flat surface for
storage. Knob does not detach
from bottom cover. Shown
detached for clarity.

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● Figure 7. Disk Pack and Cartridge Assemblies

cartridge at the handle-like front edge in such a manner that the cartridge is facing up and pointing away from your hand. The cartridge is held correctly when the letters "IBM," embossed in the handle, are to the left of your hand and rightside up. Make sure that the cartridge door is closed. Slide in the cartridge like a desk drawer. Close the interlock handle.

Removal of the IBM 2315 Disk Cartridge from the Drive

After pressing the stop key, wait until the interlock light comes on, indicating the drive is stopped. The interlock handle cannot be operated as long as the disk is still in motion. Pull down the interlock handle. Take hold of the cartridge handle and pull out the cartridge.

Close the cartridge door by pressing down on it. This step is important for two reasons: it creates a positive dust seal, and it immobilizes the disk in the cartridge.

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