Display Data in*sight system

MANAGEMENT SUMMARY

Display Data began operations in October 1973. It delivered its first in*sight system in January 1974 to an automobile dealer in Baltimore. As of January 1981, the number of installed systems is approximately 1400. Display Data currently supports 32 branch offices, and plans expansion in its product line, industry areas covered, and branch office locations.

The original choice by Display Data of automobile dealers as the first industry group to be approached was profitable. Auto dealers share a common reporting system with each of the major automobile manufacturers. This provides a large base of common applications. In addition, many auto dealers are already familiar with data processing, usually through a service bureau specializing in their applications.

Recently, the company expanded into another industry area: beverage distribution. The in*sight system, with the Beverage Distribution package, is designed to accommodate beverage distributor and supplier operations. This system provides the software for daily route accounting, sales analysis reporting, inventory control, order forecasting and control, and general accounting packages, including accounts receivable and payable, general ledger, and payroll.

All programming is performed by Display Data in Assembly language. The software is tailored to the peculiarities of each individual installation, and is provided in free-standing modules. The software is separately priced, and ranges from $2,000 for a single▷

The in*sight system, a multi-terminal small business computer system aimed initially at automobile dealers, is also offered in a new version for beverage distributors. The 1400 in*sight systems currently in use are maintained by 32 Display Data branch offices located in major cities nationwide.

MAIN MEMORY: 64K to 128K bytes.
DISK CAPACITY: Up to 40 megabytes
WORKSTATIONS: Up to 24 local and/or remote stations
PRINTERS: Up to 300 lpm
OTHER I/O: None

CHARACTERISTICS

MANUFACTURER: Display Data Corporation, Executive Plaza IV, Hunt Valley, Maryland 21031. Telephone (301) 667-9211 or (800) 638-1100.

MODEL: in*sight.

DATE ANNOUNCED: January 1974.
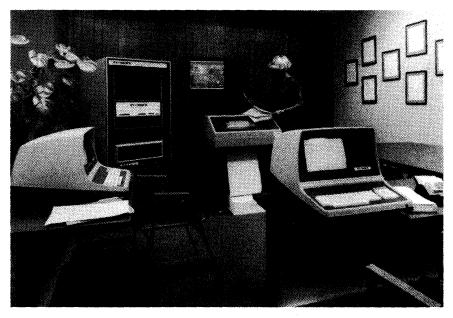
NUMBER INSTALLED TO DATE: Approximately 1400.

DATA FORMATS

The user of an in*sight system works entirely with the data formats established by his procedures and files. Turnkey software is provided.

MAIN STORAGE

TYPE: Semiconductor.

CYCLE TIME: 1 microsecond per 8-bit byte.

The multi-user, multi-job in*sight system can support up to 24 CRTs and printers, and up to four 10-megabyte disk drives. The applications software is tailored for each individual installation and includes essential accounting functions installable in free-standing modules.

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▷ payroll program to approximately $38,000 for a complete auto dealer package. Custom programming naturally increases the cost.

System configurations include 64K to 128K bytes of main memory, one to four 10-megabyte disk drives, and up to 24 local and/or remote CRT display units and printers. Among the systems presently installed, the configurations tend to include six or fewer CRTs, one printer, and one or two disk drives. The largest configuration currently installed includes 16 CRTs, four printers, and four disk drives (40 megabytes of on-line storage).

From Display Data, you get a turnkey system suitable for operation by non-EDP professionals and a dedication from the company to support the installation. Display Data provides maintenance for both the hardware and the software of the in*sight system. Initially, the company tried a third-party maintenance arrangement, but found that the level of installation loyalty by the third-party personnel was not high enough to provide the support (response time to service calls) that the company felt necessary to ensure good customer relations.

Display Data concentrates its marketing efforts within a three-hour radius of one of its branch offices to provide a quick response time to all service calls. Currently, the company has branch offices in Washington, D.C., Greensboro, NC, Columbia, SC, Newport News, VA, Baltimore, Philadelphia, Atlanta, Cleveland, Detroit, Los Angeles, New York, San Francisco, Chicago, San Diego, Houston, Cincinnati, and Dallas. For additional sales office locations, please contact the vendor.

In summary, Display Data has selected two profitable industry areas to market their product. This is made evident by the company's projection of $30 million in revenues for the fiscal year 1981.

USER REACTION

Datapro conducted interviews with eight in*sight system users randomly selected from a list of current users supplied by Display Data. Of the eight users, six were automobile dealerships, while the remaining two users were beverage distributors. A total of 11 systems were reported to be installed at the eight user sites. Three auto dealers have two systems: one for the accounting department and one for the parts department.

Of the 11, six systems were equipped with 64K bytes of main memory and three systems contained 128K bytes of memory. (Two of the interviewed users were unfamiliar with their system's main memory capacity.) An *average* configuration of the 11 in*sight systems consists of four workstations/display screens, two printers, and 20 megabytes of disk storage. The average installation period for these systems is 24 months.

The principal applications programs used by both the auto dealers and the beverage distributors are the general ▷

▶ **CAPACITY:** 65,536 or 131,072 bytes.

CHECKING: ECC (Haming Code).

STORAGE PROTECTION: None.

CENTRAL PROCESSOR

GENERAL: The Display Data in*sight system is built around a modified version of the Microdata 1600/30 minicomputer (M11-633-101). Display Data's processor utilizes in*sight's semiconductor technology and provides the system a parallel byte I/O communications link of 50,000 bytes per second.

CONTROL STORAGE: A total of 256 bytes of low-order memory is dedicated to interrupt, DMA status, and DMA control information.

REGISTERS: The in*sight system processor contains 16 eight-bit file registers called the primary file and a secondary bank of 16 eight-bit file registers which is accessible by the applications software. The secondary bank is used for concurrent I/O and condition flags. The primary file contains all operational registers, and is also used for other functions not accessible to the user, including storage of condition codes and operand addresses.

The three 16-bit operational registers include the A register, which functions as an accumulator for most operations and holds the upper portion of 24- or 32-bit data words and all of the 8- and 16-bit data words. The B register functions as an auxiliary accumulator: its prime task is to hold the lower 16 bits of the 24- and 32-bit data items. The X register is the single index register. The P register is 15 bits long and serves as the program counter. The 2-bit W register is loaded by a control instruction with the word length mode (the mode sets the byte length of the operand for all variable-length instructions). The O register holds the overflow flag and is one byte long: the flag is set by arithmetic or control instructions and reset by any instruction which tests for overflow condition.

In addition, the processor contains two special-purpose 1-bit registers. The flag in the Power Fail register is automatically set by the firmware when a power failure is detected to prevent servicing of interrupts during the condition. The GAI register is used with the General Alternate Interrupt instruction, which functions when the in*sight system is used in a dual-processor configuration.

ADDRESSING: Eight operand addressing modes are available: direct and indirect to page O for the first 256 bytes of memory; direct and indirect to the P register for a range of ±128 bytes from the next instruction; indexed, where the effective address is given by the X register; indexed with displacement, where the displacement is given by the instruction operand; extended address, enabling effective operand addressing with or without indexing; and immediate (literal) operands of one or four bytes in length.

INSTRUCTION REPERTOIRE: The processor of the in*sight system implements a maximum of 110 instructions. The instruction set contains 17 control, 12 multi-bit arithmetic and logical shift, 18 conditional jump, 6 I/O, 19 interregister, 8 stack control, 5 character/string manipulation, 2 multiply/divide, 2 decimal arithmetic, and 20 memory reference instructions.

INSTRUCTION TIMINGS: Timings are shown in microseconds for full-word, fixed-point operands:

Load/Store	4.6/5.4
Add/Subtract	4.6/4.6
Multiply/Divide	56/74*
Compare/Branch	5.6/4.0

*Average. ▶

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PERIPHERALS/TERMINALS

MODEL	DESCRIPTION	MANUFACTURER
PRINTERS		
8401	132 columns, 64-character set, serial, 55 cps	NEC Information Systems
8411	132 columns, 64-character set, 165 cps, 60 lpm	Dataproducts
8511	132 columns, 64-character set, 6 or 8 lines per inch, 150 lpm	Dataproducts
8512	132 columns, 64-character set, 6 or 8 lines per inch, 300 lpm	Centronics
TERMINALS		
8301	Local CRT/keyboard, 1920 characters, 24 lines x 80 characters, 64-character set, reverse video, numeric keypad, transmission rate of 1200 or 9600 bps	Applied Digital Data Systems (ADDS)
8321	Printing terminal, 80 columns, 30 cps	Texas Instruments
8331	Printing terminal, 80 columns, 120 cps	Texas Instruments

▷ accounting packages, including accounts receivable, accounts payable, general ledger, payroll, and inventory. Additional applications packages utilized by the auto dealers include counter billing, service accounting, orders, leasing, finance and insurance, and sales analysis reporting. The route accounting package is used by the two interviewed beverage distributors.

The following table illustrates the ratings issued by the contacted users for the in*sight system. (Note: Since the in*sight system's software is generally programmed by Display Data, questions on the system's operating system, compilers and assemblers, and ease of programming were not asked during the interviews.)

	Excellent	Good	Fair	Poor	WA*
Ease of operation	8	0	0	0	4.0
Reliability of mainframe	5	3	0	0	3.6
Reliability of peripherals	5	3	0	0	3.6
Maintenance service:					
Responsiveness	6	2	0	0	3.8
Effectiveness	6	2	0	0	3.8
Technical support:					
Trouble-shooting	6	2	0	0	3.8
Education	5	3	0	0	3.6
Documentation	2	4	2	0	3.0
Manufacturer's software:					
Applications programs	3	5	0	0	3.4
Ease of conversion	5	2	0	0	3.7
Overall satisfaction	7	1	0	0	3.9

*Weighted Average on a scale of 4.0 for Excellent.

As illustrated by the table, the interviewed users were quite pleased with their in*sight system(s). The ease of operation rating reflects the aspect that this system is designed for non-EDP professionals and provides these users with everything that they need. Both the hardware and the software of the system received impressive ratings.

The users reported very little problems with their systems. Slight problems with printers and short downtime periods were reported, but the users did not consider these problems as significant. On the other hand, the users praised the system for its speed, reliability, ▷

▶ INTERRUPTS: There are from 2 to 128 interrupts available in the in*sight processor. The system is based upon priority interrupts for internal processor interrupts, I/O peripheral device interrupts, and groups of individual external interrupts. Each such interrupt has its own unique memory address and priority assignment. External interrupts occur at device controllers or interrupt modules on the Byte I/O bus. This system of external interrupts contains a signal line, a priority line, and a select line. Internal interrupts have priority over external ones, and are dedicated to console interruption, power fail/restart, real-time clock, and user-selectable, optional interrupts.

PHYSICAL SPECIFICATIONS: The processor, as a desktop unit, is 10.5 inches high, 19 inches wide, and 20.5 inches deep. The expansion chassis is of the same size. In a rack-mountable configuration with front panel, the processor and expansion chassis fit into a single-bay cabinet 23.09 inches wide, 25.50 inches deep, and 62.06 inches high. A double-bay cabinet has the same depth and height, but is 46.06 inches wide. Power requirements are 115/230 VAC ±10 percent, 50- or 60-Hz.

INPUT/OUTPUT CONTROL

I/O CHANNELS: Printers and CRTs operate through programmed I/O channels, with a maximum total date rate of 50,000 bytes per second. A DMA facility capable of up to 1,000,000 bytes per second is used for the disk drives.
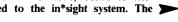
SIMULTANEOUS OPERATIONS: All peripheral and processing activities are overlapped within the capability of the memory and processor cycling rates.

CONFIGURATION RULES

Maximum configuration parameters for the in*sight system are as follows:

• Up to 128K bytes of RAM memory,

• Up to four 10-megabyte disk drives,

• Up to 24 local and/or remote terminals, and

• Up to four line printers.

WORKSTATIONS: Up to 24 terminals, CRTs or teleprinters, can be configured to the in*sight system. The ▶

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▷ flexibility, and convenience. One user said, "It's a definite advantage of having a real-time computer in-house. It makes our organization much more efficient." One beverage distributor added that his system fits his application very well, provides timely reports, and is easy to use. "I'd recommend it to anybody," the distributor said.

Datapro would like to thank the users who participated in this survey, as well as the vendor for supplying us with the list of current users.□

➤ terminals employed by the system are CRTs manufactured by Applied Digital Data Systems, Inc. (ADDS) and teleprinters from Texas Instruments. Detailed information on the terminals can be found in the PERIPHERALS/TERMINALS table on M11-393-103.

DISK STORAGE: Up to four Western Dynex disk drives can be supported by the in*sight system. Each disk drive provides 10 megabytes of on-line disk storage. Further details on the disk drives are available in the MASS STORAGE section of this report.

MAGNETIC TAPE UNITS: None.

PRINTERS: Two types of printers can be used with the in*sight system: character printers and line printers. Character printers are available with printing speeds of 55 and 165 cps. Line printer speeds range from 150 to 300 lpm. The printers are available from such manufacturers as NEC Information Systems, Dataproducts, and Centronics. Additional information on the printers can be found in the PERIPHERALS/TERMINALS table on M11-393-103.

MASS STORAGE

WESTERN DYNEX 3201 DISK DRIVE: The 3201 consists of one disk drive and a controller capable of handling three additional 3201 add-on drives. Each drive consists of one fixed and one removable, 5-million-byte, top-loading, IBM 5440-style cartridges mounted on a common spindle. Data is recorded on 406 tracks on each of the 4 disk surfaces. The total capacity of one drive (two cartridges) is 10 million bytes. The disks rotate at 2400 milliseconds. Head movement time is 10 milliseconds minimum and 35 milliseconds average. The average access time is 47.5 milliseconds. The data transfer rate is 200,000 bytes per second.

INPUT/OUTPUT UNITS

See the PERIPHERALS/TERMINALS table on M11-393-103.

COMMUNICATIONS CONTROL

The in*sight system can operate with local or remote CRT and/or printer stations. Remote stations can be linked to the system via point-to-point arrangements. Transmission speed for the in*sight system is 1200 bps. The remote operator has access to the system in the same manner as the local operator.

A special communications mode is provided with all in*sight systems. A 300-bps facility, including modem, is provided for operation over a dialed connection of the public telephone network to establish a link between a CRT station at Display Data's headquarters and the customer's system.

Through this link, program changes can be made to the operating system, new programs can be loaded or activated, and diagnostic routines can be run. A CRT station at each branch office permits this facility to be used to perform diagnostic tests prior to a service call.

SOFTWARE

Software support for the in*sight system consists of a proprietary operating system developed by Display Data and applications packages needed for each customer. New software applications packages are developed as needed, drawing on the company's previous work whenever possible. All newly developed packages are provided on a non-exclusive license basis (i.e., Display Data retains title and can offer them to other customers).

The general philosophy or program design used by Display Data is to use the CRT screen to replace or utilize the standard documents currently in use by the customer. Minimum change to existing precedures is a design goal. At present, a complete package is offered for general business accounting and other functions. Several new industry areas are being explored, and some are already implemented in pilot installations. All Display Data programming is done in Assembly language.

OPERATING SYSTEM: The general method of implementing the multi-user, multi-job operating environment is through co-resident, re-entrant applications programs. The operating system controls program loading and activation, the interface between the applications programs and I/O devices, and the interface between programs and the master and working files stored on disk.

A scratch-pad area is maintained for each active program within the operating system's resident area. For small- to medium-sized configurations of about six terminals, the operating system occupies approximately 18K bytes of main memory. Applications programs typically require from 1K to 3K bytes, with the average being about 2K bytes. According to the vendor, one installation with 64K bytes of memory and one 10-megabyte disk unit is typically able to run six or seven programs simultaneously.

Multiple master files are maintained on disk. The disk access method is index sequential. Multiple indexes are maintained to files for more rapid access. Application programs for updating master files typically affect several files. A memo posting technique is used for most master files. Transactions are recorded when entered, but are not immediately used to change the master file. However, if any inquiry is made to that file, the transactions are applied so that the displayed result is as if the master files had been updated. Physical updating or changing of the master file occurs when reports are printed, which is usually, but not necessarily, daily. Typically, each application program works with only one device—a CRT or printer (i.e., separate programs are used for input/inquiry and printing). This is feasible because the application is completely defined and not subject to direct modification by the user.

LANGUAGES: The in*sight system runs in Assembly language; however, the language is for in-house program development only, and is normally not accessible to the user.

APPLICATIONS: Two applications packages are currently offered by Display Data: Auto Dealer and Beverage Distribution.

The *Auto Dealer* package is tailored for the particular reporting requirements of each automobile manufacturer. Display Data has installed packages for General Motors, Ford, Chrysler, American Motors, Jeep, truck manufacturers, and foreign manufacturers. The package consists of ➤

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▶ the basic Auto Dealer System and a series of optional modules including Parts Inventory—Back Office, Parts Inventory—Counter Billing, Leasing, Service, Merchandising, and Sales Prospecting.

The basic Auto Dealer System includes a variety of programs to accomplish general ledger, accounts receivable, accounts payable, purchasing and receiving, and payroll functions. All of these, except payroll, are accomplished within the context of a single "interface" with the user. In general, a two-level "menu" approach is used to select the operation performed.

The first level provides selection among only six categories: Utilities, Disk File Set-Up, Inquiry Programs, Transaction Entry, Prints, and Log Off (system shutdown). Each of these categories possesses a second level of program selection. The Transaction Entry and Prints categories are the ones used for most day-to-day operations. The Inquiry Programs category provides access to the parts inventory, auto service transaction, and system operating instruction files only. General inquiry for master file records and previous transactions in the current accounting cycle is handled through the Transaction Entry category of programs.

A long list of programs is provided under the Transaction Entry category for transactions such as general journal entry, new car sales, used car sales—retail, repair orders, internal sales, fleet sales, parts, body shop, repair orders, cash receipts, cash disbursements, new car purchases, etc. Each of these transactions in effect corresponds to a journal entry in a double-entry bookkeeping system. The reason many specific types of transactions are identified, rather than one general type, is to permit close identification of the system's operation with the documents that are created during the normal course of the auto dealer's business. For any of these transaction types, the user has the option for creating automatic general ledger account entries so that the operator has only to enter amounts. The automatic account numbers are displayed with the names of the accounts to permit easy operator identification. The automatic numbers can be overridden for special handling of certain transactions.

The general style of input consists of keying transaction-identifying information, such as invoice number, customer number, etc., into the top half of the display area, with identifying information, such as customer name and address, automatically supplied for visual verification. Multiple-line journal entries are made in the bottom half. Up to 4 "pages" of 20 lines each can be maintained for each transaction to retain account activity information. Because of the historical information, the Transaction Entry operation also permits file inquiry. Reversing entries are used to make corrections.

The Prints program category contains programs for generating printed journals of each Transaction Entry type, management summary reports, trial balances, financial statements, analysis reports, and all of the payroll reports and checks. As a part of most print programs, the relevant master files are updated. The transaction journals can be printed only once because of the master register updating that also occurs.

The Payroll package is complete for salaried and hourly employees, and permits up to 10 different deduction types other than federal and state taxes. Checks, check register, payroll register, trial balance, and sorted labor distribution can all be printed.

The Parts Inventory programs provide for maintaining inventory control and for automating the generation of packing lists by bin number and inquiry for the status of specific parts. Specific reports include counter reference, various analyses and summaries, and suggested parts ordering information. With the additional programs contained in the Counter Billing version, customer bills can be generated at the counter through a CRT or teleprinter workstation and a 150-lpm printer. Access to the system also permits reviewing a customer's history so that appropriate service suggestions can be made. The package simplifies coordinating the various labor parts, service charges, and mark-ups.

Auto dealer leasing has become increasingly important. The system's Lease module can be integrated with the accounting system or set up as a separate entity. (Some dealers set up leasing as part of their dealership; some establish a separate leasing corporation.) The leasing module is reportedly strong enough that a pure leasing company that carries 1600 leases installed the system for its leasing functions.

The *Beverage Distribution* package is designed to accommodate beverage distributor and supplier operations. This system provides the software for daily route accounting, sales analysis reporting, inventory control, order forecasting and control, and general accounting packages such as general ledger, accounts receivable, accounts payable, and payroll.

PRICING

The system purchase price includes complete installation. The software prices include complete installation and training. The monthly license and maintenance fee includes enhancements to programs purchased, system updates, local branch support, and toll-free in*sight support.

As part of the contract maintenance service, the company provides periodic preventive maintenance inspections. During these calls, the disks are cleaned and the filters changed.

The maintenance arrangement is in pre-paid amounts with monthly, quarterly, or annual billing. Quarterly billing costs 10 percent more than annual billing, and monthly billing costs 21 percent more than annual.

EQUIPMENT: The following typical systems include all controllers and adapters, but the prices are exclusive of software.

SMALL SYSTEM: Includes in*sight processor with 64K bytes of memory, one 10-megabyte disk drive, a CRT controller, one local CRT workstation, a 150-lpm printer, and a modem for software/diagnostic connection to Display Data. The purchase price for this complete system is $29,700 (software additional), and the monthly maintenance cost is $274 (billed annually).

MEDIUM SYSTEM: Includes in*sight processor with 64K bytes of memory, two 10-megabyte disk drives, a CRT controller, five local CRT workstations, a 300-lpm printer, and a modem for software/diagnostic connection to Display Data. The purchase price for this complete system is $56,500 (software additional), and the monthly maintenance cost is $540 (billed annually).

LARGE SYSTEM: Includes in*sight processor with 128K bytes of memory, three 10-megabyte disk drives, a CRT controller, nine local CRT workstations, a 300-lpm printer, a 30-cps printing terminal, and a modem for software/diagnostic connection to Display Data. The purchase price for this complete system is $89,000 (software additional), and the monthly maintenance cost is $856 (billed annually).■

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EQUIPMENT PRICES

		Purchase Price	Monthly Maintenance*
PROCESSOR			
8000	Central Processor, with 64K bytes of memory, and a 10M-byte disk drive	$22,500	$220
8001	Dual-processor CPU, with 128K bytes of memory, and a 20M-byte disk drive	42,500	440
MEMORY			
8101	64K-byte memory module	4,000	40
MASS STORAGE			
8201	10M-byte disk drive	10,750	158
PRINTERS**			
8401	Printer, 132 columns, 55 cps	4,500	80
8411	Printer, 132 columns, 330 cps	6,500	92
8511	Printer, 132 columns, 150 lpm	6,500	92
8512	Printer, 132 columns, 300 lpm	8,500	120
TERMINALS***			
8301	CRT, 1920 characters	3,700	44
8321	Printing terminal, 30 cps	2,700	44
8331	Printing terminal, 120 cps	3,700	54
COMMUNICATIONS EQUIPMENT			
8601	Modem, 300 bps, for remote printing terminals	2,000	26
8602	Modem, 1200 bps, for factory communications programs (RAPID, DCS, DCCS, etc.) and for remote peripherals	2,250	26
8605	Multiplexer System (for four devices), includes two multiplexers and two 2400-bps modems	12,000	125
8606	Multiplexer System (for eight devices), includes two multiplexers and two 2400-bps modems	15,000	156

*   A 20 percent discount is provided on monthly maintenance fees if paid annually in advance.
** I/O channels are included.
***Controllers and I/O channels are included.

SOFTWARE PRICES

	One-time License Fee	Monthly License and Maintenance Fee*
Auto Dealer System—		
Accounting	$5,000	$80
Payroll	2,000	50
Parts Inventory—Back Office	5,000	80
Parts Inventory—Counter Billing (requires Parts Inventory—Back Office)	5,000	80
Sales Follow-up and Management	5,000	80
Service Follow-up and Merchandising	3,000	70
Preventive Maintenance System (PMS)	5,000	95
Leasing	5,000	80
Vehicle Management System (VMS)	3,000	55
Finance and Insurance System (requires VMS)	6,000	95
Factory Communications Programs (DCS, DCCS, etc.)	3,500	95
Repair Order Billing	7,500	125
Parts RAPID	1,500	25
Beverage Distribution System—		
Basic Route Accounting System	4,000	60
Daily Route Accounting		
Sales Analysis		
Inventory Control		
Accounts Receivable		
General Journal		
Forecast and Order Control	2,000	35
Season/Annual Trend Forecasting		
Order Planning		
Order Entry		
Order Reporting		
Complete General Ledger System	4,000	35
Financial Statements		
Depreciation of Assets		
Schedules		
Trial Balance		
Accounts Payable System	4,000	35
Payroll System	2,000	35

* Includes all Display Data enhancements, and brewery- and government-required changes. A 20 percent discount is provided on monthly license fees if paid annually in advance.
**Special conversions of customer master files and sales analysis data are available.