



**AMPEX**

# **DISK DRIVES**

**for OEM applications**

**100 and 200 Megabyte 3330 Compatible —  
DM-330/331 Series**

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**29 and 58 Megabyte 2314 Compatible —  
DM-312/322 and DM-323 Series**

**A family of reliable disk drives from Ampex —  
one of the world's largest independent  
manufacturers of computer peripherals.**

# Ampex DM-330/331 disk drive

## 100 AND 200 MEGABYTE 3330 TYPE

- Variety of standard or custom interfaces and controllers
- 100 or 200 megabyte density
- Top loading convenience
- Dual port option

These compact units have an average access time of only 28 milliseconds, and start/stop times of only 15 seconds. Pack loading height is a convenient 32 inches (81.28 cm). Available in single density version, DM-330, or double density version, DM-331.

**Compact and Self-contained.** The DM-330 disk drive is a compact, stand-alone unit only 38 inches high, 19.25 inches wide, and 34 inches deep (96.52 cm x 48.89 cm x 86.36 cm). Each drive has its own self-contained regulated power supply, so that one malfunctioning power supply doesn't affect other drives in the system. The drive can be located separately from the controller, and is mounted on casters for easy movement and maximum convenience. All cable connections to each drive are plug-removable.

The DM-330 has a single spindle design which provides 100 megabytes of storage per drive. This permits capacity increases in convenient 100 megabyte increments by daisy-chaining as many drives as are required. An off-line exerciser allows maintenance, diagnostics and head alignment on the drive while the rest continue normal operation.

**Double Density.** Ampex double density drives, designated the DM-331, provide 800 tracks and 200 megabyte capacity, while retaining the features and advantages of the DM-330.

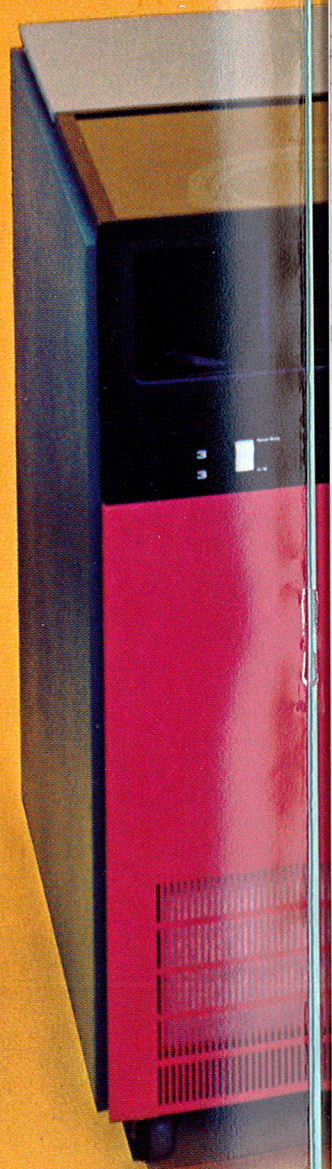
**Dual Port Option.** A dual port option is available for the DM-330 and DM-331, which allows a drive to be connected to two different controllers at the same time. In this mode of operation, the drive com-

municates with either of the two controllers at any one time, remaining in a ready condition for the other.

**Better Cost/Performance Ratio.** The Ampex DM-330 gives you better cost/performance than any competitive disk drive. The average access time is only 28 milliseconds. Both start and stop times are 15 seconds. As a result, the throughput of your OEM system is increased, processor time saved and the time required to load and unload drives reduced.

**Reliable and Rugged.** The DM-330 incorporates the latest advances in disk drive technology. It has all the proven reliability and ruggedness for which earlier Ampex DM-312, DM-322, and DM-323 disk drives are noted. TTL and ECL circuits are used throughout the DM-330.

**Top Loading Convenience.** In addition to requiring less floor space than competitive disk drives, the compact DM-330 has a top loading single pack configuration which makes it exceptionally easy to load and unload. The pack loading height is an optimum 32 inches (81.28 cm), eliminating stooping and the need to lift the disk pack to an awkward height. This attention to human factors engineering increases operating efficiency by reducing operator fatigue in pack loading and unloading.



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**Interfaces and Controllers.** At Ampex, a special interface design group provides custom and standard interfaces for DM-330/331 drives to meet your particular requirements. Our three standard interfaces include an IBM interface, an IC differential interface (SN 75-110 or SN 75-107), and an Ampex differential (current source) interface. The Ampex interface has excellent noise rejection characteristics, and permits remote location of disk drives from the controller.

As for controllers, we can provide our standard controller for the DM-330 drive, the DC-830. This controller interfaces directly with an IBM 2880 Block multiplexer or equivalent. It has a micro-programming capability (by means of an integral floppy disk). It can be supplied

in versions for two channels with eight drives, two channels with sixteen drives, or two channels with 16 drives in a dual port configuration.

We also have the capability of designing and building any type of custom interface or controller for both large and small OEM systems.



# Ampex DM-312/322 and DM-

## 29 AND 58 MEGABYTE 2314 TYPE

- Standard or custom interfaces
- Single or double density
- Field proven reliability
- Top loading convenience

The Ampex DM-312/322 and DM-323 Disk Drives are third generation 2314 type units with an excellent record of reliability in hundreds of applications. They are available in both single and double density versions with several standard and custom interfaces. Average access time is 32 milliseconds. Start time is 20 seconds. Stop time is ten seconds, the industry's fastest.

**DM-312 Single Density Drive.** The Ampex DM-312 is a single density 29 megabyte drive which is functionally equivalent to IBM drives using 2316 or equivalent disk packs. It includes a front panel select plug to change the unit number dynamically by interchanging plugs. The format is 200 cylinders with four alternates.

For 2314 plug replacement applications using IBM controllers, the DM-312 can be supplied with IBM equivalent drivers and receivers, a 3.4 volt twisted pair interface, and a select plug. The DM-312 is also available in a five volt Ampex differential (current source) interface that exhibits excellent noise rejection characteristics, or a single ended 3.4 volt twisted pair interface without select plug. Other interfaces are available for other applications.

**DM-322 Double Density Drive.** The Ampex DM-322 is a double density 58 megabyte drive that can provide significant floor space savings over IBM 2314 or equivalent type drives. One DM-322 will replace two single density drives. It does this through the use of two logical units on a single disk pack with two sets of interleaved tracks. By this means, it is functionally equivalent to two IBM drives.

Four Ampex DM-322 drives and a controller (such as an Ampex controller compatible with an IBM block multiplexer or equivalent) can store 233 megabytes — capacity equal to an IBM controller and eight drives.

With minor software changes, eight double-density Ampex drives can be put on a single controller — saving the cost

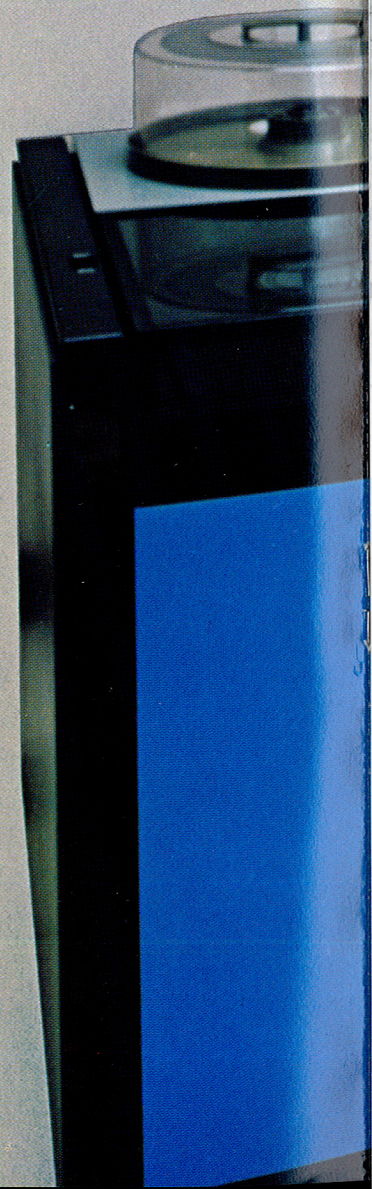
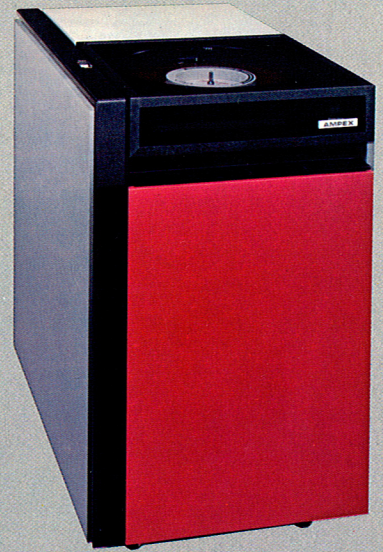
of one controller as well. In large-data-base applications, this combination offers great economy and up to 466 megabytes on a single controller. Savings in floor space of up to 40% and savings in operating costs of up to 30% are easily obtainable.

**DM-323 Double Density Drive.** The Ampex DM-323 double density drive offers all the advantages of the DM-322 but with a different data format — 400 cylinders with six alternates, with the tracks numbered 0 to 400 consecutively. Like the DM-322, it provides 58 megabyte capacity using 2316 or an equivalent disk pack.

**Field-Proven Reliability.** The DM-312/322 and DM-323 have designed-in reliability resulting from an unusual degree of attention to engineering detail. They are ideally suited to time share or other systems in which minimal downtime is a critical requirement.

Head positioning is accomplished by an ultra-reliable electromagnetic actuator and photoelectric sensing of a precision optical grating. Proven logic circuits and stringent worst-case design practices are employed in all phases of sub-system and overall system design. The reliability of each unit is assured by exacting Ampex manufacturing, inspection, testing, and quality assurance procedures.

**Top Loading Convenience.** The Ampex DM-312/322 and DM-323 drives are top-loading, stand-alone units designed for maximum convenience and ease in changing disk packs. Pack loading height



# 323 disk drives

is only 36 inches (91.44 cm). Each drive is mounted on casters, and can be easily moved for maximum operator convenience. Interconnecting cables may be located either beneath the floor or on top. Units located side-by-side can be cabled together without floor cutouts. A convenient storage area for extra disk packs and covers is located at the rear of each drive.

**Interfaces.** Ampex's special interface design group has come up with several standard interfaces for the DM-312/322 and DM-323 drives and has the capability to design any type of custom interface needed. Standard interfaces include a single ended five volt interface using coaxial cable for interface lines, a single ended 3.4 volt using twisted pairs for interface lines, and a single ended 3.4 volt using twisted pairs and incorporating a select plug.

**DC-314 and DC-324 Controllers.** To provide a complete disk subsystem, either of two controllers can be supplied by Ampex for the DM-312/322 series disk drives. Both controllers have two channels and can handle up to eight drives. The DC-314 controls single density 29 megabyte units. The DC-324 controls double density 58 megabyte units. The DC-324 can also handle a mix of single density DM-312 and double density DM-322 drives.



# Why Ampex?

- **Fourth generation performance, convenience, and reliability**
- **Precision manufacture with comprehensive QA**
- **Complete customer support and systems integration**
- **Backed by 30 years of continuing leadership in memory technology**

When an OEM buyer chooses a disk drive for his computer or data system, he evaluates many factors and trade-offs. Up near the top of the list are performance, reliability, manufacturing know-how, customer support, and company reputation. On all counts, Ampex scores high, as we have consistently done throughout our 30 years of leadership in memory technology. Consider these points:

**Performance.** In terms of performance, Ampex drives easily rank among the most advanced on the market. Check our specifications on capacity, access time, start and stop time, and other critical parameters. Check, too, the equally important factors of reliability and maintainability.

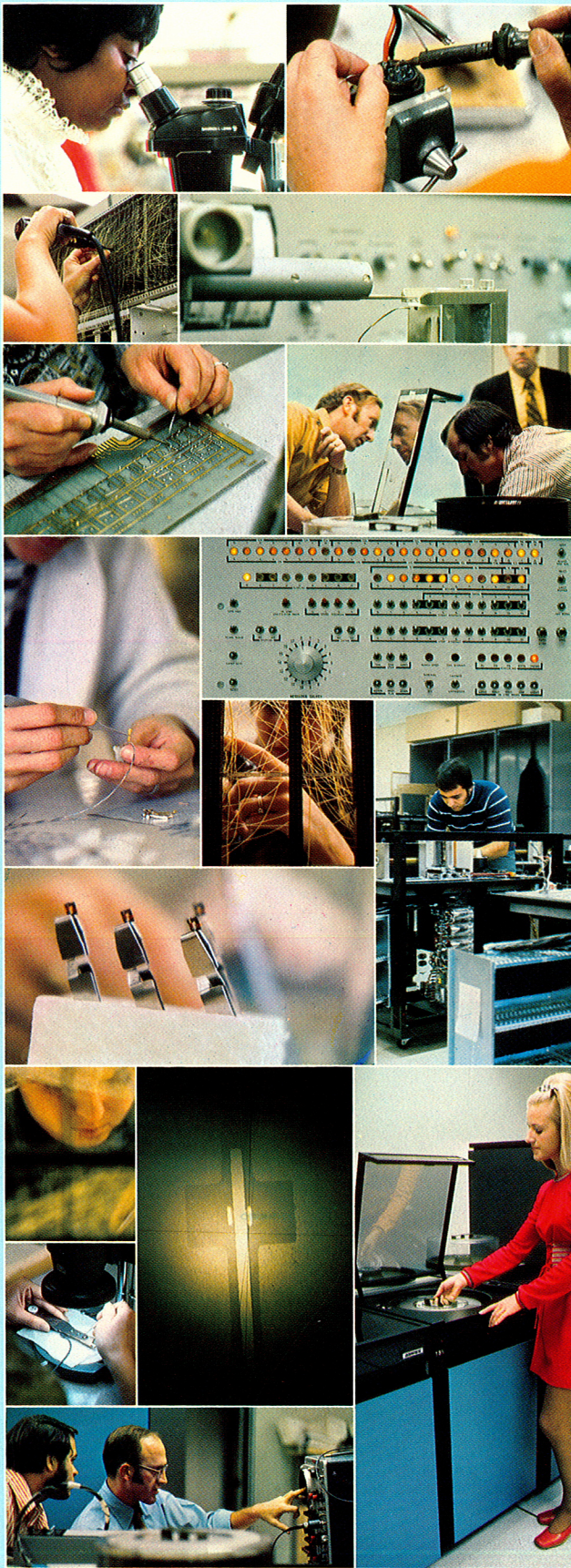
**Reliability and Maintainability.** Reliability is the key area of concern to all disk drive users. Recognizing this, we designed our drives to provide maximum performance with minimal service. Satisfied users can attest to the fact that we achieved our design goals.

Maintainability is also excellent with Ampex drives. This results from our basic philosophy of design and our manufacturing know-how. Because the background of many of Ampex design engineers includes field service experience, maintainability is a reality with our drives — not just a design ideal.

For example, we use smaller circuit boards with single connectors in our disk drives for improved reliability and handling ease. Head positioning is executed in Ampex drives with reliable electromagnetic actuators. Position sensing employs precision optical gratings or special pre-recorded servo tracks. Dependable solid state devices are used whenever feasible instead of less reliable mechanical relays.

**Customer Support.** Customer support at Ampex extends from comprehensive documentation to assistance on systems integration, rapid response to your queries, servicing at your customer installations when required, plus spare parts backup at U.S. and international locations. In the area of customer training, Ampex maintains a professionally staffed training department. Ampex training courses, coupled with our complete documentation, can bring your systems integration and customer engineers up to speed quickly on Ampex drives.

**Custom Interfaces.** The ability of a company to provide a variety of custom interfaces is certainly a vital factor in evaluating any independent supplier of peripherals. At Ampex, custom interface design is handled by a special group staffed by some of our most experienced and creative engineers.



### **Precision Manufacturing Techniques.**

Sophisticated manufacturing techniques used by Ampex contribute to the total excellence of product. For instance, circuit board construction and wire wrap operations are both performed in-house since this is the best way we know of meeting our exacting specifications. Power supplies are also built in-house and incorporate single unit construction for ease of maintenance and simplified voltage checking.

**Quality Control.** Continuous inspection and testing is performed throughout the manufacturing cycle from receiving and production through final assembly and systems test.

Statistical samplings from all incoming components are subjected to rigid mechanical tolerance and electrical testing. Close tolerance components undergo a meticulous piece-by-piece inspection to make sure they meet Ampex standards. Circuit boards are dynamically tested under computer control for the correct output levels, rise and fall times, and board functions as compared against a standard board. All input pins on the board are exercised, and all output pins are sensed during this test.

### **Comprehensive Final System Testing.**

A minimum of eight hours of controller drive diagnostics are run on each unit following final assembly. Individual disk drives are subjected to at least 24 hours of burn-in at 125°F. to locate potential component failures before final computer testing.

Extensive computer driven tests are run on all drives using standard diagnostics as well as special test and checkout diagnostics. In addition, inter-drive compatibility tests are run on all drives for a minimum of three passes to ensure total drive-to-drive compatibility in all systems.

Interaction tests also are performed with a full string of drives on each controller. Final quality control testing is done on an IBM System/370. Each Ampex unit receives a minimum of six hours of computer testing before shipment.

**Convenience.** Ampex disk drives were also designed with human factors clearly in mind. Top loading convenience, caster mobility, side by side mounting, and convenient pack storage on top of each drive are examples of attention to ease of operation.

For additional information, contact the Ampex sales office listed below:

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