

Wang Systems

Newsletter 8

Wang Labs to expand in Lowell.

THE
SUNDAY



SUN

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DR. AN WANG

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by ALBERTA COOK
Sunday Sun Staff

LOWELL — Wang Laboratories, in its second major expansion in less than a year, will buy the former Parkwood Laminates building on Industrial Avenue from the General Electric Company for \$1.5 million next month.

Wang, which now employs 1,800 people at its Greater Lowell facilities, will eventually hire another "few hundred" for the new Lowell manufacturing location, according to the

company president, Dr. An Wang. Employees will also be moved from the Tewksbury facility to Lowell, he said. The firm employs 4,100 worldwide.

The sale of the single-story 200,000 square foot property near Wang's present research and development complex is set for March 15.

"WE ARE CROWDED," despite the continuing expansions of Wang into other facilities, Dr. Wang said. "Even with the expansion in Tewksbury, the company needs more manufacturing space," he said.

Completion of a 126,000 sq. ft. addition to the Tewksbury manufacturing plant, expanding its capacity by one-third to 370,000 sq. ft., is expected in May. This fall, the company also leased another 40,000 sq. ft. of space at a facility on Treble Cove Road in Billerica.

With this major expansion, Wang will have more than doubled its Greater-Lowell area square footage within the past year. The company now owns or leases close to a million square feet of industrial space here.

"The building was available and convenient," Dr. Wang said, explaining why the vacant Industrial Avenue structure was chosen. "We enjoy Lowell's atmosphere."

THE BUILDING is located near the three-building complex now occupied by Wang's Lowell research and development facility. The company bought the complex from the Mostek Corporation for \$1.75 million in May of 1976.

General Electric, which had bought the company from Parkwood Laminates, had offered the building to Wang in November, he said. GE closed its plastic lamination operation there last July.

The building needs extensive renovation before Wang can move its operations in, the company president said, and "we hope to move in by June."

While he has no plans for more building purchases, additions or leases for now, Dr. Wang said another expansion by the company could be expected a year from now.

WANG ATTRIBUTED the rapid growth of his firm to increasing sales and the introduction of new products among the small computer and word processing systems it manufactures and markets worldwide.

Another spokesman for the company, Ralph Crusius, assistant to the president and director of corporate relations,

WANG

said yesterday Wang Laboratories "expects to be a billion-dollar company by 1986."

Recently, the company reported net earnings for the second quarter of fiscal year 1978 had risen 64 percent over the same period last year, thanks largely to the doubling of orders for Wang word processing systems. Also during the second quarter, the company reported a 48 percent jump in revenues over fiscal year 1977.

Revenues for the second quarter, ending December 31, 1977, were \$47.1 million. Net earnings rose to \$3,378,000 from the \$2,061,000 reported for the same period during the previous year.

It was the ninth consecutive quarter that the company reported its profits rising faster than revenues.

For the six months ending December 31, Wang reported revenues of \$83.4 million and net earnings of \$5.2 million.

Wang Laboratories began its manufacturing operations at the Tewksbury facility. In addition to the Lowell and Tewksbury locations, it also operates plants in Burlington, Littleton, Waltham, Boston and Worcester in Massachusetts.

New Products

HFAM

For the past three years, Wang Laboratories has offered the Keyed File Access Method (KFAM) software packages to provide System 2200 users with a convenient way of organizing, updating, and retrieving the information which is consolidated in a data base. KFAM's popularity derives primarily from the fact that it allows fast, random access to the individual records in a data file. The success of KFAM speaks well for its versatile key file structure, which enables the user to maintain up to nine separate keys per data base. As the applications for KFAM became more and more complex, KFAM was enhanced to meet the new demands being placed upon it. Consequently, KFAM itself has matured into a more complex system than was originally envisioned. However, as KFAM became a more sophisticated software package, to a certain extent it outgrew the requirements for running on smaller 2200 systems.

The Hashed File Access Method (HFAM) was developed primarily to fill the gap left by the embellished KFAM systems. The main determinant in choosing between HFAM and KFAM is the size of the 2200 system to be used, with the relative power of the two alternatives a secondary consideration. Main memory space is an important factor, particularly when running application programs; the CPU speed also should be taken into account. The foremost difference between the two software systems is implied in

their names; hashed versus keyed. HFAM maintains only one disk file per data base and uses a hashing algorithm to store and retrieve records, while KFAM employs two separate files for each data base, the key file and the user (data) file. Due to the nature of hashing algorithms, the size of an HFAM file is roughly comparable to the equivalent KFAM files (user file plus key file). Hence, disk space is not a central issue when considering the relative merits of the two systems.

Unlike KFAM user files, HFAM files are never operated directly upon by the user. Instead, all access to the data base is performed by HFAM subroutines. A BASIC application program must be written which includes appropriate calls to the HFAM subroutines. HFAM offers nine subroutines which are similar in function to KFAM subroutines. However, while KFAM subroutines merely position the user to a desired location in the file (the user's application program must perform the actual disk read or write operation), HFAM subroutines accept all necessary information from the application program and perform the required disk access operations themselves. The nine HFAM subroutines are listed below.

	Open File
	Close File
Add Record	Get Sequential Record
Retrieve Record by Key (Physical)	Retrieve Record by Key (Sequential)
Store Record	
Delete Record	
Get Physical Record	

Data files not originally created by HFAM *cannot* be automatically converted to the required HFAM format. In order to access an existing data file using HFAM, a new HFAM data file must be created using the Initialize File utility and an application program written to transfer the data base to the new HFAM file. Once the data base is transferred, HFAM may be used to run updates, produce reports, modify the record format or file size, etc.

HFAM provides the user with a number of features unavailable in KFAM. To begin with, HFAM fully supports multivolume files, although it is strongly recommended that each physical volume of a multivolume file reside on a dedicated disk. The HFAM subroutines require only about 5K bytes of main memory, as opposed to KFAM's 6K to 9K. This is an important consideration, since on systems with a small amount of main memory more space is left for application programs. This 5K figure includes all disk mount messages for multivolume files. It also includes a routine to search the disk index, eliminating the necessity of testing for the

existence of the data file in the application program. Lastly, HFAM allows up to six data files to be open simultaneously on a "T" CPU.

Since HFAM is a smaller system than KFAM, it naturally is somewhat more limited in scope. With HFAM only one key may be specified per data file, whereas KFAM allows up to nine. Furthermore, since the HFAM system provides only a Sort on Key, to Sort an HFAM file on any other field requires the implementation of either a user-written or an Integrated Support System (ISS) sorting routine. HFAM allows a maximum of 256 bytes (one disk sector) per record, as contrasted to KFAM's multiple sector records. KFAM also supplies a somewhat wider range of subroutines and utilities than does HFAM, necessary largely to support KFAM's key file structure.

In summary, while HFAM clearly cannot be considered a replacement for KFAM, it has many features which make it an attractive alternative for smaller 2200 systems. It is anticipated that HFAM will be primarily used on these smaller systems where main memory space is at a premium and where multiple keys are not an integral part of the data base structure.

The HFAM system and documentation will be completed and available for release in mid-April and upon release can be obtained through your district analyst.

The Spring Offensive

Many of our competitors are currently offering or planning to offer dual-sided double-density diskettes. While we do not rule out the possibility of such an offering in the future, it is our opinion that, for the immediate future, there is a better way.

Our fixed/removable hard disk is an established and proven product with reliability and performance which far exceeds any flexible diskette drive available. In addition, the hard-disk concept provides far greater expansion capability.

By offering a 1.2 megabyte fixed/1.2 megabyte removable, hard disk unit at prices lower than comparable diskette-based systems, we can create new configurations that not only compete, but outperform systems such as the IBM 5110.....and with far greater expansion capabilities. This major tactic along with adjustments to the 2200T, VP, and MVP CPU prices provide a variety of highly competitive systems.

In addition, a new low-end member of the 2200VS family has been created to allow the first-time user low cost, high-powered data processing with excellent expansion capability.

WCS-50

- 2200VS-2B CPU with 64KB memory (max.

- 192KB) and one 308KB diskette drive
- One 22V02 IOP capable of controlling the diskette unit and up to three 10MB F/R disk drives
- One 2260V 10MB F/R disk drive
- One 22V01 IOP capable of controlling one printer and up to three 2246P workstations
- One 2231V-2 120-CPS Printer
- One 2246P workstation
- Cabinetry, virtual storage operating system, system utility software, assembler, and choice of BASIC, COBOL or RPGII compiler

GENERAL ACCOUNTING APPLICATIONS FOR THE 2200VS

Wang Laboratories recently arranged to have General Accounting applications developed for the new 2200VS. Order Entry, Accounts Receivable, Accounts Payable, General Ledger and Payroll will soon be available in interactive COBOL. Licenses and the software will be provided directly by Mini-Computer Business Applications, Inc. of Los Angeles, California.

These five applications had been developed previously by MCBA for other minicomputers and have been installed in approximately 2,000 installations by 200 software vendors. As such, we believe these applications to be the most generally-accepted systems in the industry. Due to Wang's endorsement, Wang vendors will be able to acquire licenses at a reduced price compared to vendors of other equipment.

Schedule of Availability

These applications are currently in the process of being converted to, and adapted specifically for, the 2200VS. They will be available in the following sequence:

1. Accounts Receivable
2. Order Entry
3. General Ledger
4. Accounts Payable
5. Payroll

The first application (A/R) is scheduled for release in June 1978, with the remaining applications to become available at one-month intervals thereafter.

Descriptive Literature

By the time you read this, your Wang district analyst will have received interim documentation on all five applications, including a system description and selected screen and report layouts.

A glossy, twelve-page brochure will be available in June. This document will stress the advantages of the 2200VS and Wang service, as well as the General Accounting applications.

Technical documentation, including a description of each application, a section on outstanding features, file

definitions, all screen layouts and samples of major reports is being prepared and will be available as follows:

- | | |
|------------------------|--------------|
| 1. Accounts Receivable | Early-April |
| 2. Payroll | Mid-April |
| 3. Accounts Payable | End of April |
| 4. General Ledger | Mid-May |
| 5. Order Entry | End of May |

The Applications

The applications have been designed in a totally integrated manner. The Accounts Receivable System is updated by the Order Entry System for invoices that have been billed. The General Ledger is posted directly from the Accounts Receivable, Accounts Payable and Payroll systems. Each system may, however, be installed on a stand-alone basis.

Order Entry allows both single-pass Invoicing and two-pass Open Order Entry with separate billing. Inventory Control is an integral part of the system.

Accounts Receivable is an open item and/or balance forward system which includes Sales Analysis.

Accounts Payable is an accrual system which includes the Cash Requirements, Vendor Analysis and Check Reconciliation functions.

Payroll handles both hourly and salaried employees and includes Labor Distribution.

General Ledger is a multi-company, multi-profit-center system and, optionally, budgets and/or last year comparatives may be shown on the Profit and Loss Statement and Balance Sheet.

Acquiring a License

Wang is handling the prerelease marketing of this software. At this time, then, all inquiries should be forwarded to Stan Nowak or Ernie Hyde at the corporate headquarters.

GBS

CAUTION — — —

A GBS user recently destroyed the system disk by copying the data disk over it during the backup procedure. First, we advise that each vendor incorporate some checking procedure into the backup program to verify that the user has, indeed, removed the system disk and replaced it with a backup disk when the prompt calls for this action. If, however, no such check is in the system and your user is caught in this situation, please beware. To recover, he may mount a previous backup system disk (as long as the software is up-to-date on it) and simply run the KFAM utility called "Key File Recovery" for each KFAM data file on the fixed disk. This procedure will put him back in business. The "caution" here is do not, I repeat, do not run any programs that access a KFAM file after the backup system disk has been mounted and before all files have been run through

"Key File Recovery." What will happen is that the KDR record from the old system disk will replace the KDR record on the data disk when the file is closed, thus the ending record or last key added will reflect information from a previous processing period. The "Key File Recovery" program reads the KDR record at the end of the data file to determine how many records to rebuild keys for. If the user should inadvertently run any programs before running "Key File Recovery," he is apt to lose a few days' worth of data.

ERRATA

Recently a number of GBS Errata Notices (Nos. 41-52) were distributed to all licensed GBS vendors. If you wish to receive copies of these errata, they may be obtained by contacting Paula Welch, in Lowell.

MOD-4 PAYROLL

Just a note of clarification...There will be both a hard disk and diskette version of MOD-4 just as with the other GBS modules. There are rumors afoot that a diskette version will not be released. The diskette version will be released shortly following the hard disk version and will handle a maximum of 150 employees.

MVP VERSION OF GBS

The need for a multiple-station version of GBS has been recognized for some time. In response to your many urgent requests, design work has begun to convert GBS to run on the MVP processor. This project has been assigned a high priority and will be Wang's first experience in converting an existing package to the MVP.

Unlike the current GBS, which was written for T processors, the new package will use the more powerful and efficient BASIC-2 language and the MVP file access method, KFAM-7. Flexibility, efficiency, and ease of modification will be the primary design criteria. Like the original version, it will be designed as a vendor tool - a complete, usable package that you can install quickly and profitably. It will not be designed for direct sale to end-users.

You should bear in mind the future availability of this product when you install systems. To allow easy growth, it is to your advantage to keep modifications to the bare minimum. The new product will be kept as close to the current version as is practical. A file conversion procedure will be included.

Obviously, the more you modify a customer's system now, the more difficult his upgrade will be. And, of course, customers should buy a VP processor, not a T, if an upgrade is planned.

It is too early to accurately judge the amount of time required to complete the conversion. As with any project, the phases required are design, programming, debugging, system testing (and test installation), and documentation. Periodic updates will be included in this column as the project progresses.

Recent Publications

The following items have been released from Lowell from February 1, 1978 and February 28, 1978.

DATA SHEETS

Word Processor 5538 Twin Sheet Feeder Data Sheet (700-4495)

2281P Printer/Plotter Data Sheet (700-4473)

MANUALS

Mortgage Management System System Manual (700-4334A)

Small Accounting System (Payroll) User Manual (700-4458)

Small Accounting System (Payroll) System Manual (700-4459)

Word Processor Glossary Auxiliary Functions User Manual (700-4642)

Word Processor Glossary Decision Processing User Manual (700-4614)

Word Processor Glossary User Manual (700-4624)

MISCELLANEOUS

Word Processor 30 (CDC Disk) Power Procedures (700-4424)

PRODUCT BULLETINS

#152A 2271P Plotting Output Writer

#160 Word Processor Twin Sheet Feeder 3/3/78

REPRINTS

Word Processor 5531-2 120 CPS Line Printer Data Sheet (700-4333A)

2200 Sort Statements Reference Manual (700-3559F)

2221W Line Printer User Manual (700-3638C)

PCS-II Data Sheet (700-4153C)

2230MXA/B Data Sheet (700-3740B)

2250/Option 67 8-Bit-Parallel I/O Interface Controller User Manual (700-3156B)

Word Processor 20 Data Sheet (700-3892D)

Introducing GBS (700-4186B)

2254 IEEE-488 Interface Data Sheet (700-4008B) 2/28

2209 Nine-Track Tape Drive Data Sheet (700-3565E) 2/28

Model 9027 Scanning Input Interface Operating Procedures (700-4389A)

2200T Introductory Guide (700-4613) 3/2/78

Questions, Corrections & Amplifications...

- Release 1.1 of the MVP BASIC-2 system platter is now being shipped to all new MVP users. All of the pertinent information has been included in the reference manual. Existing customers will receive the new 1.1 system platter with a description of the new release. Release 1.1 replaces all previous MVP BASIC-2 releases and is required for the proper operation of Wang MVP telecommunication packages and the 2209 mag tape drive.

If you have an MVP and have not received this release, contact Paula Welch in Lowell by phone or telex.

MVP QUESTIONS AND ANSWERS

The following is a list of "most frequently asked questions" concerning the MVP. These questions have been answered and submitted by the Research and Development Department here in Lowell. We hope you find this information useful in clarifying any questions that you may have.

How fast is the MVP?

The MVP CPU processes at the same speed as a 2200VP (six to ten times faster than the 2200T). However, CPU time is shared among the partitions, with a small swapping overhead. Dividing CPU speed by the number of partitions as a measure of partition execution speed is quite conservative since during most I/O operations, the partition is put to "sleep" releasing this partition's CPU time until I/O completion.

Does the MVP support foreign terminals?

No. The communication protocol between the 2236 MXD and the 2236D terminals is eight data bits plus odd parity. This is not a popular mode of asynchronous communication. Secondly, the MXD frequently sends special control characters such as atoms to facilitate compressed data to the terminal. These would appear as random garbage on most foreign terminals. Third, the MXD does not have any facility to translate our cursor control characters into different characters that may be required by the foreign terminal. (To support foreign terminals, the MXD would have to be redesigned to provide PROM space for the extra microcode.)

May a terminal be attached to a global partition and execute it?

Yes. A global partition may contain the appropriate DIM and COM statements to allocate variable storage. It is then possible to execute the global partition directly, rather than calling it from another partition. A directly executed global partition is still reentrant and its program text may still be shared by other calling partitions. There are at least three practical situations where directly executing a global partition is desirable. First, the 1K system overhead of setting up a separate calling partition is saved. Second, unrelated jobs may use the global partition naming facility to locate each other and pass synchronizing information back and forth through global variables. Third, it may be desirable to merely give jobs a name, so that an operator responsible for controlling several partitions can refer to them by name rather than partition number.

Does the MVP support Batch processing?

Yes, but not directly. The MVP operating system does *not* form queues of pending jobs, assign priorities, or provide an automatic means for processing a queue of BASIC programs one at a time. Also, the MVP does not support a card reader at the present time. However, BASIC-2 provides all of the tools necessary to write a batch processing system.

Does the MVP support Print Spooling?

Not really. The goal of automatic print spooling is to make a disk file look exactly like a printer from the program's point of view. BASIC-2 has the PRINTUSING TO statement that allows one form of MVP output operation to be targeted to variables in memory, rather than a printer or CRT. This could be used to write a SPOOLING program, at the expense of some normal I/O flexibility. It would probably be easier, however, to implement batch processing and sequentially process report generating programs. Batch processing would also require less disk space. A more automatic spooling is a consideration for a future release.

Why must the MVP be powered down in order to reconfigure memory?

As far as the operating system is concerned, reconfiguring memory is a very drastic operation. It is not possible to move an executing program from one memory address to another. Further, it is not possible for the operating system to detect whether a partition may be safely cleared. (We can't tell the difference between the case of an operator leaving the terminal without clearing the program text and a program under development, where the operator has not keyed "RETURN" lately.) By insisting that the system be powered down in order to reconfigure memory, we hope to impress upon the user

how drastic the action of reconfiguring memory is on the current contents of the system.

Can a program tell which partition it is loaded into or which terminal it is assigned to?

Yes. The numeric function #PART returns the partition number. The function #TERM returns the terminal number. Example:

```
PRINT #PART, #TERM
10 IF #PART = 3 THEN 20
```

(In the case of global text, #PART and #TERM give values that apply to the calling partition.)

Can a program tell the size of the partition it is loaded into?

Yes. The SPACEK function gives the partition size in K (including the 1K system overhead). The SPACE function gives the free space (the space not currently used by program and variables).

```
Example: PRINT SPACEK
```

In the case of global text, SPACEK applies to the calling partition.

(By the way, if you want to know how much memory is being used by a VP or MVP program, PRINT SPACEK - SPACE/1023. The answer will be output in K.)

What happens if a LOAD statement is encountered in global text?

The program overlay is loaded into the original calling partition. Execution proceeds in the original calling partition, just as if the LOAD statement had been encountered in the original calling partition.

What happens if a STOP statement is encountered in global text?

The program stops. The CONTINUE command will cause execution to resume with the next statement in the global partition.

What security features are provided on the MVP?

No hardware protection, such as memory storage keys, are required because the MVP microcode Operating System/BASIC interpreter controls all memory allocation and memory references. A user program cannot escape from its partition and run wild through memory. The operating system allows a partition to access only the terminal it is assigned to. This insures that a programming error in one partition will not disturb the screen of another terminal.

An important MVP security feature is the ability to disable programming on any partition. This forces the operator to go through software to access disk files. With programming disabled, the operator may only load a program called "START." The "START" program is responsible for causing other programs to be loaded. The operator running with a non-programmable partition cannot read or alter the contents of memory, list the program, or list the disk catalog without the aid of software. Password protection of disk files is built into KFAM7 software.

Programs saved with SAVE! command are encrypted when stored on disk and thus cannot be examined by an unauthorized person. When an encrypted program is loaded, it cannot be modified or listed.

Will the MVP eventually support all 2200 peripherals?

Some 2200 peripherals present potential timing problems on the MVP. Others present logical problems. We will add new peripherals to the MVP as we test them to make sure they perform well and don't bog down the system. The 2226 console will probably never be supported, because it lacks necessary keyboard buffering.

How much memory does a typical program require?

The Wang 2200 is very memory efficient. Programs are stored in atomized form, where each BASIC keyword is represented by a one-byte atom. One benchmark showed that the average BASIC statement required eleven bytes. Numeric variables require eight bytes. Alpha variables require the number of bytes specified in the dimension statements. Wang BASIC is rich with data conversion statements that allow numeric data to be stored to less than full thirteen-digit precision in alpha variables.

Memory requirements on the MVP differ from other 2200 systems only in the amount of system overhead. If one thinks of the 2200T and 2200VP as "single partition systems," the comparison of per partition overhead is as follows:

2200T	2200VP	2200MVP
700 bytes	3K	1K

In addition, the MVP requires 3K bytes for tables used in the control of the system as a whole.

Shall I write 2200T compatible BASIC programs for my MVP?

The BASIC-2 is a more efficient language than Wang BASIC as far as program size and execution speed are concerned. Even so, writing 2200T compatible programs for the VP is justifiable since only a single program need be maintained for either CPU.

However, on a multi-programming system the considerations are different. Since an inefficient program uses more CPU time, less CPU time is available for processing other programs. Thus, not only does the inefficient program run more slowly, but the entire system performance is degraded. Good MVP programming must consider the effect of the program's execution on the total system performance, and thus should be written efficiently making use of the tools provided by BASIC-2. This primarily involves areas of terminal/keyboard I/O and delay loops.

For example, character entry is often performed on the 2200T as follows:

```
100 KEYIN A$, 110, 120 : GOTO 100
```

The program loops on line 100 until a character is entered, but note that *no* meaningful processing is actually being performed. The BASIC-2 form of KEYIN is much preferred

```
100 KEYIN A$,, 120
```

since the program is put to "sleep" until a character is entered. The CPU is only involved when characters are actually entered.

Better yet is to request an entire line of data; for example:

```
100 LINPUT A$
```

in which case, the program is put to "sleep" until the entire line of data is entered. Using dummy FOR/NEXT loops to delay for a specific period of time is clearly wasteful of CPU time since no meaningful processing is taking place. Implementing delays with SELECT P is recommended since the partition is put to "sleep" during the SELECT P pause (the timing is done by the terminal). Unlike FOR/NEXT delays, SELECT P has the additional advantage of being independent of the CPU workload.

Big words that describe the MVP: (Reference *Encyclopedia of Computer Science* by Ralston and Meek)

Multi-programming: We execute more than one job at a time. We interleave I/O with computation. We also switch CPU bound users out every 30 ms. to insure good response time for all.

MFT: This is a big word used by IBM. It means multi-programming with a fixed number of tasks. This term applies to the MVP because, like IBM OS 360/MFT, we divide memory into a fixed number of partitions of fixed size.

Front end processor: This is a small, limited capacity computer used to augment the I/O capability of a larger computer. On the MVP, we use a microcomputer (based on 8080 microprocessor) to buffer keystrokes from the terminals, buffer data to be printed to each CRT and local printer, and to do editing of text lines. Our front end processor is called a

2236 MXD. An MVP system has one 2236 MXD for every four 2236D terminals.

Background/Foreground: This is a limited form of multi-programming supported on minicomputers. Background/Foreground involves one high priority job of a real time nature (e.g., monitoring instruments) and a lesser priority background job that runs when the CPU is not processing the Foreground job. On the MVP all partitions have equal priority, but there is some extra priority given to I/O. For the purpose of the MVP, we define a background task as one that runs with on operator intervention. Further, a background job on the MVP releases control of the terminal, so that the terminal may be used to interact with a program running in another partition assigned to that terminal.

Because background/foreground implies a scheduling priority, the term does not truly apply to the MVP. It is, however, the best way to describe the situation where one terminal controls more than one partition.

Time Sharing, Time Slicing, Time Division Multiplexing: These roughly synonymous terms describe a multi-programming system that is optimized for fast response time to interactive users. The MVP is definitely optimized for interactive use. Our time slice is 30 ms, which is comparatively fast by industry standards. The BASIC INPUT statement is handled by the 2236MXD as far as responding to individual keystrokes. From the time the operator types carriage return until the MVP begins to process, that user's BASIC program can be no longer than one-half second (assuming sixteen partitions, none of which are waiting for I/O). The above figure is very much a worst case.

Batch Processing: As the name implies, batch processing has to do with collecting jobs into a group or "batch" to be submitted to the computer in a job stream. The MVP operating system does not support batch processing directly, but it is possible to write BASIC software to perform jobs scheduling, queueing, etc.

Reentrant code: Reentrant code is program text that may be accessed by several users in the multi-programming environment simultaneously, yet the individual user need not worry about the presence or absence of any other users that may be contending for the program code. This term precisely describes a global partition that is used to contain shared program text. All calling partitions must have their own copy of the variables.

RS-232-C: This is the electrical standard that describes the connector and cable used to connect the terminals with the 2236 MXD. The RS-232-C standard connector and interface are also found on the 2227B and 2228B telecommunications controllers.

Asynchronous/Full duplex communication: Communication between the terminals and the MXD is serial-by-bit and asynchronous. This differs from bisync used by the 928 word processor in that each byte in asynch must send along some timing information. Full duplex means that both parties may talk at once. It is possible to type on the keyboard of a 2236D terminal while output is being printed on the CRT or local printer. Our character format is eight data bits plus odd parity. This is perfectly acceptable format, but it is not very commonly used.

Technical Information Center May We Help You?

Frank Agnew
Gerard S. Boyer
Michael J. Chen
Christopher J. Glueck
Theodore J. Leonsis
Wayne Sandberg

1. 2272 Accessories List

The following accessories are available on the 2272 Digital Drum Plotter:

279-5050-24 Ball Point Pen Adaptor Assembly	\$30.00/1 \$75.00/3
725-0472-6 Ball Point Plotter Pen/Blue Package of 5	\$15.00
725-0472-0 Ball Point Plotter Pen/Black Package of 5	\$15.00
725-0473-6 Fiber Tip Pen/Blue Package of 5	\$15.00
725-0473-2 Fiber Tip Pen/Red Package of 5	\$15.00
725-0473-0 Fiber Tip Pen/Black Package of 5	\$15.00

615-0214

Plotter Paper

\$40.00

Box of 1000 Sheets

2. 2261W Line Printer

Recently, the Technical Information Center has been receiving many calls concerning the availability and/or existence of a paper rack as an automatic enclosure with the 2261W printer. The 2261W does not include a paper rack as an automatic enclosure or as an option.

The 2221W paper rack has been substituted as a "convenience option" in some cases. However, please be advised that attaching a 2221W paper rack to a 2261W is not a recommended option because the positioning of the 2261W's fans may blow the paper from the rack.

3. Audio Alarm

Wang's audio alarm provides a 2200 system user with a powerful error detection and editing tool. The tone may be activated either by Hex code 07 under program control or by the operating system on the VP and MVP.

On the Wang 2200 Systems A, B, C, S and T, the audio alarm serves as a programmable prompt to aid the programmer and operator. Installation of the option consists of connecting a speaker wired to a printed circuit board in the system console.

The 2200VP and MVP operating system broadens the error detection and editing capabilities of the audio alarm. Standard on the MVP, the audio alarm is a recommended option on the VP, as well. Not only active under program control, the audio alarm also alerts the VP and MVP user to system errors such as hardware malfunctions, parity and verify errors, standard VP and MVP errors, and errors in LINPUT mode, (i.e., overflow of data buffers or the depression of illegal Special Function Keys).

Quicker error resolution, standardization of error messages and an efficient error alert medium characterize the benefits of the Wang audio alarm. The operating system of the VP and MVP adds increased error detection capabilities to this device. The audio alarm provides a time-saving, versatile method of error resolution for a variety of user applications.

Note: The audio alarm is available in the following forms:

For the 2200WS, WCS-15 and PCS II, it is Option 60 containing a keyboard clicker, alarm and auxiliary CRT connector. Option 60A, also available on the PCS-II,

provides all the features of Option 60 in addition to a 80x24 screen. Option 31 is the audio alarm for the 2226 and 2210 console. See current price list for pricing information.

4. KFAM 5 Security Measure

KFAM 5 allows a user the option of incorporating a password into the system as a security measure. When a password is built into the program, only authorized users (who know the password) can access the KFAM file. To gain access to the file, the operator need only enter the proper "password" when running his program.

Please

Note: When building KFAM 5 subroutines incorporating a password, the user must select the "multiplexed file" option (Special Function Key 24). This must be done, whether the file is multiplexed or not.

5. WCS-40/MVP Questions

These are several questions that frequently arise concerning 2200MVP. The answers have been provided for your benefit by the Technical Information Center.

(1) Why is the 2270A-D diskette drive required on all 2200MVP orders?

During the life of the 2200MVP we will be enhancing the capabilities of this system with new revisions to the Operating System. These revisions, along with other system software, will be distributed to 2200MVP customers on diskettes. In addition, all Customer Engineering diagnostics are stored on diskette for field service calls. Without a floppy diskette, the costs of software distribution and field service calls would be excessive.

The 2270A-D is a modified version of the 2270A diskette drive. The 2270A, IBM compatible diskette drive was chosen rather than the 2270 because it was more easily adapted to provide overlapped processing which is required on the 2200MVP.

(2) Why can't a 2270 diskette drive be configured on a 2200MVP?

Changes have been made to both the Model 2270 and its I/O controller to provide overlapped disk processing. The 2270A-D provides this disk

overlap feature and is the only diskette drive that can be configured with the 2200MVP.

(3) What is meant by overlapped processing?

Overlapped processing is simply the concurrent processing of a job in the CPU while I/O operations are being performed. For example, on the 2200MVP, the CPU may be servicing one or more partitions during the time it takes to physically locate a data record on a disk drive.

(4) Will the 2270A-D IBM-compatible diskette handle Wang formatted diskettes?

Yes, the 2270A-D Diskette Drive is physically and functionally identical to the Model 2270 except that the controller in each diskette drive has been modified to provide overlapped processing and automatically handle both IBM 3740 Series diskettes and Wang diskettes. IBM 3740 diskettes, of course, must be previously formatted (initialized) by IBM prior to use on the 2270A-D.

(5) Does the 2200MVP support the 22C31 triple controller?

The MVP will not support the 22C31 triple controller since this controller is used to control the 2226 console keyboard which is not supported on the 2200MVP.

(6) Is it possible to use more than one telecommunication controller with the MVP?

Yes! Up to four 2227B or 2228B communications controllers may be utilized on the MVP. Any or all 2236D terminals may be operated from remote locations without the requirements for 2227B or 2228B TC boards. The 2236 MXD provides the TC capability for these devices.

(7) Will KFAM run on the MVP? If so, can partitions share files?

Yes. KFAM-7 has been developed for the MVP, to run in a global partition and therefore can be shared by all other partitions. It is functionally the same as KFAM-5 in that it allows several programs to access the same files.

(8) How compatible is MVP BASIC-2 with the Wang 2200 BASIC and BASIC-2 of earlier 2200 models?

For the most part, MVP BASIC-2 is upward

compatible with VP BASIC-2. BASIC-2 is, in turn, compatible with Wang BASIC as supported on the 2200T. The MVP imposes some restrictions on \$GIO, especially \$GIO with delays or timeouts. The main software compatibility problems arise with program logic, not individual statements. An MVP is much like a multiplexed disk environment, with the added complication of a shared printer. MVP BASIC-2 contains new statements to allow programs to "hog" a shared printer.

(9) Can terminal #1 terminate a program executing in a partition assigned to another terminal?

No. Unlike most multi-programming systems, the MVP has no main console with ultimate control over the system. It is true that terminal #1 controls the system at partition generation time, but after memory has been partitioned, terminal #1 has no special status. (The only special power terminal #1 maintains is the ability to set the Broadcast Message.) Of course, programs may cooperate by exchanging control information via global variables.

(10) How are terminals numbered?

Terminals are numbered according to which port on which 2236 MXD they are plugged into. The terminals plugged into the first MXD are numbered 1-4. The terminals plugged into the second MXD are numbered 5-8. It is not necessary to fill the MXD ports in order, nor is it necessary to assign a memory partition to unused MXD ports. A good use for spare MXD ports is to set them to various baud rates for use with various speed remote terminals. It does not hurt the MXD to move the terminal connectors around while the system is powered on.

(11) How far away from the CPU may the 2236D terminals be located?

The standard cable length supplied with the terminal is 25 feet. However, direct connection cables are available up to 1,000 feet. Short haul modems provide connections up to five miles, and telecommunications modems can communicate for distances over five miles.

(12) Are global partitions associated with a terminal?

Yes. All partitions on the MVP are assigned to a terminal. The terminal to which a partition is assigned exercises ultimate control over it (i.e.,

the operator at that terminal may CLEAR the program from the partition). Global partitions differ from non-global partitions in that a global partition executes a DEFFN @ PART statement, which makes its subroutines and global variables available to other partitions. By default, any MVP partition may access the global partition. Access may optionally be restricted to specific terminals.

(13) Are global partitions reentrant?

Yes. Any number of partitions may be simultaneously executing the global shared program text. This is possible because each calling partition contains its own set of variables.

In cases where the global partition contains shared data (global variables), it may be necessary to "hog" the shared data while critical updates take place — just as it is sometimes necessary to hog shared disk files. Global variables may be used as semaphores to easily implement this hog mode.

(14) How difficult is it to modify an existing 2200 program to be loaded into a global partition and accessed by several calling partitions?

Modifying a program to be shared as a global partition is a fairly simple clerical change, if the program does not require overlays.

A DEFFN @ PART statement must be added to declare the partition global. A DEFFN statement must be added to form the entry point to the global program. DIM and COM statements are removed; otherwise, variable storage will be allocated within the global partition, which will waste memory.

A short calling program must be written. This program will be loaded into all partitions wishing to call the global program. This short calling program consists of a SELECT @ PART statement, several DIM and COM statements (like the ones removed from the global text) and a GOSUB to cause execution of global text to begin. All variables, including numeric scalars, must explicitly appear in the calling partition usually in DIM or COM statements.

(15) How are global partitions identified?

By a name of up to eight characters.

(16) Can a global subroutine call a global subroutine in yet a different global partition?

Yes.

(17) What happens if two or more partitions assigned to the same terminal try to print to the CRT?

At any given time, only one partition is "attached" to the terminal. The attached partition has exclusive control of the terminal. If another partition attempts to access the terminal, it is "put to sleep" until the terminal becomes available to it. The "attached" partition maintains control over the terminal until it explicitly gives up control by executing a \$RELEASE TERMINAL statement, either in program or immediate mode. Control of the terminal is usually released to "any waiting partition," though it is possible to specify to which partition control is to be released.

(18) Can a program executing a partition assigned to one terminal cause a message to appear on the CRT or local printer of another terminal?

Not directly. Part of our protecting MVP users from each other's programming errors is to not allow direct access to the other guy's terminal. In order to send a message to another terminal, the message must be put some place where a program executing a partition attached to the receiving terminal can access the message. Global variables and disk files are means by which terminals may communicate. Even the Broadcast Message requires a specific effort by the receiver before it will be displayed. Terminals communicate on the MVP system by mutual cooperation.

Software Package Listing

This is just a short follow-up to the article in Newsletter #7, where we initiated the "Software Package Listing."

To date we have not yet received any response (i.e., Package Listing Forms); therefore, we have no listings for this month's issue. To reiterate, we would like to generate a perpetual list of valid, proven and documented packages available for cross-license installation by other software vendors. This list will appear each month in the Systems Newsletter.

We are continuously receiving calls from salesmen, analysts, and vendors requesting information concerning the

availability of software for specific industries. It is our goal that such a listing will provide answers to some of these questions and provide the field with some direction. In addition, this listing can provide a forum for you to spread the word about your packages, resulting, hopefully, in additional revenue for all.

The response form is included in this issue for your use in submitting your program(s) for listing. For a further explanation of this program, please refer to Page 8 of System Newsletter #7.

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Mr. Thomas M. Carpenter
703 North Avenue P
Clifton, TX 76634
(817) 675-6253

Last Minute Items

GBS Distributor Version

The Wholesale Distribution version of GBS is now officially released. If you are a licensed GBS vendor, contact your district analyst to receive your copy. If you wish to become a licensed vendor for the GBS system, your district analyst will provide you with the necessary agreement forms.

ISS FEEDBACK

We are soliciting your comments, criticisms and suggestions regarding the ISS utilities and subroutines. Are they good? Are they useful? Why? Why not? How can we improve them? What additional types of subroutines or utility aids would be useful? If you don't use them, why not?

You are the users. ISS was written for you. Use the attached mailer and respond today.

NEW \$GIO SEQUENCES FOR THE 2209A TAPE DRIVE ON THE MVP

GBS DISTRIBUTOR VERSION

The MVP specifications mention that the \$GIO sequences for controlling the 2209A tape drive must be changed for use on the MVP. This article documents these changes. All of the new sequences are compatible with the 2200VP and VP users may wish to adopt the new sequences as they can provide some faster output on the VP.

The present \$GIO sequences, documented in Table 4-1 of the 2209A manual, will lead to an input timeout error (I92) on the MVP. The MVP cannot allow one partition to wait for an input strobe (8607) for a long time, as this would be unfair to other users. The MVP hardware does not permit the MVP to switch users once an 860X microcommand has begun, because data may be lost in the process. The solution is to wait for the tape drive controller to become ready (1020) before asking the board for input. Thus the change to the \$GIO sequences is to insert a 1020 microcommand after any CBS (44xx) that causes tape motion and before the single character input (8607) that follows the tape motion commands.

As mentioned in the 2209A manual, it is not necessary to keep the tape controller board enabled throughout an entire tape operation. The example of "look ahead read" is given. In the example, the \$IF ON statement is an acceptable substitute for the "wait for ready" microcommand (1020).

10 \$GIO READ /07B (4400 1020 8607 442A C220, A\$) B\$()

or

20 \$GIO LOOK AHEAD READ /07B (4400, A\$)

-
-
-

30 \$IF ON /07B, 500

-
-
-

500 \$GIO READ CONTROLLER BUFFER /07B (1020 8607 442A C220, A\$)

In the previous example, \$IF ON and the 1020 microcommand in line 500 are redundant.

(An exception to the above is that tape motion stops if the tape drive controller is disabled during a skip file operation. The skip file operation is completed when the board again becomes enabled. A forthcoming ECN will fix this problem.)

Another important MVP change is the increased importance of Master Reset (459C). The reset key on the 2236D console will not reset the tape drive controller. If a reset from the console happens to occur in the middle of the execution of a tape drive \$GIO sequence, the tape drive controller will be left in an unpredictable state. In such cases, it is important that the tape drive controller be reset by sending a CBS of HEX(9C) without waiting for ready (459C).

The "Status" \$GIO sequence is currently documented as allowable at any time (CBS of 8B without waiting for ready). Experience has shown that reading the controller status during tape operations sometimes interferes with proper controller operation. The status sequence should be used to read tape drive status when the tape is not in motion (448B rather than 458B). \$IF ON or the \$GIO microcommand 1010 should be used to test for "tape operation complete."

On the VP and MVP, the \$GIO sequence 13000 A000 is a faster multi-character output than the A200 in the present tape drive manual. Due to the mechanics of starting and stopping the tape, the difference in data transfer time may not affect tape writing throughput, but it will allow better utilization of the MVP processor by other partitions.

Last minute items

To summarize, the new recommended VP/MVP \$GIO sequences for the 2209A tape drive are listed below:

Backspace File	\$GIO BSF /07B (4405 1020 8607, A\$)
Backspace Record	\$GIO BSR /07B (4404 1020 8607, A\$)
Forwardspace File	\$GIO FSF /07B (4402 1020 8607, A\$)
Forwardspace Record	\$GIO FSF /07B (4408 1020 8607, A\$)
Read	\$GIO READ /07B (4400 1020 8607 442A C220, A\$) B\$()
Rewind	\$GIO REWIND /07B (4446 1020 8607, A\$)
Write EOF	\$GIO WEOF /07B (4403 1020 8607, A\$)
Write Gap	\$GIO WGAP /07B (4407 1020 8607, A\$)
Write	\$GIO WRITE /07B (4429 1300 A000 4401 1020 8607, A\$) B\$()
Look Ahead Read (subset of Read)	\$GIO LAR /07B (4400, A\$)
Finish Read (subset of Read)	\$GIO FR /07B (1020 8607 442A C220, A\$) B\$()
Buffer Write (subset of Write)	\$GIO BW /07B (4429 1300 A000 4401, A\$) B\$()
Finish Write (subset of Write)	\$GIO FW /07B (1020 8607, B\$)
Master Reset	\$GIO RESET /07B (459C, B\$)
Status	\$GIO STATUS /07B (448B 1020 8607, B\$)

Proper operation of the 2209A with the MVP also requires at least Release 1.1 of the operating system.

The Technical Information Center is available to assist you with questions regarding the new \$GIO sequences.

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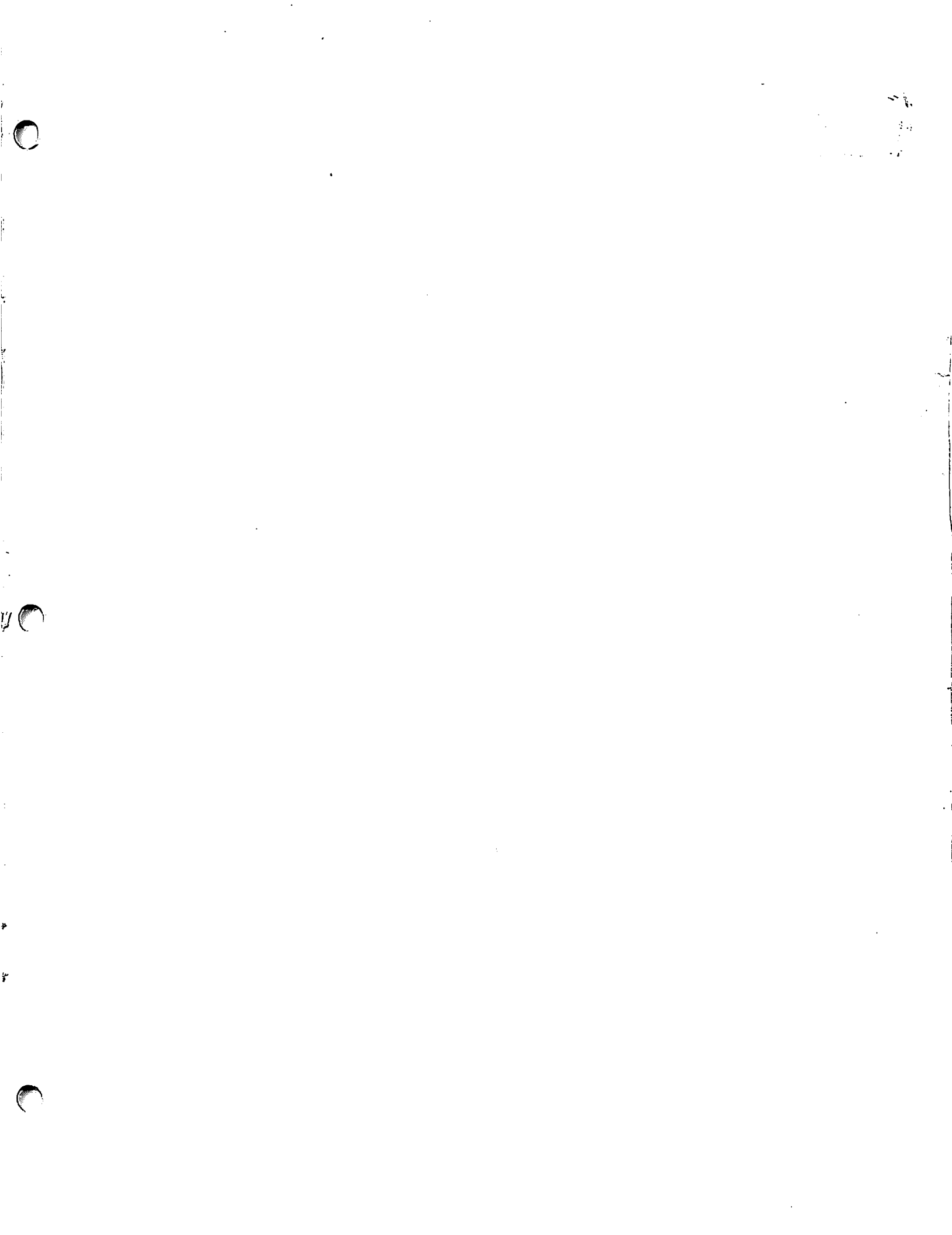
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History: Dr. An Wang earned his Ph.D. in Applied Physics at Harvard University. His early work in magnetic core memory development contributed to one of the giant steps that made computers a part of modern life. Reliable, large-capacity memory was one of the biggest needs that had to be filled before the computer could become a commercial reality.

Wang Laboratories, Inc., then started in 1951, with the idea that we could find new and better ways to fill information handling needs.

Since then, we have grown to a \$135 million company, listed among the top growth businesses in the United States.

Our main manufacturing facility is located in Tewksbury, Massachusetts. Another facility in Burlington houses the Wang Data Center.

To accommodate Wang's rapid growth, we recently relocated our administrative headquarters and research and development operations from Tewksbury to a new facility in Lowell, Massachusetts, which almost doubles available floor space.

In North America, we serve our customers through over 100 Wang-staffed sales and service centers.

Our worldwide business operations employ some 4,200 people among them 1,800 highly trained sales and systems specialists and customer engineers. We maintain 50 Wang-owned sales and service offices in 17 countries and are represented in 48 additional countries.