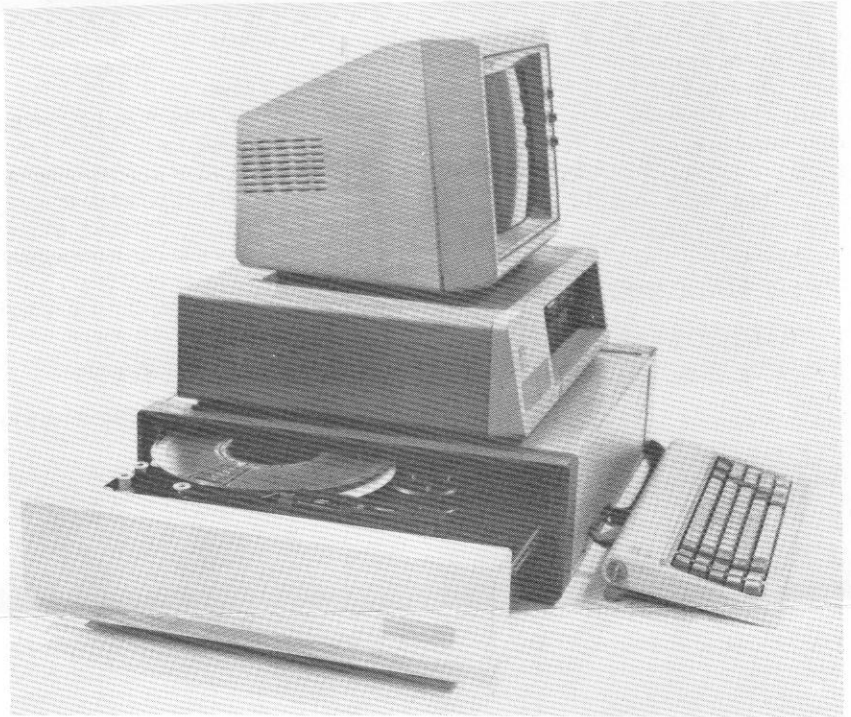# A K SYSTEMS

APPLICATION NOTES:

- **Software Programs**
- **Hardware**
- **Specifications**
- **Installation & Conflict**
- **Resolutions**
- **Operating with Networks and Emulators**
- **High Level Language Linkers**

1.0 SOFTWARE, SYSTEM OPERATION

• **TO READ AND WRITE TAPES:** Use the DT command with optional ASCII to EBCDIC conversion to read and write tapes from or to other computers. The high speed start and stop times and streaming mode of the A K Systems Mainstreamer processes data approaching 2.4 million bytes (Mb) per minute as a function of block size. Small block tapes are read or written nearly ten times faster than several other systems.

• **COMMANDS:** Data is transfered on a file-by-file basis and PC-DOS/MS-DOS Syntax type commands enable batch files to be constructed for easy repetitive read/write processes.

• **LABELS:** Labels may be set up to suit any requirement in separate DOS files for combination with data files, or to be written separately on magnetic tape as header or label files.

• **IBM COMPATIBLE:** The A K Systems TS-100 Magnetic tape system is compatible with any tape written in 800 cpi NRZI (optional) or 1600/3200 cpi PE, IBM compatible formats. Blocks to 64K Bytes in length and files of any size to the PC-DOS limitation of 32 Megabytes can be processed.

• **TESTING "STRANGER" TAPES:** The "TDUMP" program reads any "stranger" tape and provide a summary of Record, Block, and File lengths (Format), or provide an ASCII, EBCDIC, and/or Hexadecimal (or all 3 simultaneously) printout of the stranger tape contents.

BACKING UP HARD DISKS

• **COMMANDS:** "TBACKUP" and "TRESTORE" commands transfer files from disk to reel-to-reel tape and back again, respectively. Wild cards are legal and batch files can be set up so non-computer personnel can easily perform the routine back-up of hard disks. Streaming mode can flow data to magnetic tape as fast as the disk to memory transfer can take place, at 160 KBytes per second, or 9.6 Mb/min. from memory to tape. Read-after-write verification is automatically performed on the fly as data is backed up from the hard disk. Errors found are immediately corrected.

• **SHORT BACKUP:** Transactional backup appends on tape only those files that have been added or modified since the last backup.

• **DATE BACKUP:** Only files added or modified since a specified date may be backed up or Appended.

• **PARTIAL BACKUP:** Single files, directories, or sub-directories may be backed up, appended, or restored.

• **DIRECTORY LISTING:** Use "TDIR" at 100 ips high speed to scan the tape and provide a complete listing of the files on tape. Direct the listing to monitor, printer, or file. Scan a full tape (2400 ft.) containing 43 Mb of data in less than 4.8 minutes.

2.0 HARDWARE, MAGNETIC TAPE DRIVE

• **INDUSTRY STANDARD PERFORMANCE:** Speeds of 25 and 100 inches per second (ips) at 1600 characters per inch (cpi) gives data transfer rates of 2.4 million characters (Megabytes, Mb) per minute and 9.6 Mb per minute, respectively. Memory to tape transfers at 9.6 Mb/minute are achievable with PC and XT type computers and with high-speed AT computers. Disk to memory and memory to disk data transfer rates determine over-all system performance.

• **POSITIVE TAPE TENSION:** Rewind speeds of 200 inches per second (ips) at specified tape tensions of 8 ounces plus or minus 1 ounce provide industry standard tape packing for mainframe compatibility and freedom from tape "cinching," a condition which can damage tape when loosely wound layers are wrapped over by higher tape tension layers. High speed rewind shortens waiting times considerably, increases tape system productivity.

• **DOUBLE DENSITY:** 50 inch per second (ips) tape speed at 3200 cpi provides double data storage, is industry standard speed and density. Write 92 Mb per 2400 ft. reel of standard computer tape.

- **HIGH CAPACITY BACKUP:** Use of 3M 700 or equivalent 1.0 mil substrate tape provides up to 138 Mb (unformatted) data storage on one 10½ inch diameter reel of tape. Not all magnetic tape drives successfully handle 1 mil thickness tape; therefore, this mode of operation is suggested for local backup rather than for data interchange and/or distribution.

- **TRANSPORTABLE TAPE DRIVE:** 60% smaller and 60% lighter than industry-standard tape drives, the Mainstreamer can be separated from its Power Module for easy portability. Carrying cases are available which are suitable for carry-on air travel.

- **TABLE TOP STACKING:** An optional Table Top Cabinet with slides takes up zero table top space, and stacks under the computer. The monitor goes on top at a convenient height for viewing. The tape drive pulls out for loading, goes in out of the way while in operation. The cabinet protects the drive from magnetic fields and accidentally spilled coffee.

- **RACK MOUNTING:** The Mainstreamer is designed for rack mounting in standard 19" RETMA rack enclosures. Either compact top load (drawer mounting on slides) mounting using only 5¼ inches of vertical rack space, or front load mounting using 14 inches of vertical rack space are options.

3.0 SPECIFICATIONS

- The A K Systems Mainstreamer has been designed to provide industry standard performance in a small, lightweight, low cost package. The Mainstreamer start/stop time, access time, and repositioning times, read/write tape speeds and data densities (some optional, consult factory), rewind speeds and times, and tape tension control equal or exceed those of industry standard tape drives, and exceed those of other machines. The A K Systems Mainstreamer has closed loop supply reel motor servo control which gives positive tape tension control. Some machines do not have this feature. A tape drive without this feature can have widely varying tape tension which can be caused by outside factors such as warped tape reels or variable tape friction from reel to reel which can dangerously effect data reliability and tape handling, and which prevents compliance with ANSI and IBM standards.

HARDWARE SPECIFICATIONS

Data Transfer Rate:
    2.4 Mb/min, 1600 cpi, low speed
    9.6 Mb/min, 1600 cpi, high speed

Time to Read 10 Mb (typ.):
    10 Kb blocks: 8.2 mins.
    2 Kb blocks: 24.2 mins.

Tape Speeds:	25, 50, and 100 ips.
Rewind Tape Speed:	200 ips.
Data Access Time:	60 milliseconds at 25 ips.
Tape Repositioning Time:	240 ms. at 25 ips.
Tape Tension:	8 oz. + or - 1 oz.
Data Densities:	1600/3200 cpi, PE 800 cpi, NRZI, (optional)

4.0 EASY AND FLEXIBLE INSTALLATION

IBM'S ARCHITECURE: IBM provides 4 Direct Memory Access (DMA) channels in the PC/XT/AT computer architecture. DMA channel 0 is exclusively reserved for the dynamic Random Access Memory (RAM) refresh. DMA channel 2 is used for data transfers to and from floppy disks, while DMA channel 3 is reserved for Hard disk use. DMA channel 1 is provided for all the auxiliary equipment which requires Direct Memory Access. The TS-100 magnetic tape system requires DMA. Networks, modems, emulators, cartridge tapes, graphic adaptors, Bernoulli Boxes and other devices require DMA, and many are factory set and fixed on DMA channel 1. Conflicts can easily arise, whereby two devices attempt to communicate simultaneously, resulting in system errors.

CONFLICT RESOLUTION: When conflicts do occur with the operation of the TS-100 magnetic tape system, DMA error messages are displayed. This is when one or more devices are attempting to transfer or acknowledge data at the same time as the Mainstreamer on the same DMA channel.

The "TINSTALL" program enables the user to move the system to other available DMA channels. If none are free, the TS-100 System is designed to share DMA channel 3 with the hard disk. When using TBACKUP and TRESTORE, the "/ALT" (Alternate) parameter must then be included in the PC-DOS/MS-DOS type command syntax if the magnetic tape system is sharing DMA channel 3 with the hard disk. Running the TINSTALL program (as described in the manual or on the TINSTALL screen) easily moves the Mainstreamer's DMA channel assignment.

5.0 OPERATION WITH NETWORKS AND WITH COMMUNICATION EMULATORS

TAPE DRIVE BECOMES VIRTUAL DISK: The TS-100 magnetic tape drive can be relabeled or renamed with a character designation "C" through "K", for example. Network, emulator, downlink software and communications software which transfers files from network workstations, mainframes, terminals, etc. to a PC-DOS/MS-DOS disk drive can also transfer files directly to the A K Systems tape drive having a disk-like character designation. Use the "TDS" program. Files may be transferred to and from programs such as DBASE II/III and 123/.Symphony. Other applications for character designated tape are also in use. Special lexicon commands are available for use with Novelle Networks and Dataflex database software (inquire of factory for more data).

6.0 LINKING HIGHER LEVEL LANGUAGE APPLICATION PROGRAMS TO TAPE ROUTINES

GENERAL PURPOSE TAPE ROUTINES: Use "GPTR" linking to access tape from Fortran, Pascal, Basic and C. Use the supplied assembler source code for GPTR to link assembly language software, other languages, and/or complied object code.

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A K SYSTEMS
Model TS-100

The Small, Low-Cost, Lightweight, 9-Track Magnetic-Tape Subsystem For IBM Personal Computers

Major Features

A K SYSTEMS's Model TS-100 Magnetic-Tape Subsystem affords users of IBM PC, PC/XT, and PC/AT Personal Computers an effective means of reading and writing IBM- and ANSI-compatible, 9 track, ½-inch magnetic tape for information interchange with mainframes and mini-computers at the lowest cost per byte and lowest cost per unit.

The TS-100 also provides a fast, reliable means of high-speed backup/restore of the PC's hard disk on low-cost, universally available ½-inch magnetic media.

Featuring the smallest physical size and weight for a tape transport with its capability, the unit fits in a dual 8-inch Winchester or floppy disk drive footprint. Simplified front-panel controls facilitate operation even by nontechnical personnel. Internal diagnostics test all functions, including Write and Read circuits, during the tape-loading sequence.

Outstanding features of the TS-100 include:

- Low cost, small size and light weight.
- 800 BPI NRZI (optional)
- IBM-format-compatible 1600 BPI (3200 BPI also offered)
- Data trasfer rates up to 160,000 bytes/sec
- DOS command, syntax-oriented software
- Block sizs up to 65,535 bytes
- 10½-inch reel capacity
- ASCII, EBCDIC, and binary data tapes accommodated
- Up to 138 Mbytes storage capacity on a single reel

TS-100 Components

Components of the TS-100 include the compact, lightweight A K SYSTEMS Model PCT-1000 MAINSTREAMER™ Tape Transport integrated with A K SYSTEMS PCI-100 interface and software.

The PCI-100 interface consists of a single printed circuit board that plugs into any short or long expansion slot on the PC. This interface is a full-function DMA coupler that uses the IBM PC's main memory to buffer data, providing high-speed data transfers between the PC and tape. Block sizes of 4 to 65,535 bytes can be read from or written to tape. Up to eight tape transports can be addressed from a single interface.

The comprehensive PCI-100 DOS-command syntax-oriented software package completes the TS-100 subsystem. The PCI-100 programs are simple, yet extremely powerful tools for accomplishing data transfers.

The Software

PCI-100 software, contained on a single 5¼-inch diskette, consists mainly of six DOS-command syntax-oriented utilities that allow data transfer between the IBM PC and tape. Any of the utility command lines may be inserted into a ".BAT" file for use where repetitive operations occur. This batch operation is also convenient when operators unfamiliar with the DOS command syntax or tape nomenclature use the equipment.

Brief descriptions of the six utilities appear on the reverse side.

DT—Used to transfer DOS files to/from tape through use of the following command syntax:

Disk-to-tape transfers

DT [d:][path] filename [.ext]TAPE [n]: [[parameter] . . .]

Tape-to-disk transfers

DT TAPE [n]:[[parameter] . . .][d:] [path] filename [.ext]

where d, path, filename, and .ext conform to the PC DOS standard nomenclature and one or more parameters, if specified, allow the following operations to occur:

/B:n	Sets the physical block size to n.
/R:n	Specifies a logical record length of n.
/S:n	Skip n files.
/EOT	Positions tape at logical end of tape.
/BOT	Positions tape at beginning of tape.
/OFF	No ASCII-to-EBCDIC translation to occur.
/CR	Logical records to be delimited by carriage return.
/LF	Line feed to follow carriage return.
/T	Tab character processing to occur.
/A	Append existing tape file.
/SHORT	Short logical record is permitted.
/U	Variable length tape records used.
/DISKS	Multiple disk drives.

BPS (Basic Programming Support)—Consists of a set of programs and subroutines used to access ½-inch magnetic-tape data for IBM Personal Computer BASIC programs. Implements the USR function of BASIC to transfer tape data, commands, and error codes between the user's program and the tape subsystem. This method provides the user with simple, efficient access to tape data in a context compatible with the BASIC programming language. The BPS software frees the user of chores normally associated with tape processing, record deblocking, data translation, etc.

TDUMP—Prints a dump of the contents of a tape to a user-specified device such as a printer or the console. For users uncertain of the type of data on a tape, this procedure lets users determine the exact contents of a tape quickly and efficiently.

Several options provide for different listing widths, page lengths, and dump contents. Users can display or suppress the ASCII, EBCDIC, or hexidecimal equivalent of data output from tape. The tape format is also displayed with the count of physical blocks of each length and the file marks encountered.

TBACKUP—Used to back up DOS files to tape with a syntax similar to the standard DOS "BACKUP" command. The identifier "TAPE:" replaces the diskette identifier used in the backup command as follows:

TBACKUP [d:][path][filename[.ext]] TAPE [n]:[[parameter] . . .]

where d, path, filename, and .ext conform to PC DOS standard nomenclature and global filename characters such as ? or * are allowed. One or more of the following parameters can be specified:

/S	All subdirectories below current directory to be backed up.
/M	Back up only files changed since previous backup.
/A	Position tape at logical end of tape before backup begins.
/D:mm-dd-yy .	Only files after specified date to be backed up.
/FAST	Use high-speed mode of tape transport.
/STREAM	Allows disk to use continuous block DMA transfers.
/C:n	Assigns class code of n to all files.
/DISKS:	Allows a string of disk drives to be backed up.

TRESTORE—Companion program to TBACKUP. Restores files to disk with a command syntax similar to standard DOS "RESTORE." Parameters similar to those for the A K SYSTEMS TBACKUP are used to facilitate TRESTORE operations.

TDS (Tape Device Support)—Consists of a set of programs used to access ½-inch magnetic tape for IBM Personal Computer programs and utilities that perform I/O operations through the IBM PC DOS operating system. These extremely powerful programs allow the tape transport to be addressed as a character device or block device (disk drive). With the TDS device driver installed, the user can control tape functions and positioning with an IOCTL function call used similarly to the "DT" command line and parameters. Once the tape is positioned, the tape file can be accessed just as a regular DOS disk file would be.

Hardware Specifications

Reel Sizes (dia.)
10.5 in. (26.67 cm)
8.5 in. (21.59 cm)
7.0 in. (17.78 cm)

Recording Formats
1600 and 3200 cpi PE, IBM, and ANSI compatible. 800 cpi NRZI (optional)

Tape Velocity
25 and 100 ips streaming. 50 ips at 3200 cpi.
Rewind speed: 200 ips nominal

Data Capacity (unformatted)

Data Density	3200 cpi		1600 cpi PE	
Tape Thickness (mil)	1.0	1.5	1.0	1.5
10.5-in. reel	138 MB	92 MB	69 MB	46 MB

Data Transfer Rates
40K bytes/sec. to 160K bytes/sec.
20K bytes/sec. at 800 BPI

Mounting Options
Horizontal (front load) or vertical (top load) standard EIA rack.

Physical Dimensions

	Height	Width	Depth*
Top Load	5.25 in	19.0 in.	14.0 in
Front Load	14.0 in.	19.0 in.	5.25 in.
Power Supply	17.5 in.	4.75 in.	5.25 in.

*Without power supply

Electrical Requirements
100, 115, 220, 240 volts AC ± 10%
48 to 440 Hz, 150 watts avg.

MTBF
6500 hrs.

MTTR
30 min.

Warranty Policy
For a period of one year from the date of purchase, A K SYSTEMS will repair or replace defective equipment within 15 days from receipt—in accordance with terms and conditions of AK SYSTEM's standard warranty policy. Users pay only for shipping the new or replacement unit and for returning the dective unit.

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