MEMOREX

3650
Disc Storage Subsystem

The Memorex 3650–Superior Value, Flexibility and Reliability

Superior Value

The Memorex® 3650 Disc Storage Subsystem is *the* superior alternative to the IBM 3350 Disk Storage Facility for use on System/370 Models 135 and larger or compatible processors.

The 3650 is Memorex's largest and fastest disc subsystem. With a capacity of 317.5 MB per spindle and 635 MB per module, the dual-spindle 3650 transfers data at the rate of 1.198 MB/second. A unique group of available optional features and planned enhancements make the Memorex 3650 a superior investment for high performance, cost effective data processing.

A typical Memorex 3650 Disc Storage Subsystem consists of a 3653 Storage Module and Controller providing control logic and power for up to three 3650 Storage Modules. The 3653 is attached to the block multiplexer channel through the Memorex 3674 Storage Control Unit (SCU) or an equivalent IBM unit. Several options for increased redundancy and performance are available.

Greater Flexibility

The Memorex 3674 Storage Control Unit—a microprogrammed controller with read/write monolithic memory—attaches to the block multiplexer channel. The 3674 can control strings of 3650's as well as strings of Memorex removable media 3670/3675 and 3640 series drives. You receive the advantages of three types of disc storage under one common control. The 3674 also controls IBM 3350 disk storage equipment to provide the ultimate in configuration flexibility. A maximum of 32 spindles can be controlled by one 3674.

To ease the installation effort, conversion from 3670 and 3675 storage is quite simple. Any Memorex 3650 spindle can operate in one of three modes: Native (317.5 MB per spindle), Memorex 3670 compatible (2-100 MB volumes per spindle), or in Memorex 3675 compatible (1-200 MB volume per spindle).

You can easily reconfigure this intermixed system: two-, three-, and four-channel switching and string switching allow configuration flexibility for redundancy, load balancing, and special applications.

Compatibility

The Memorex 3650 is functionally compatible with the IBM 3350. Designed to work with System/370 Models 135 and up, the Memorex 3650 subsystem can be attached in three ways, depending on CPU model and user preference:

- attachment through the Memorex 3674 SCU
- direct attachment to the System/370 Integrated Storage Control (ISC)
- attachment through IBM 3830 Model 2 or 3 SCU

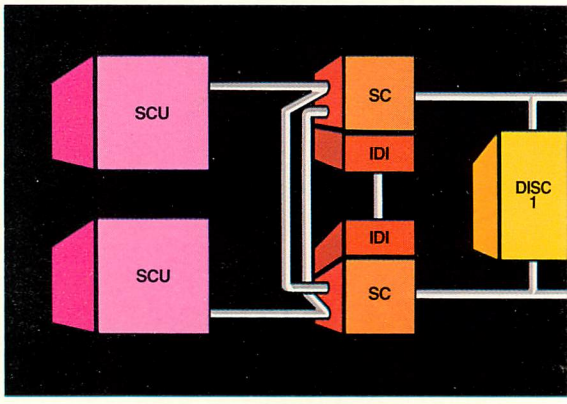
System Component	Memorex	IBM
Storage Module and Controller	3653	3350 A2
Storage Module	3650	3350 B2
Storage Module and Alternate Controller	3654	3350 C2
Storage Control Unit	3674	3830-2

Increased Performance

The optional Memorex Intelligent Dual Interface (IDI) feature increases the performance, efficiency, and flexibility of the 3650 Disc Storage Subsystem.

Industry standard configurations rely on the intelligence in the processor to resolve contention by implementing the operating system's optional channel feature or rescheduling and restarting I/O operations. But Memorex's Intelligent Dual Interface reduces this additional processor load. Contention is resolved at the string and this frees CPU cycles for problem programs. As a result, some programs run up to 30 per cent faster. Memorex can not guarantee your results, but most users will experience noticeable improvement.

The IDI enables two simultaneous data transfers per string, and reduces resource contention down to the individual spindle. This significantly improves disc subsystem throughput and increases overall system efficiency. The Memorex IDI can be combined with fixed head feature to achieve the highest performance configuration available from any disc supplier.



The Intelligent Dual Interface (IDI) enables two simultaneous data transfers per string. This increases total system performance and data availability.

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Vertical Integration Assures Built-in Reliability

Testing at Every Step

Reliability is designed and manufactured *into* the 3650 subsystem. Before component level testing, all active elements built into the 3650 undergo extensive burn-in. The most modern comprehensive methods and equipment are used to test the parts. Only after successfully completing these rigorous tests are components allowed into assembly inventory.

Comprehensive testing procedures are performed at the component, assembly, and subsystem levels. Hermetically sealed, high-reliability-grade integrated circuits are certified for specification conformance, proper nomenclature, count and packaging. Computer-assisted systems measure machined parts and circuit boards in three dimensions with a test plate calibrated in millionths of an inch. Radiflow, a sophisticated leak test for integrated circuits, uses radioactive materials to assure package integrity.

Assembled printed circuit boards pass through automated testers that simulate actual operating conditions. The boards are burned in with DC power for 48 hours at 160°F, then returned for more automated testing. Burn-in and extra testing at this level reduce system failure and associated costs.

Electro-mechanical subassemblies also undergo extensive testing. Special automatic testers, developed at Memorex, are used to inspect heads, carriages and other subassemblies.

As assemblies become systems, they are again inspected. Before printed circuit boards are installed, off-line testers perform power supply and power distribution unit tests.

Then, printed circuit boards are inserted and off-line testers simulate channels for a series of diagnostics.

HDA Quality

Memorex manufactures the most critical components of the Head Disc Assembly (HDA), such as heads, discs, and printed circuit boards. It is here that Memorex's experience in both media and equipment offers extra value. Control of quality—from ferrite powder through assembly into heads; and from aluminum sheets to finished discs—gives added assurance of successful integration and superior HDA reliability.

HDA components are completely assembled by Memorex within the most stringently regulated Class 100 "clean room" atmosphere. This sanitized environment must contain less than 100 particles per cubic foot and no particle may exceed 0.5 micron in size. For example, if the HDA were the size of Houston's Astrodome, then all allowable contamination would correspondingly fit within the head of a match.

HDA integrated circuits are tested to full MILSPEC 883 B levels. This includes vibration and acceleration testing at 30,000 times the force of gravity, followed by x-ray analysis and electrical tests to eliminate substandard parts.

Finally, Head Disc Assemblies are installed and particle counts assure proper purging and exclusion of contamination.

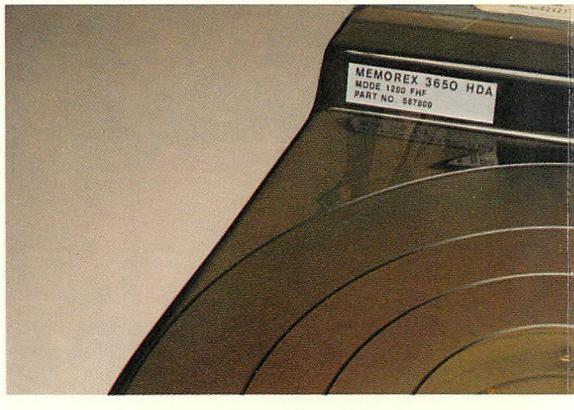
Quality Assurance

The 3650 is put through many hours of data handling tests. Quality Assurance tests and retests each module on-line with large scale CPUs to assure total compatibility and data integrity.

After a 3650 is installed in the customer's system, QA performs its own on-site audit—to further ensure customer satisfaction.

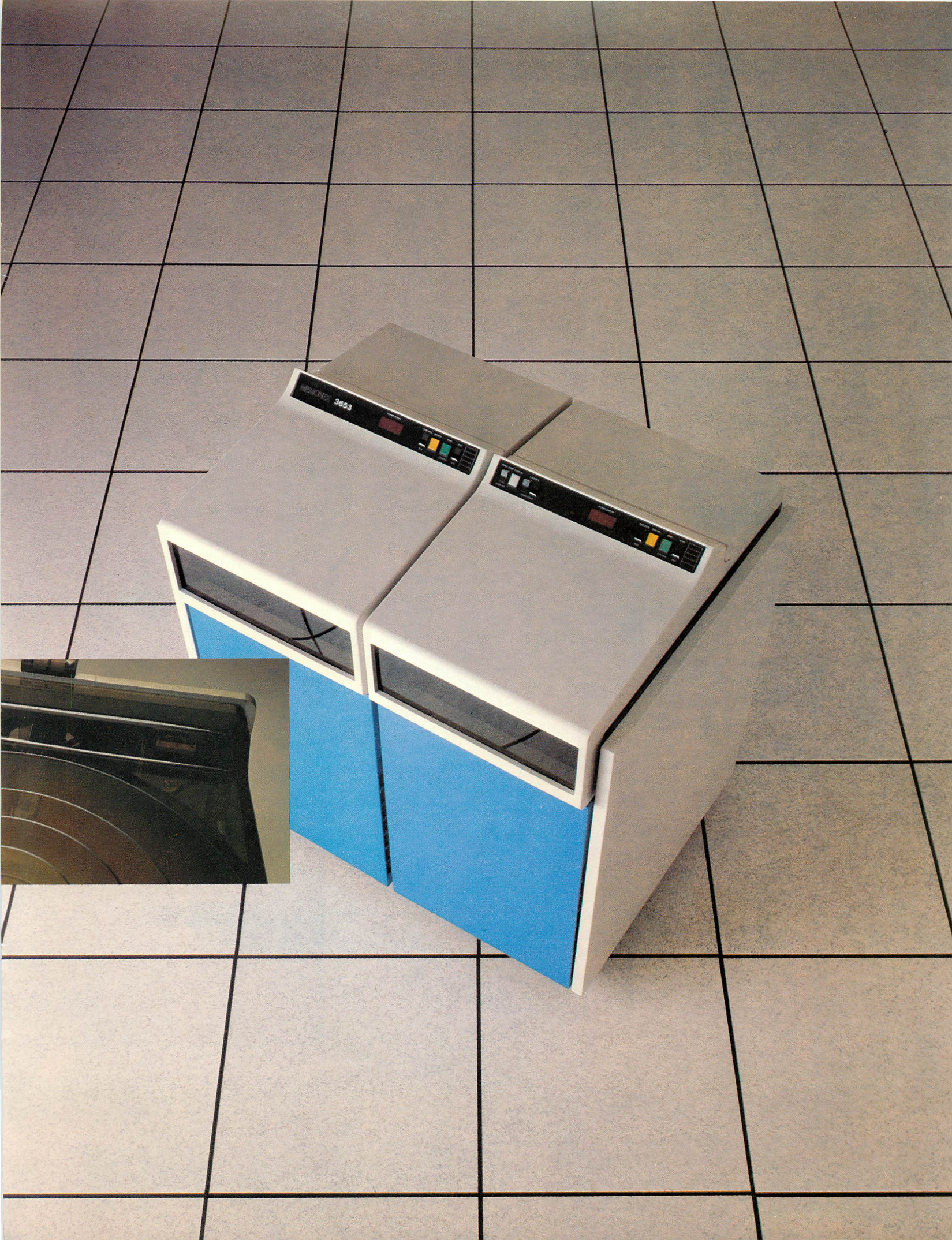
Experience

In short, reliability of the 3650 is assured because of Memorex's eleven years experience in the disc drive business. Memorex has produced over 35,000 drives with proven reliability through more than 500 million hours of operation.



Strict control of quality, from the ferrite powder through the head manufacturing process to the final Head Disc Assembly (HDA), gives Memorex added assurance of successful integration and superior reliability.

Memorex has increased the functional utility of the external packaging. Less floor space is required for maintenance. Accidental ABENDS and unnecessary restarts have been eliminated by moving the "Attention" button away from the front of the module.


3653

Data Integrity, Equipment Maintainability– Dedicated Service

Data Availability and Integrity

The Memorex 3650 Subsystem incorporates proven error detection and correction logic. The 3653 corrects data errors up to four bits in length and the 3674 SCU corrects single-bit SCU memory errors. IBM SCUs have only parity checking, so a single bit error stops the job. But with Memorex, the jobs keep on running; and the problem is corrected at your convenience.

Optional features are available to provide redundant data paths all the way from the main memory to the disc spindle. Nothing assures data availability more directly than redundancy and reliability.

Power supplies and logic circuits in the 3650 serve only one spindle. Therefore, each spindle within the module is virtually independent. This drive independence assures the user of maximum availability.

Memorex has designed the 3650 Subsystem to ensure the ultimate in reliability. However, should drive electronics fail, the Field Engineer can quickly get your data back on line by moving the HDA cables from one side of the module to the other. This "cable swap" procedure minimizes the amount of time the data is unavailable.

Ready Maintainability

Even with the 3650's high reliability, the equipment must be maintainable. The Memorex design incorporates hardware service aids and isolates functions to field replaceable units.

Memorex offers complete test procedures in the Fault Isolation and Diagnostics System (FIDS). This system—containing 40 subsections—aids in the identification of any defective unit for quick replacement. Micro-diagnostics feature a selectable priority so the user can select how much resource is dedicated to fault isolation and how much for continuing production.

Indicators on the 3674 diagnostic panel signal specific problems. LED's on the power supply, power distribution unit and PC boards isolate faults to a single replaceable assembly. The built-in fault isolation circuits detect errors and turn on a light. This light display indicates the problem assembly for quick replacement.

Memorex Field Engineers can immediately meet 95 percent of all spare requirements from their own portable spares kits. Remaining spares are available at the branch office. These spare inventories are backed up by a worldwide parts inventory system.

Proven Enhancement Capability

Memorex has a history of ongoing enhancements to extend useful life to the customer. For example, the 3670, first introduced in 1971, is the largest disc program in Memorex history. Double Capacity, String Switching, Disc Cache, and Intelligent Dual Interface have all been announced as enhancements to the 3670 system.

Similarly, a series of enhancements are planned for the 3650 disc system. The first of these is the IDI. Others will be announced when the development of technology assures successful implementation. The 3650 is a product family and, so far, only the first generation has been introduced.

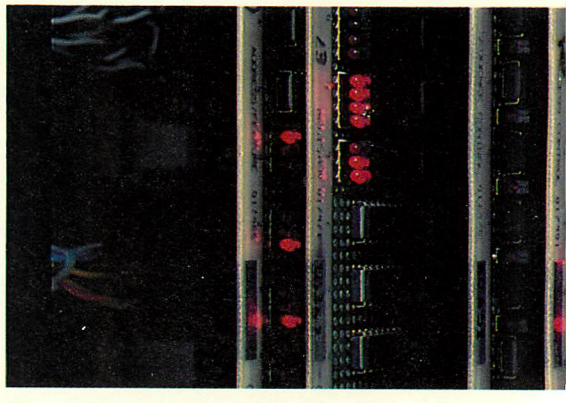
Peace of Mind

All this progress in technology and manufacturing benefits you, the user.

As users upgrade from one CPU to another and incorporate the latest Memorex products, the cost of storage is cut; performance increases; and reliability improves dramatically.

More than just a product, the 3650 provides data availability and offers you peace of mind over the product's total useful life.

The Memorex 3650 Disc Storage Subsystem—a reliable, quality product from a reliable, quality company.



Logic circuits–with error detection capability–activate light-emitting diode indicators. Each function is isolated to a single unit. Therefore, the assembly needing replacement is quickly identified and quickly replaced. Repair time is reduced and available machine time is increased.

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Memorex Corporation – Quality, Value, Service.

Founded in 1961, Memorex employs nearly 12,000 highly skilled people in more than 100 locations throughout the world. With modern headquarters and major manufacturing facilities in Santa Clara, California, Memorex also has production facilities in Liege, Belgium; Nogales, Mexico; Eau Claire, Wisconsin; and Irvine, Santa Ana, and Anaheim, California plus a network of regional warehousing and distribution centers.

Memorex is a worldwide supplier of high technology equipment and magnetic recording media used in data storage, retrieval and communications. The growing line of products today includes high quality disc, tape and semiconductor data storage systems; telecommunications processors and terminals; computer tape, disc packs and data modules; audio and video tapes; word processing supplies; and field engineering and facilities management services.

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