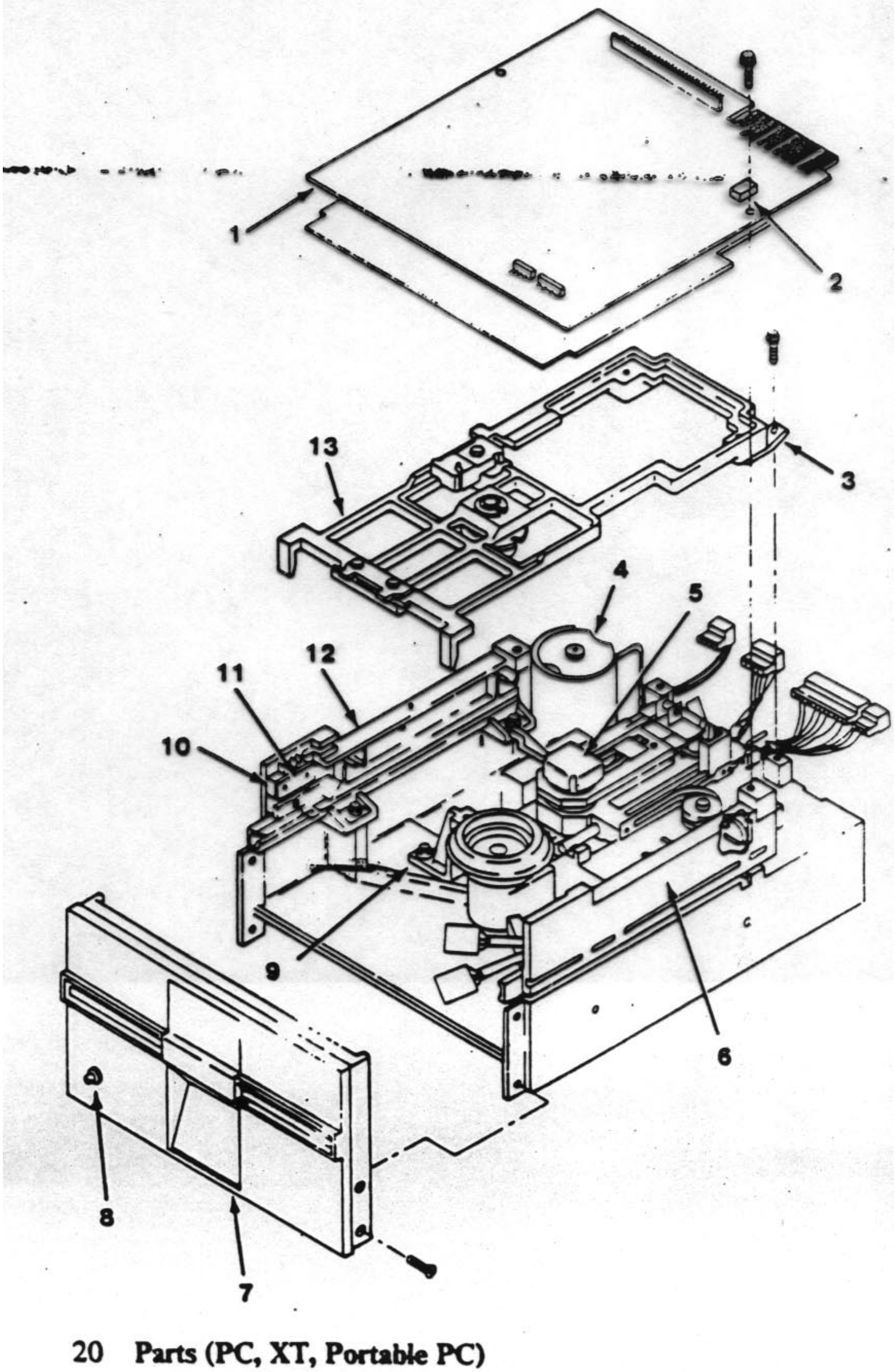
Assembly 9. Full High Diskette Drive Type 2



DESIGN

FUNCTIONAL REQUIREMENTS

WHAT DOES IT DO?
WHAT IS THIS PRODUCT FOR?
LIST THE FUNCTIONAL REQUIREMENTS (OF THE UNIT, COMPONENTS)

DESIGN PARAMETERS

WHAT ARE THE DESIGN PARAMETERS?
WHO MADE IT?
WHERE DOES IT COME FROM?
WHAT IS THE MATERIAL?
WHY WAS IT CHOSEN?
IS THE SOURCE OF SUPPLY DEPENDABLE?
HOW MUCH DOES IT COST?
HOW IS IT DISPOSED OF AFTER IT IS DISCARDED?

FORM (DIMENSIONS - COULD IT BE BIGGER OR SMALLER
(WEIGHT - COULD IT BE HEAVIER OR LIGHTER
(SHAPE - WHY CHOSEN?

EXTERNAL CONSTRAINTS (SYSTEM CONSTRAINTS)

ENVIRONMENT
LEGAL/SAFETY/REGULATORY
POLITICAL IMPLICATIONS
LABOR RELATIONS
NATIONAL SECURITY
ECONOMICS
HISTORIC/TRADITIONAL/MORAL

HUMAN CONSTRAINTS:

ERGONOMETRIC
HEALTH
ESTHETICS
DEGREE OF IMAGINATION/TECHNICAL COMPETENCE

INPUT CONSTRAINTS

HOW WAS IT MADE? (GENERAL METHOD OF FABRICATION MOLDED, EXTRUSION, ETC.)
HOW IS IT ASSEMBLED IN THE FACTORY? (HOUSING, # OF FASTENERS)
IS THE ARRANGEMENT OF COMPONENTS RATIONAL? (ERASE OF REMOVAL AND REPLACEMENT, TESTING, REPAIR, ETC.)
COULD YOU SUGGEST ANOTHER LAYOUT?

EXTERNAL CONSTRAINTS (SYSTEM CONSTRAINTS)

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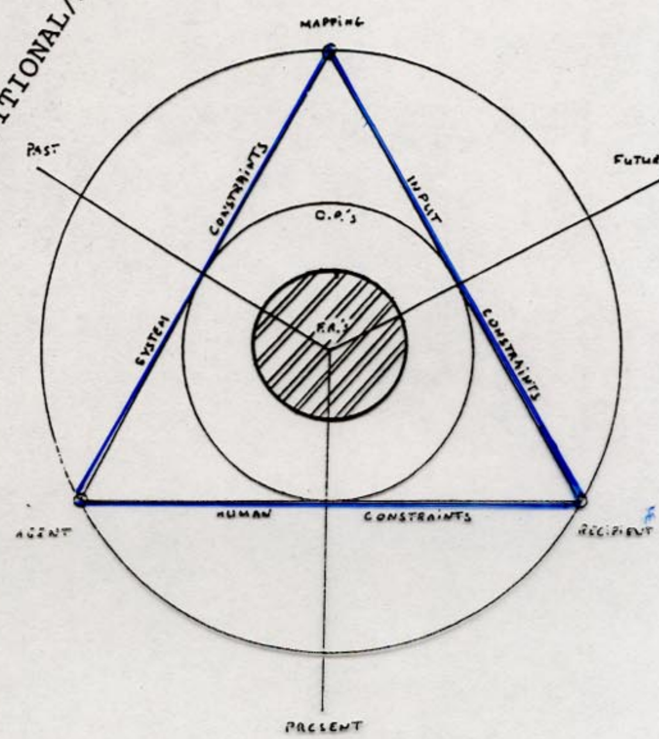

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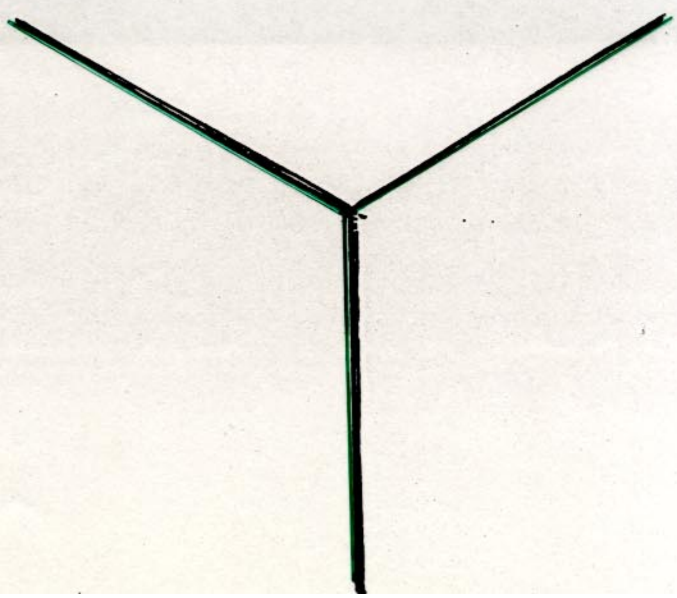


FUNCTIONAL REQUIREMENTS

The fundamental concept of butterfly valve design can be traced back to the time of Archimedes who employed its use in his various steam engine designs. Rubber seated butterfly valves have been in use in pipelines carrying liquids and gases since the late 1920's. Prior to the availability and development of natural rubbers, butterfly valves were of the metal-seated type, used for such applications as flue dampers, steam control, and pen-stocks for hydroelectric plants reaching diameters in excess of 30 feet.

In the early 40's, the use of rubber seated butterfly valves continued to gain wider acceptance as flow control devices, especially as an alternative to gate valves. The obvious advantages are: they provide *tight shutoff*, they are *relatively easy to operate* even with large pressure drops across the valves, they require *less space* for installation, they contain *less weight* to support, and they offer an *economic advantage*.

DESIGN PARAMETERS

Features of Keystone resilient seated butterfly valves

Every Keystone resilient-seated valve is factory tested to at least 110% of its bubble-tight rating.

1. Top plates
Standardized for actuator interchangeability.

2. Heavy duty top bushing
Absorbs side thrust loads.

3. Bi-directional stem seal
Is suitable for full vacuum and is self-adjusting.

4. Thru-stem
Design provides dependability and positive disk control. Connections are standardized for actuator interchangeability.

5. Secondary stem seal
Formed by the controlled stem penetration through the seat.

6. Primary stem seal
Formed by pre-loaded contact of disk hub with flatted seat surfaces. Completely isolates stem and body parts from the stream.

7. Special self-locking stainless disk screws
Allow quick and easy disassembly and full interchangeability. Connection is positive, shakeproof and designed for maximum torque capacity. (Valves 24" and larger have special taper pins with seals and retainer nuts.)

8. Rounded and hand-polished disk and hub edge
Provides full concentric seating, lower torques and longer seat life.

9. Replaceable seat
Isolates the stem and body parts from the stream and also serves as flange gasket. Molded-in O-ring provides positive seal against standard ANSI flange faces.

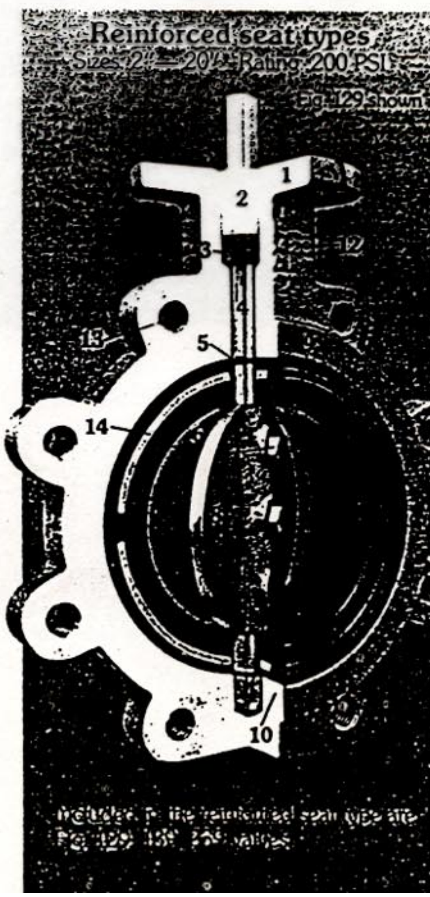
10. Patented dove-tail seat retention method
Eliminates the need for bonding; makes seat replacement simple and fast. Extra heavy edge section resists tearing. Meets AWWA thickness requirements.

11. Standardized mounting
Assures complete interchangeability of manual and power actuators.

12. Neck
Design allows actuator clearance and 2" of insulation over flange. (Fig. 228 and 229, only)

13. Locating holes
Drilled locating lugs suitable for ANSI 125/150 lb. flange bolts, allowing for positive alignment.

14. Metal reinforced seat
Replaceable: isolates the stem and body parts from the stream. It also serves the purpose of flange gaskets. The molded-in O-rings provide positive seal against standard flanges.



Features:

- **Cast-in top plate** is standard for direct actuator mounting.
- Fig. 2 has drilled & tapped lugs meeting ANSI 125/150 flange standards.
- **Steel body** provides strength and durability for severe abuse such as fire conditions.
- **One-piece, thru-shaft design** for high strength and positive disc control.
- **Drop-tight shut-off** in either direction to full valve pressure rating. Every valve is factory tested.
- **Neck length adequate** for flange & insulation clearance.
- **Universal seat design** has Keystone's famous patented dovetail seat retention. No bonding to valve body is required. The seat can be replaced at the valve location in the field.
- **Extra heavy seat** performs flange gasket function. No gaskets between the valve and flange faces are required. Use of gaskets adversely affects performance. Resilient seat also seals against the disc drop tight. It isolates the valve body and shaft from the fluid flow.
- Valve can be installed with O.D. tubing, rubber-lined or heavy-wall pipe, and slip-on or weld-neck flanges.
- **Primary seals** formed by preloaded contact between disc and seat. These seals protect valve from fluid contact.
- **Shaft seal** prevents dirt from entering valve. It also adjusts itself to pressure and shaft motion.
- **Hand-polished disc edges** insure maximum seat life.
- **Stainless steel disc screws** allow quick, easy disassembly. Connection is positive, shake-proof, and stronger than shaft.

Dimensions And Materials

Valve Size		Dimensions (In.)										Top Plate Drilling			Tapped Lug Data				
In.	mm	A	B	C	D	E	F	G	H	Q	Keyway	Bolt Circle	No. Holes	Hole Dia.	Bolt Circle	No. Holes	Tap	LB.	kg
2	50	2	4 1/8	5 1/2	1 5/8	4	1 1/4	9/16	3/8	1 3/8	—	3 1/4	4	7/16	4 3/4	4	5/8-11 UNC	8	3.5
2 1/2	65	2 1/2	4 5/8	6	1 3/4	4	1 1/4	9/16	3/8	2 1/16	—	3 1/4	4	7/16	5 5/8	4	5/8-11 UNC	11	5
3	80	3	5 3/16	6 1/4	1 3/4	4	1 1/4	9/16	3/8	2 9/16	—	3 1/4	4	7/16	6 1/4	4	5/8-11 UNC	12	5.5
4	100	4	6 3/8	7	2	4	1 1/4	5/8	7/16	3 5/8	—	3 1/4	4	7/16	7 1/2	8	5/8-11 UNC	18	8
5	125	5	7 3/8	7 1/2	2 1/8	4	1 1/4	3/4	1/2	4 3/4	—	3 1/4	4	7/16	8 1/2	8	3/4-10 UNC	22	10
6	150	5 3/4	8 1/2	8	2 1/8	4	1 1/4	3/4	1/2	5 1/2	—	3 1/4	4	7/16	9 1/2	8	3/4-10 UNC	28	12.5
8	200	7 3/4	10 11/16	9 1/2	2 1/2	6	1 1/4	7/8	5/8	7 1/2	—	5	4	9/16	11 3/4	8	3/4-10 UNC	44	20
10	250	9 3/4	13	10 3/4	2 1/2	6	2	1 1/8	7/8	9 19/32	1/4 × 1/4	5	4	9/16	14 1/4	12	7/8-9 UNC	68	31
12	300	11 3/4	14 13/16	12 1/4	3	6	2	1 1/8	1 1/8	11 1/2	1/4 × 1/4	5	4	9/16	17	12	7/8-9 UNC	113	51
14	350	13 1/4	17 5/16	12	3	6	3	1 3/8	1 3/8	13 1/8	5/16 × 5/16	5	4	9/16	18 3/4	12	1-8 UNC	149	68
16	400	15 1/4	19 1/8	13 7/32	4	6	3	1 5/8	1 5/8	15	3/8 × 3/8	5	4	9/16	21 1/4	16	1-8 UNC	245	111
18	450	17 1/4	21 9/16	14 1/2	4 1/4	8	4 1/4	1 7/8	1 7/8	16 7/8	1/2 × 3/8	6 1/2	4	13/16	22 7/8	16	1 1/8-7 UNC	269	122
20	500	19 1/4	23 11/16	15 7/8	5	8	4 1/4	1 7/8	2 1/8	18 3/4	1/2 × 3/8	6 1/2	4	13/16	25	20	1 1/8-7 UNC	371	169

Body: Steel (A216, Grade WCB)
Seat: Buna N, EPDM
Disc: Aluminum-Bronze, 316 SS

Bushing: Acetal
Shaft: 316 SS (2"-10" Valves), 18-8 SS (12"-20" Valves)
Disc Screws: 316 SS

METCALF & ED

General valve construction materials**

Soft Seat
Body: Cast Iron, Ductile Iron, Aluminum, Bronze, Steel.
Disk: Cast Iron, Ductile Iron, Bronze, Iron with Nickel Seating Edge, 316 Stainless Steel, Monel, Titanium.
Stem: Coated Alloy Steel, 416 Stainless Steel, 316 Stainless Steel, Monel.
Seat: EPDM, Buna N, Teflon-lined Buna N.
Bushing: Acetal.
Stem seal: Buna N.
Disk screws: 316 Stainless Steel, Monel.

Reinforced Seat
Body: Iron (Fig. 129 and Fig. 139 also available in marine materials).
Disk: Aluminum-bronze, Nodular Iron, 316 Stainless Steel.
Stem: Coated Alloy Steel, 316 Stainless Steel.
Seat: EPDM, Buna N.
Disk screws: 316 Stainless Steel.
Bushing: Acetal.
Packing: Buna N.

*See Valve Selection Guide for specific sizes available and pressure ratings.

**Available standard materials of construction may vary according to valve types and sizes. See individual valve brochures or your exclusive Keystone distributor for specific materials of construction.

EXTERNAL CONSTRAINTS

Research and development in metals and synthetic elastomers conducted during the early 40's fueled the surge in technological advances in the following years. Mr. C. K. Stillwagon, the pioneer of the modern resilient-seated butterfly valve and founder of Keystone Valve, recognized the need for a rugged, compact, tight shutoff valve for oil field applications and began experimenting in these postwar years with new concepts in butterfly valves. In 1951, the Keystone Butterfly Valve was originated by Mr. Stillwagon especially to meet the requirements of the oil industry. Following acceptance in the oil industry, applicability to a wide range of industrial services soon became apparent. Applications soon developed, including widely diverse services ranging from abrasives to zeolite. The name "Keystone" soon became synonymous with the words "butterfly valve."

This new concept incorporated two new design approaches. First, the reduction of metal content to only that required to provide the essential functions of the valve without sacrificing reliability, performance, or quality of the product. This achieved a saving in both space and weight. A body design of wafer construction when cross-bolted between flanges was subject to compressive loading only. This feature eliminated the necessity for high strength body material. The second was a field replaceable seat, as opposed to the bonded or vulcanized liners previously employed. This also eliminated the necessity for cumbersome adjusting segments to establish tight shutoff, the seat being retained in a machined dovetail in the body by mating pipeline flanges. The seats were molded from the newer synthetic elastomer materials available, which offered improved physical properties over the old natural rubbers, as well as superior resistance to chemical attack.

The Keystone Valve Division of Keystone International, Inc., is the single largest producer of butterfly valves in the world. Since its pioneer beginnings in 1951, Keystone has built a global network of manufacturing and distribution facilities, with production plants in eight countries, and worldwide sales offices to service customers in every industrial nation. Keystone is the only manufacturer of butterfly valves with "designed-in" capability for international flange accommodation. Only Keystone can provide international parts supply and interchangeability in valves installed between JIS, DIN, ANSI and BS flanges

INPUT CONSTRAINTS

Flange and Pipe Compatibility: The Figure 2 valve is made to be used between all types of ANSI 125 and 150 pound flat or raised face flanges. Flange gaskets are unnecessary as the Keystone butterfly seat face design eliminates the need for gaskets. Lined pipe, heavy wall pipe, or flanges must have a minimum allowable inside diameter (Dimension "Q") at the centered body face to clear the disk sealing edge when opening the valve.

Installation Information: The Keystone valve is non-directional and will control flow equally well in either direction. For the best results in slurry service regarding sedimentation, position the valve assembly to have the stem in the horizontal position and the lower disk edge to open in the downstream direction. To install the valve between existing ANSI flanges, the flanges must be spread sufficiently before placing the valve in position to prevent distortion and/or damage to the sealing face of the seat. In new construction using ANSI welding type flanges, the following method of installation has proven beneficial. With the disk in the nearly closed position, align and center the companion flange bolt holes to the body lug holes. Assemble the body and flanges with the flange bolting, and make-up the bolting. Use the flange-body-flange assembly for fit-up and centering to the pipe. Tack weld the flanges to the pipe. Remove the bolting and valve assembly from between the flanges. **Important: Do not finish weld the flanges to the pipe with the valve bolted between the flanges as this will result in serious heat damage to the seat.** Finish welding the flanges to the pipe and allow the flanges to cool completely.

Maintenance: Routine maintenance or lubrication is not required.

Repairs: The Keystone butterfly valve is field repairable. If in time it is necessary to replace certain parts, the valve must be removed from the line. Proceed by turning the disk to the nearly closed position, loosen and remove all bolting, spread the flanges if necessary, and remove the valve from between the flanges.

Valve Disassembly: Turn the disk to the almost open position. Proceed by removing the operator or actuator, disk screws with "O" rings, stem, packing, and bushing. Remove the disk by pulling or "rolling" the disk out of the seat bore. To remove the seat from the body, pry under both seat edges at one point, collapse the seat into the shape of a round bottom heart configuration (♡),and pull the seat out of the body bore. Discard the parts to be replaced.

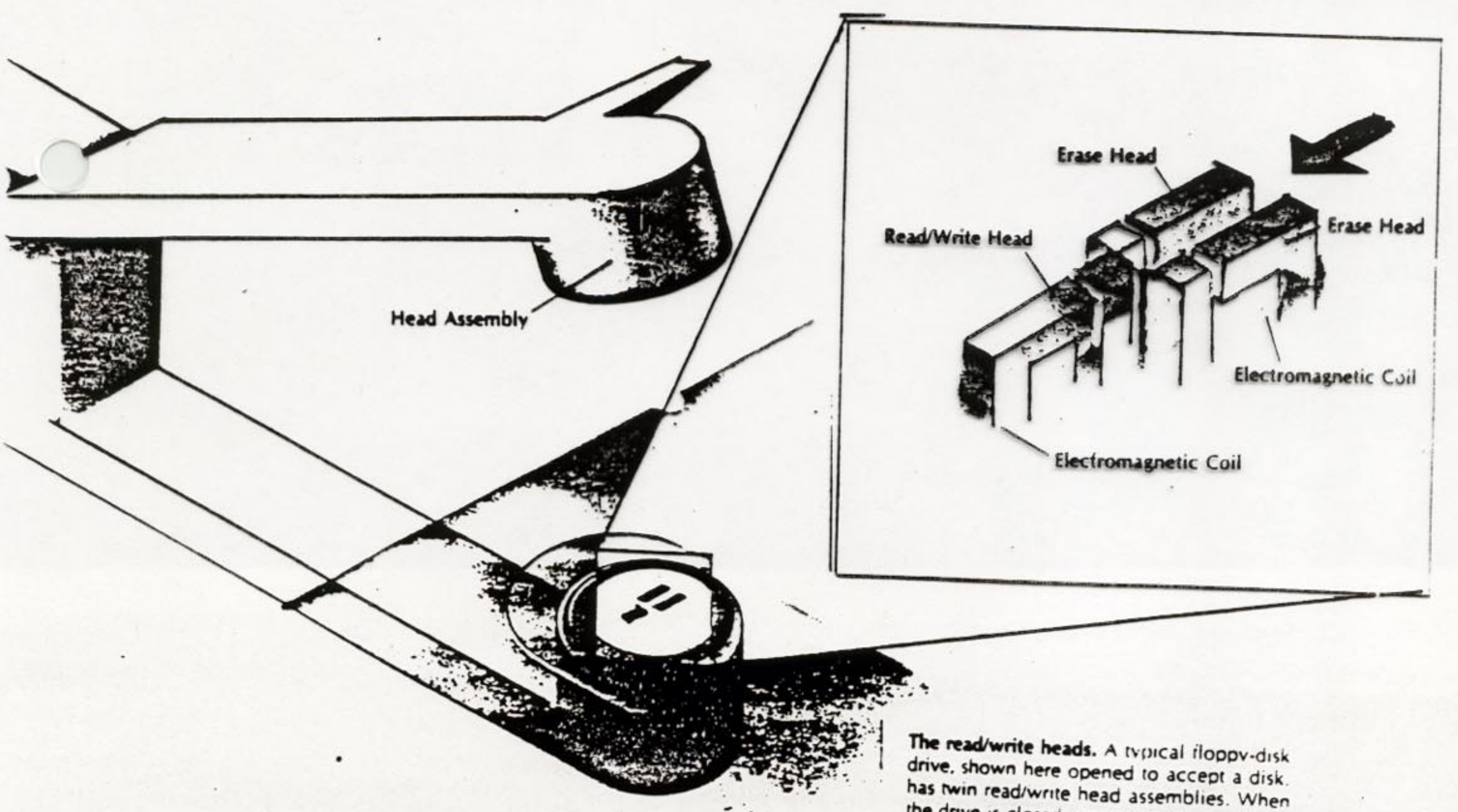
Valve Assembly: Clean all reusable parts. If possible, use Silicone base oil or lubricant to facilitate assembly. Collapse the seat into the shape of a round bottom heart configuration (♡), firmly place the "bottom" part of the seat into position taking care to align the lower stem holes, snap the seat into position within the body, and check all stem holes for proper alignment. Install the disk with the screw holes toward the body top plate and align the stem holes. Install the packing, bushing, and stem. Use a rotary downward pressure on the stem to facilitate assembly while paying particular attention that the seat is not damaged due to any misalignment of the stem holes. Align the counterdrilled portion of the stem screw holes with the disk screw holes. Place "O" rings on the disk screws. Install the disk screws and tighten securely.

Floppy-Disk Drives

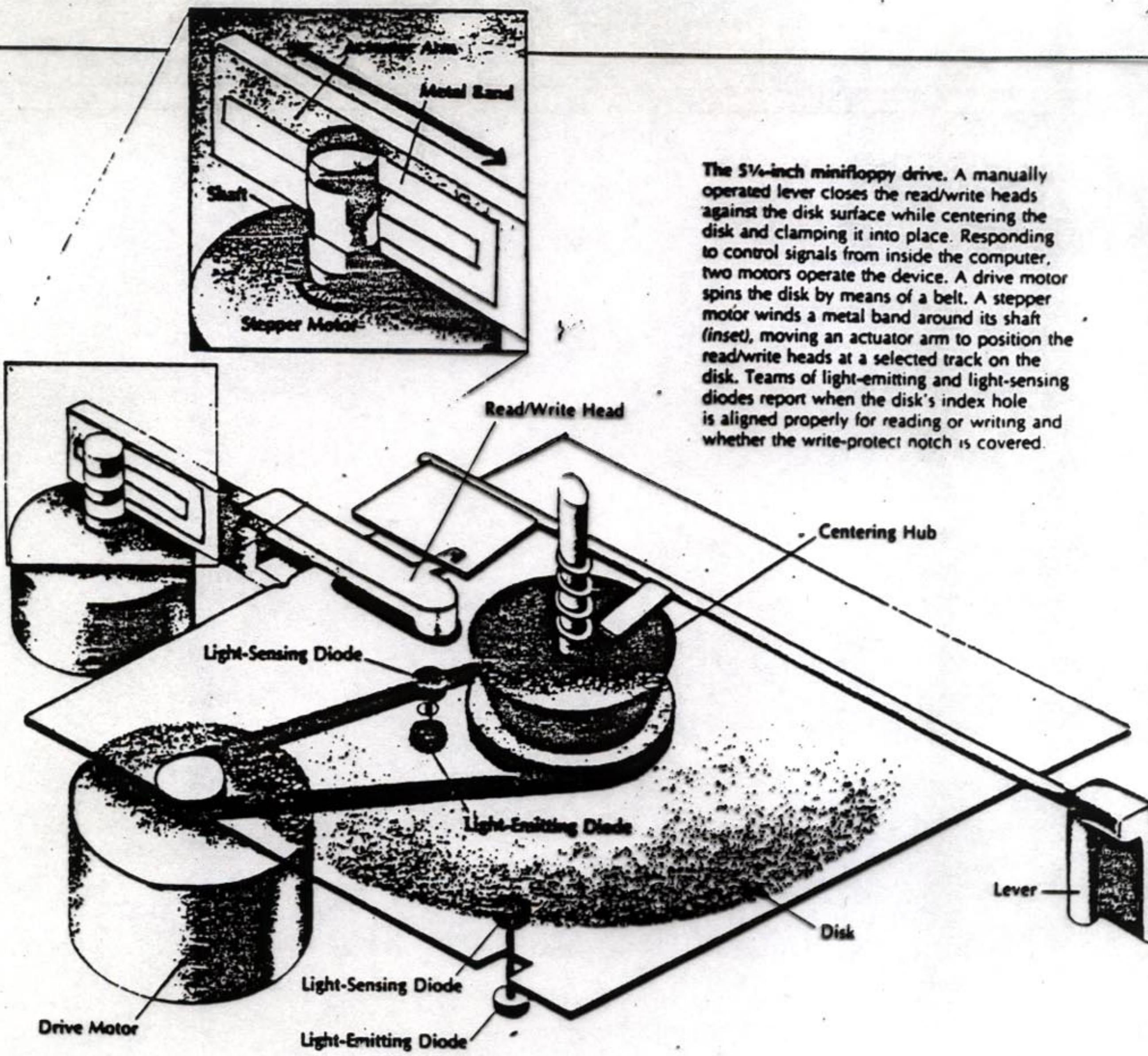
A disk is nothing without a disk drive, the machinery that spins the disk to record data on its magnetic surfaces and later to retrieve the information. Although the drives for floppy disks of various sizes differ in detail, they have much in common. For example, all have read/write heads, similar in design to the one shown below, that transfer data to and from the disk according to the principles of magnetic recording explained on pages 40 through 42.

To store and recall data, the read/write heads of all floppy-disk drives touch the disk's magnetic material. Despite the presence of liners to clean the disk surface, the rubbing of disk against head can clog the narrow recording gap built into the head. Though this potential source of error can usually be remedied by cleaning, constant abrasion ultimately wears disk and head alike, eventually rendering the floppy unreadable or the drive unserviceable.

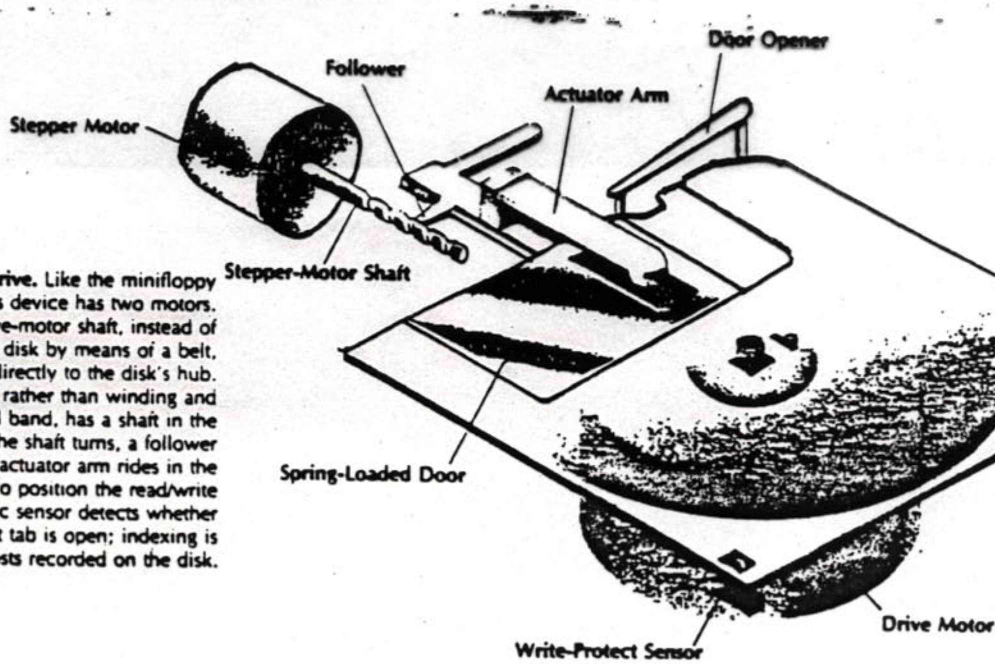
Floppy-disk drives employ an unusual type of motor to move an actuator arm that positions read/write heads at the proper track on the disk *(pages 48-49)*. Called a stepper motor, it operates with a cogging, or start-stop, motion. When the motor is activated by a pulse of current from the computer, the shaft rotates a fraction of a degree, moving the heads a calibrated distance. A conventional motor spins the disk for reading and writing in one of two ways. In a bulkier but less expensive system, a belt connects the drive motor to a small turntable that spins the disk. Where space is at a premium, a direct-drive arrangement is employed, in which the turntable for the disk is fastened to the motor's drive shaft.



The read/write heads. A typical floppy-disk drive, shown here opened to accept a disk, has twin read/write head assemblies. When the drive is closed, one assembly touches the underside of the disk and the other touches the top. Each head is really three heads in one *(above)*: a pair of erase heads and a read/write head for recording and recovering information. The erase heads, which flank the read/write head, remove stray magnetic signals from the space between data tracks. Without the buffer zones thus created, variations in alignment between disk drives could make data recorded by one drive unreadable to another.

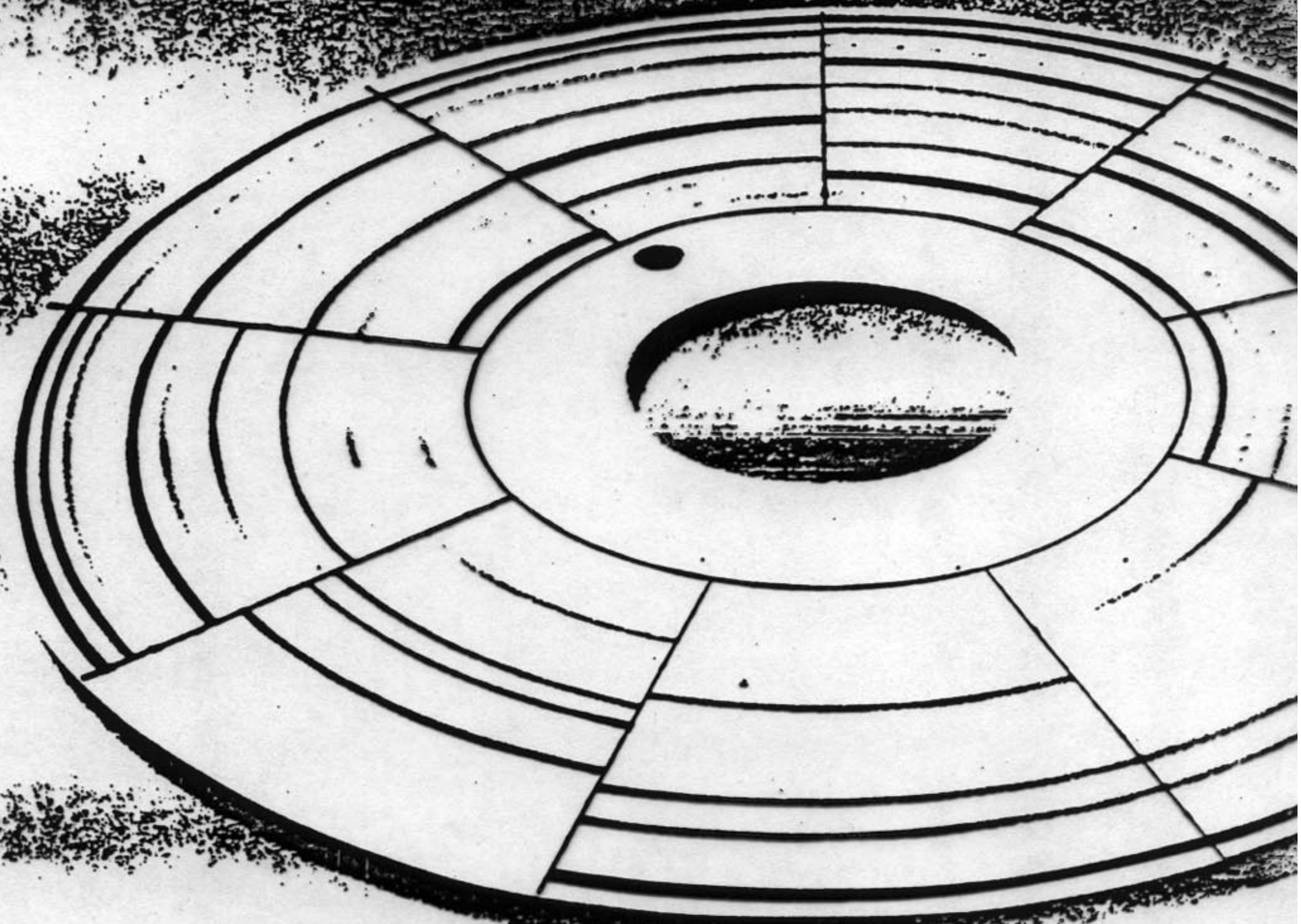


The 5¼-inch minifloppy drive. A manually operated lever closes the read/write heads against the disk surface while centering the disk and clamping it into place. Responding to control signals from inside the computer, two motors operate the device. A drive motor spins the disk by means of a belt. A stepper motor winds a metal band around its shaft *(inset)*, moving an actuator arm to position the read/write heads at a selected track on the disk. Teams of light-emitting and light-sensing diodes report when the disk's index hole is aligned properly for reading or writing and whether the write-protect notch is covered.



A microfloppy disk drive. Like the minifloppy drive above, this device has two motors. However, the drive-motor shaft, instead of spinning the disk by means of a belt, automatically locks directly to the disk's hub. The stepper motor, rather than winding and unwinding a metal band, has a shaft in the form of a screw. As the shaft turns, a follower attached to the actuator arm rides in the shaft's groove to position the read/write heads. An electronic sensor detects whether the write-protect tab is open; indexing is by magnetic signposts recorded on the disk.

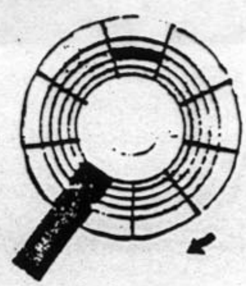
2



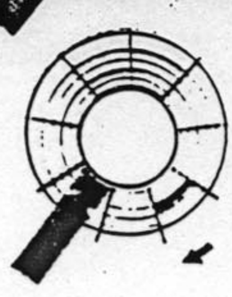
Disks: Circular Tracks for Fast Access

Seeking Out the Data on a Disk

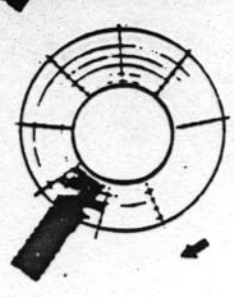
1 In the first of four steps, a disk drive starts locating data (green) by shifting the arm holding the read/write head to the desired track. This is called seek time.



2 The controller then waits for an index hole, near the center of the spinning disk, to be detected. The hole provides a reference point for the start of scanning.



3 The head begins to read, scanning for the desired sector's identifying label. The period required for this process is called latency time.

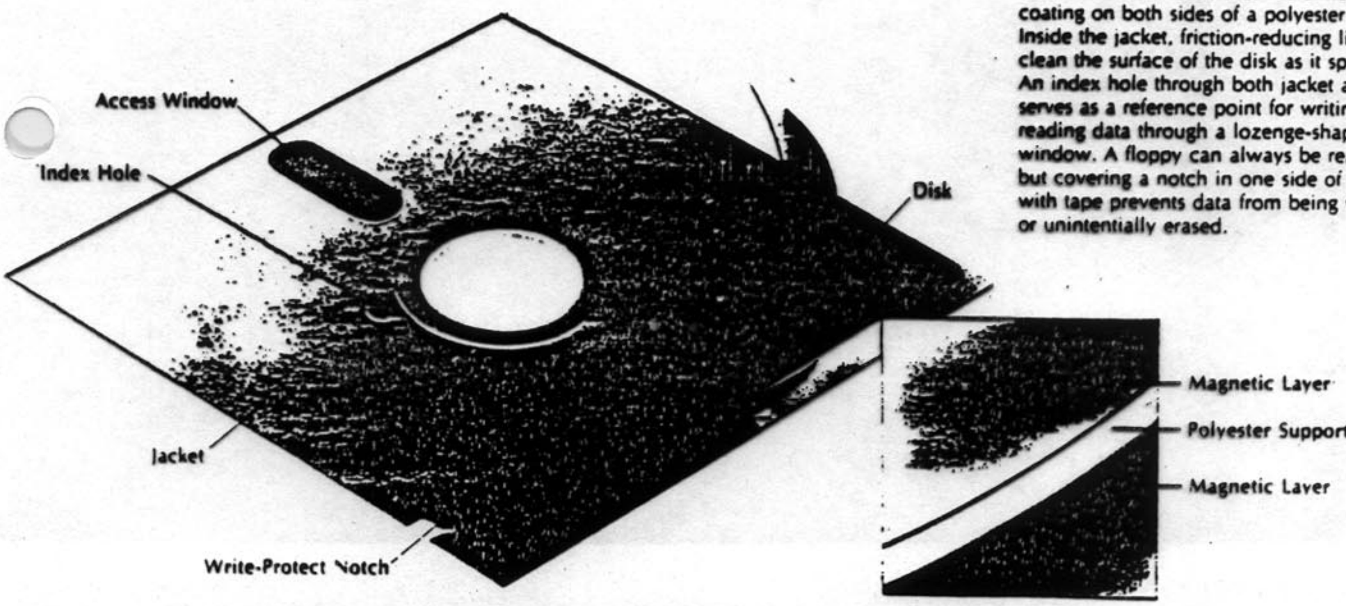


4 When the correct sector has been found, the data is read or written over. The time it takes for all four steps is the disk's access time.

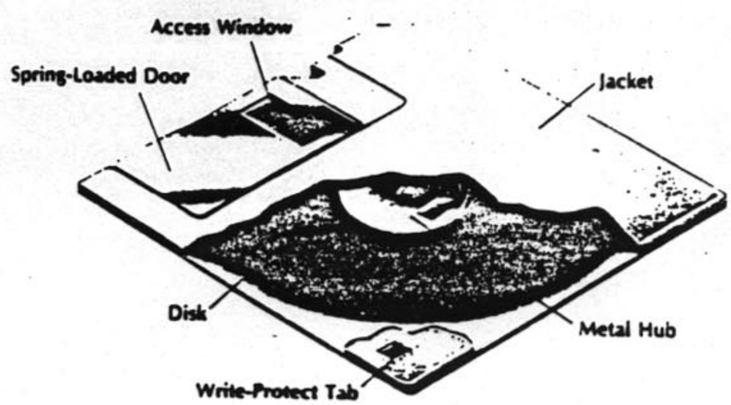
Magnetic-disk

Disks for storing computer data magnetically come in two varieties: floppy disks *(below)*, named for the flexible material they are made of; and hard disks *(right)* constructed from rigid metal platters. Floppy disks are the less-expensive variety. They are cut from huge sheets of polyester, a tough plastic, which have been coated in advance with a layer of magnetic material. All floppies—the original version (disks 8 inches in diameter), minifloppies (5¼ inches in diameter), and microfloppies (3½ inches in diameter)—have a lower recording density than hard disks. However, they are rugged and can be easily removed from one computer's disk drive—the combination recorder-and-player *(page 57)* that spins the disk to store and recover computer data from its surface—to that of another.

Some hard disks share the transportability of floppies, but more often they are permanently installed in the disk drive. Removable or fixed, hard disks are substantially more expensive than floppies and are more susceptible to catastrophic damage that can destroy data. Hard disks are made from polished aluminum platters. After polishing, the disks are coated one at a time with a thin layer of magnetic material, then they are used either singly or in stacks.



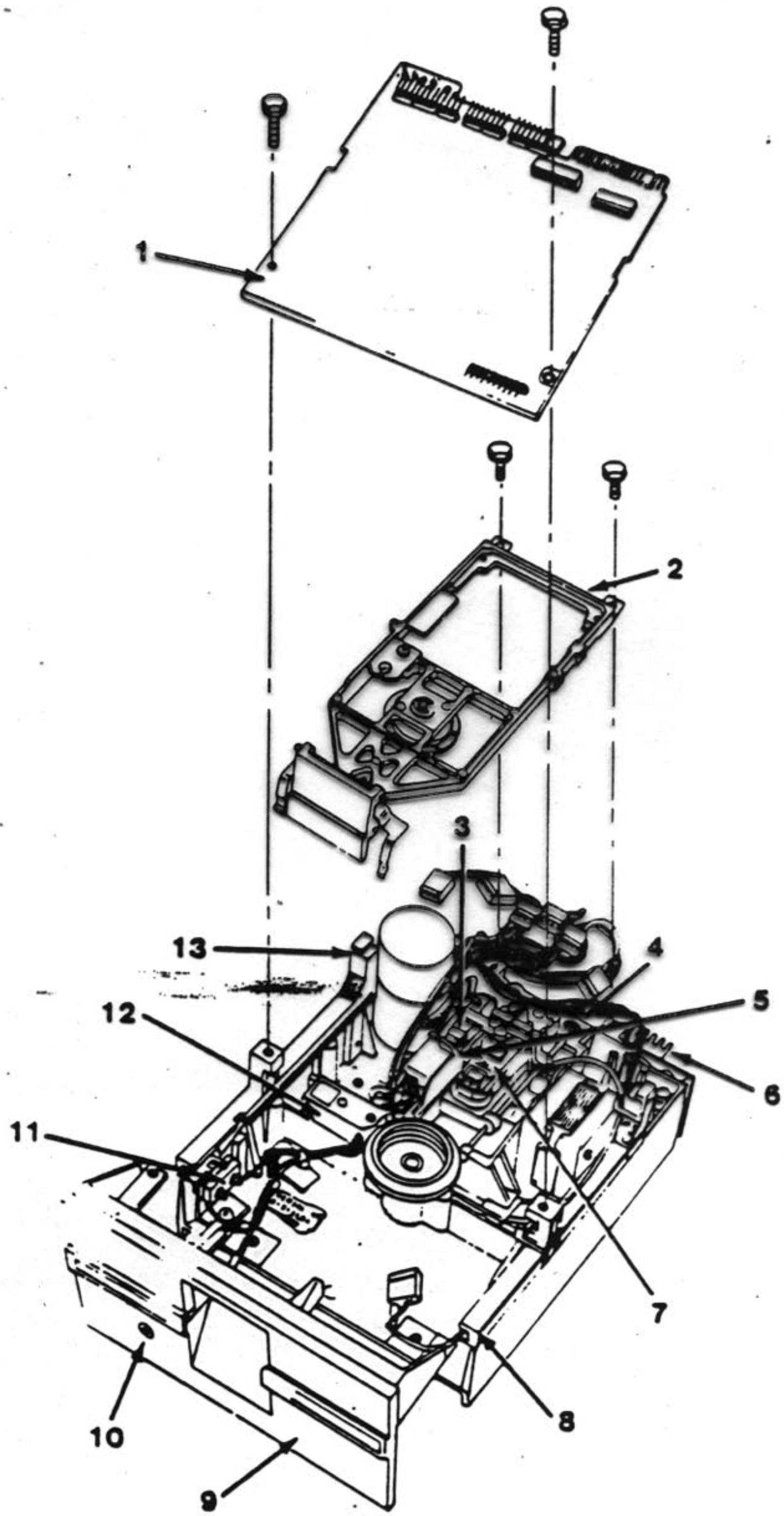
A 5¼-inch minifloppy. A protective jacket encloses a disk *(inset)* that has a magnetic coating on both sides of a polyester support. Inside the jacket, friction-reducing liners clean the surface of the disk as it spins. An index hole through both jacket and disk serves as a reference point for writing and reading data through a lozenge-shaped access window. A floppy can always be read, but covering a notch in one side of the jacket with tape prevents data from being written or unintentially erased.



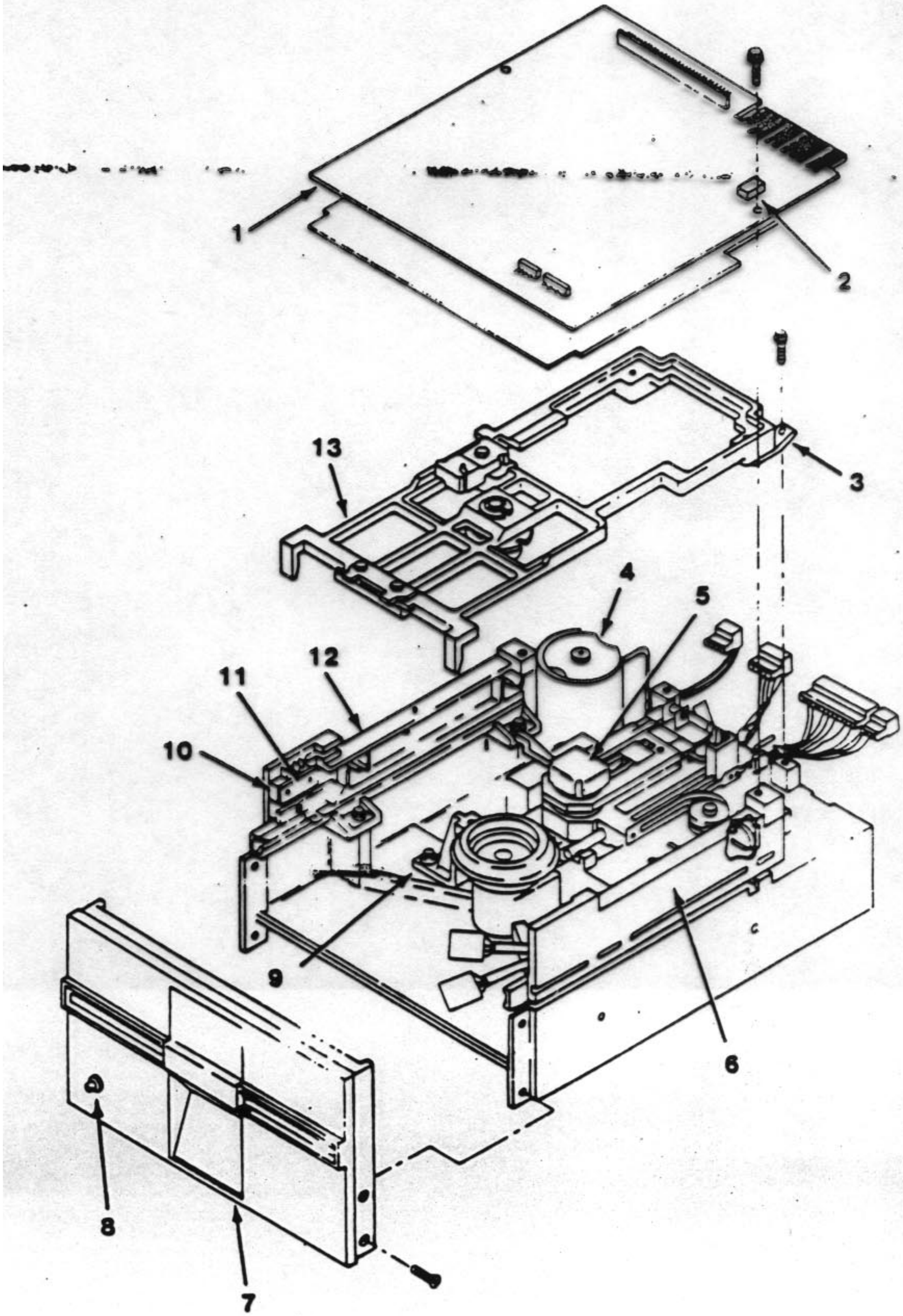
A 3½-inch microfloppy. In this smallest of floppies, a rigid plastic jacket protects the flexible magnetic disk. A spring-loaded door (shown open here) covers the jacket's access window. The door remains tightly closed until the floppy is inserted into a disk drive, thus warding off dust and fingerprints. A metal hub, bonded to the underside of the disk, has one hole that serves to center the disk and another for spinning it; indexing is by magnetic signal recorded on the disk. Protection against unintentional writing or erasure is achieved by sliding a tab to open a hole in the corner of the jacket.

4

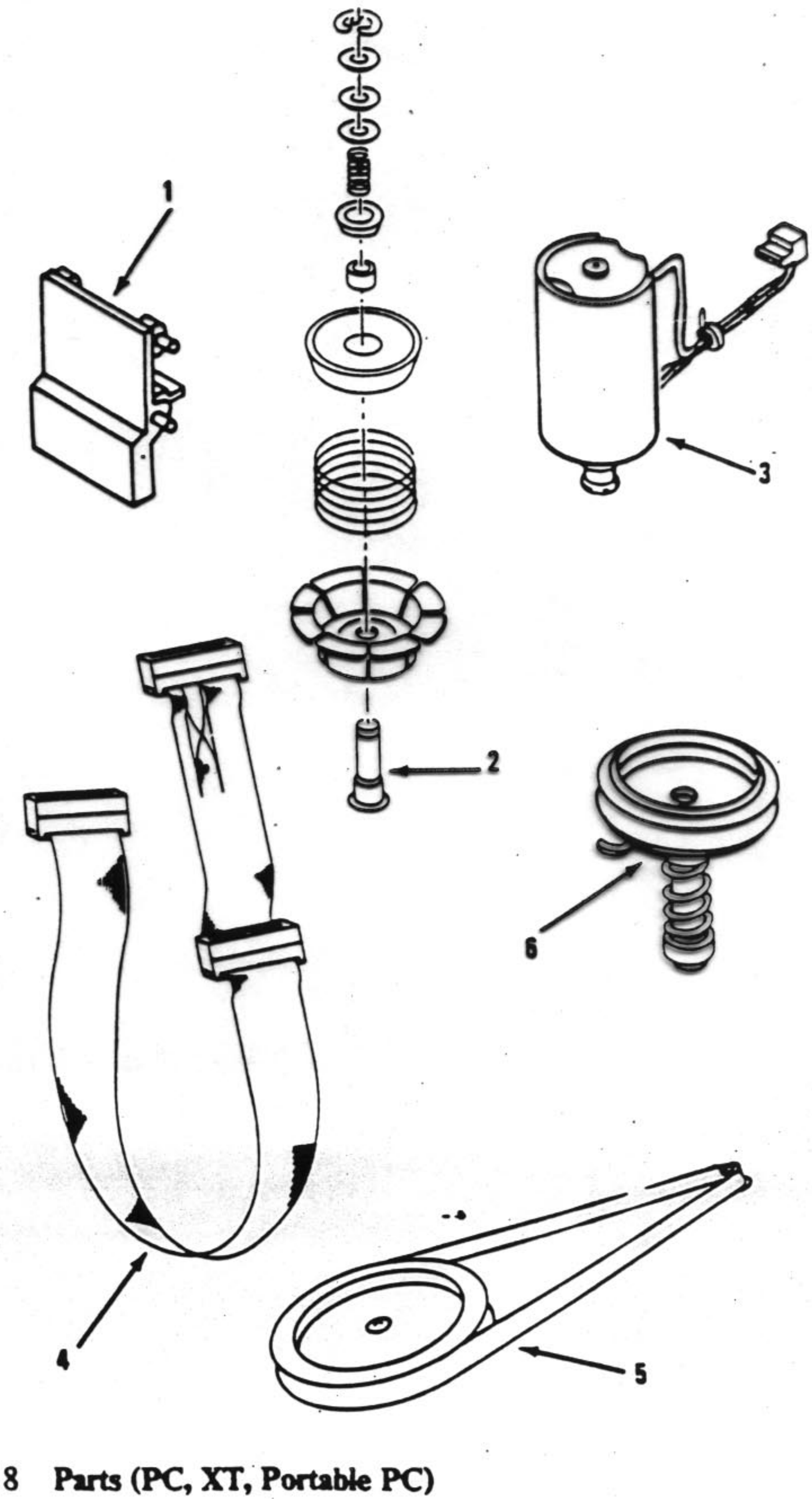
Assembly 7. Full High Diskette Drive Type 1



Assembly 9. Full High Diskette Drive Type 2



Assembly 8. Full High Diskette Drive Type 1



Alignment Tests

The Radial Alignment Check measures the drive's head alignment in relation to the track it is reading. The test makes the measurement by attempting to read sectors that are progressively offset from the track centerline. A properly aligned drive can read sectors that are equally offset away from [–] and toward [+] the spindle. Non-symmetrical readings indicate radial misalignment.

Figure 5 illustrates an example of proper radial alignment

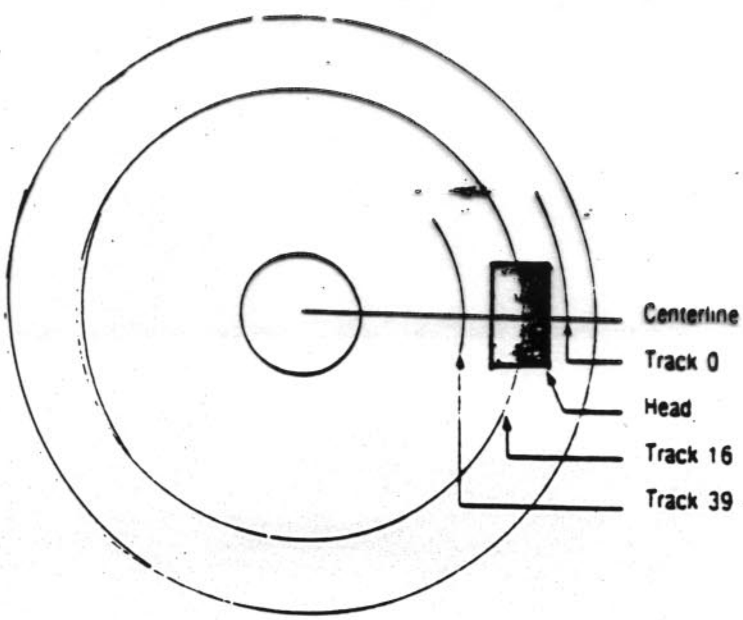


FIGURE 5. Proper radial alignment

Figure 6 illustrates an example of radial misalignment away from the center spindle hole.

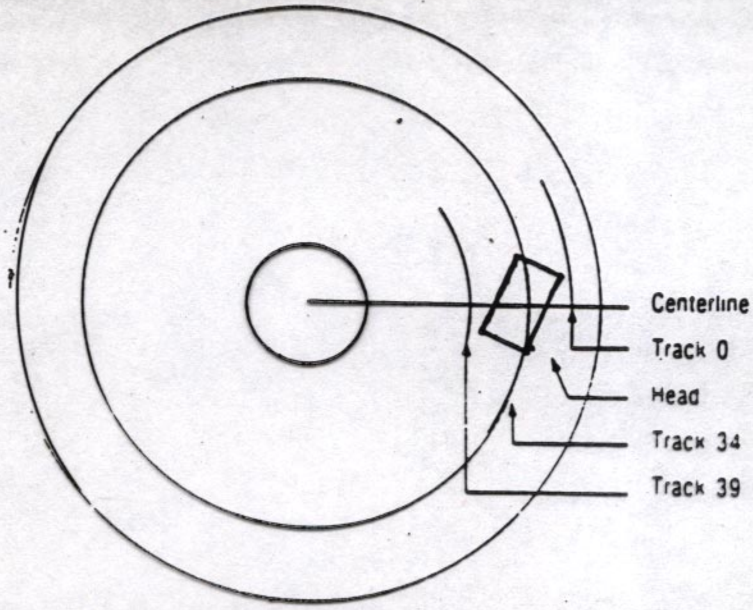


FIGURE 10. Improper azimuth alignment

Azimuth testing can also be an indicator of read sensitivity. If Drive A reports −42, +42 minutes of angle read and Drive B reports −32, +32, both drives show correct azimuth alignment. But the lower reading (−32, +32) could indicate a read sensitivity or a radial alignment problem in Drive B. (See "Radial Alignment Check" in this chapter of the manual for further information about read sensitivity.)

INTERROGATOR reports this error message for the Azimuth Alignment Check: **NOT ABLE TO READ TEST DISC**. (Refer to "Error Messages," Chapter 8 of this manual.)

Press the **ESC** key to return to the **ALIGNMENT Test Selection Menu**.

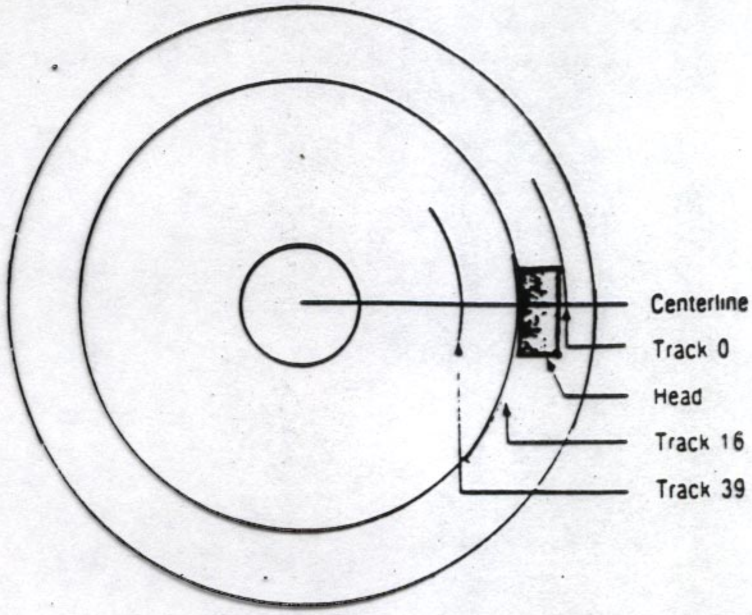


FIGURE 6. Radial misalignment away (–) from center

Figure 7 illustrates an example of radial misalignment toward the center spindle hole.

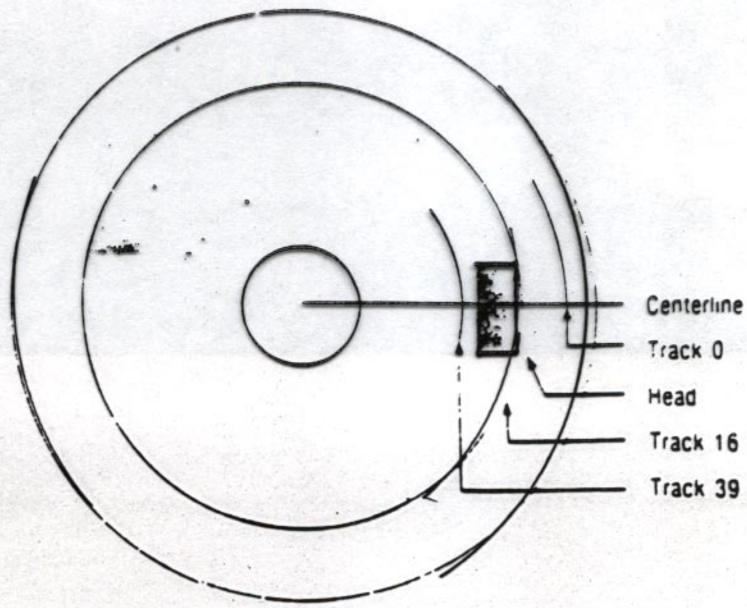


FIGURE 7. Radial misalignment toward (+) center