Help Needed at Central Supply, STAT: Bar Codes Ease Growing Pains

BY ROBERT STANLEY

Desert Samaritan Hospital and Health Care Center (Mesa, Arizona), like the area it serves, is a constantly growing entity. At this time it has 22 nursing units, for example. Along with growth comes the need to bring in more and more sophisticated systems to cope with the problems that inevitably ensue from expansion. One of the areas long under consideration for updated organization had been SPD (Supplies Procurement, Distribution; or Central Supplies Department). The system could not keep up with expansion, and the new institution-wide information system did not adequately address the problem associated with SPD floor stock. Consequently, we sought an answer to our problem outside the hospital, and we found it.

The new system we discovered is the result of close cooperation between the Desert Samaritan Hospital staff and the Standard Register Company. We agreed to be a pilot installation of their Cart Exchange Control System (CECS), after seeing it demonstrated. The modifications we worked out with Standard Register have made the system specifically compatible with our basic SPD operation, and solved a potentially difficult problem.

A Stocking Problem

Our floor stock is maintained in stock rooms located near each of the nursing stations as well as the Emergency and Operating rooms. Each stock location contained between 200 and 300 items in its floor inventory. We needed a system that would handle the restocking of these locations while maintaining adequate par levels. The system had to be able to track all floor stock items (chargeable and non-chargeable) so as to reflect the total supply use, while ensuring that patients would be charged correctly for items they used.

The system we eventually implemented is based on two bar-coded labels—one for patient identification, with the bar code representing the patient account number; the other containing the SPD item information. Each label carries information that is also human-readable, including the respective ID numbers and patient information such as doctor, sex, age, medical record number, etc.

The nursing station supply rooms are not identically stocked; each has its own profile on computer disk file, listing the specific items it contains. This includes the item ID numbers (in bar code as well as Arabic numerals), descriptions, units of measure and the par values—the inventory level at which the items need to be maintained. From this information, we have printed a profile for each nursing station, including a scannable bar code for

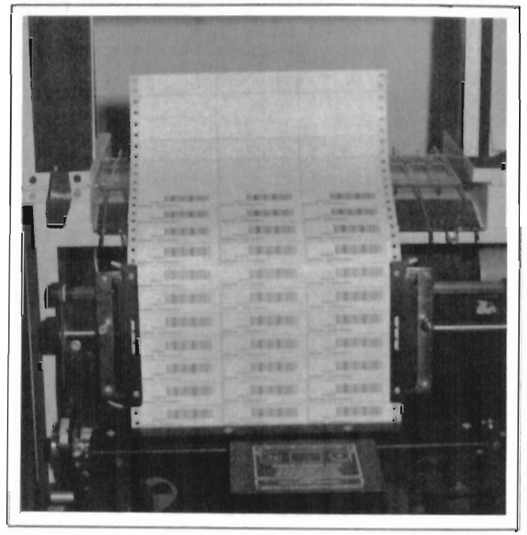

Photo 1. Pressure sensitive item labels are printed out three-wide ready for immediate use. Labels contain item description (alphabetic) along with identifying numeric number in man-readable and machine-readable (bar code) languages.

each item. This list is maintained in a binder at the nursing station for inventory purposes.

Identification labels for SPD items (Photo 1) are prepared in that department by the Standard Register Cart Exchange Control System equipment. The equipment includes a CRT intelligent terminal, a dual floppy disk drive and a Model 300 dot matrix printer, with all the necessary software. When the system was installed, the first step towards implementation was to build an item file

on the floppy disks. This master file contains all SPD items and lists the ID number, an alphabetic description, the unit of measure and whether it is a charge or non-charge item for each of them.

Identification labels for the SPD items are printed out as required. They are piggyback pressure-sensitive labels (Photo 2), mounted three wide on the carrier sheets. This feature allows them to be moved twice—first, removed from the carrier sheet and affixed to the appropriate items; later, when an item is used on the nursing floor, the label is removed from the item and affixed to the appropriate patient's Charge Sheet.

The patient ID labels (Photo 2) are generated when information is entered into our mainframe computer at the time of admission. The computer directs a Standard Register Flexible Image printer to produce a set quantity of pressure-sensitive labels. These are sent to the appropriate nursing station to be used when ordering services from ancillary units, as well as for identifying forms required in the medical record. They are used instead of metal or plastic plate imprinting. For SPD charging, one of the labels is placed on a Patient Charge Sheet held in a loose-leaf binder kept at each Nursing Station.

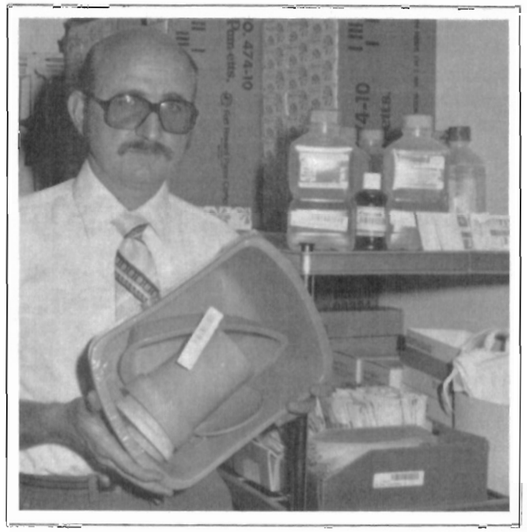

Photo 2. Each label is a piggyback construction, allowing it to be affixed to item and later removed and re-affixed to the patient's charge sheet.

The Stocking Solution

Each day, a member of the SPD staff checks the floor stock inventories with a portable wand scanner. If an item's quantity is found to be below par value, the operator scans the bar code on the page of the station's binder (Photo 4) and then enters the quantity found on the shelf via the keyboard. Then the Patient Charge Sheets are read. The wand scanner is first passed over the Patient ID Label at the top of the page, and then over any item labels affixed to the charge sheet which have been removed from items issued to the patient (Photo 5).

The information gathered from these operations is transferred from the wand readers into the CECS

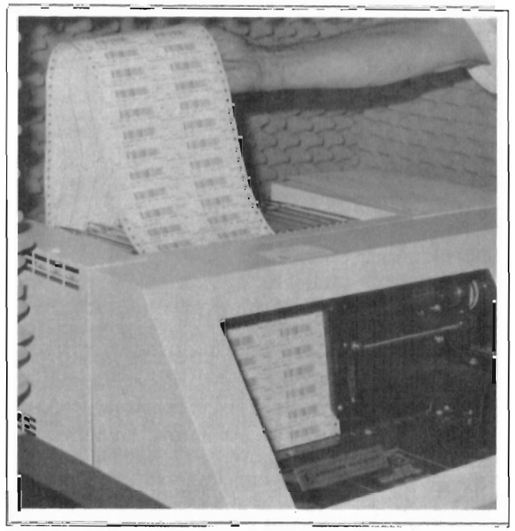

Photo 3. As each patient is admitted, a set of pressure sensitive labels is prepared and sent up to the appropriate nursing station. One of these will head up the patient's card for SPD charges.

Photo 4. If an item is found to be below par level, the bar code is read and the operator enters the number of items still in stock via the scanner's keyboard.

storage memory for printed reports. At present, we print a list of patient charges, which is then used as a source document for input to our mainframe computer for billing updates. We are working with Standard Register to develop an interface that will allow us to transmit the patient charge information directly to our mainframe from the CECS unit.

What is Gained

Immediate printed reports are a major benefit of the new system. In addition to the Patient Charge list, we are able to generate a pick list by nursing station, listing the items needed and quantities required to replenish the station inventory to par levels. These are filled daily.

Another report is each station's Discrepancy Report, which indicates item quantities remaining in the inventory, what has been used, what has been charged for, and what has not been charged. The Discrepancy Report provides a fast and efficient means for us to compare patient charges against missing items so the nursing stations can be made aware of missing and perhaps lost charges, and have time to reconcile them.

Less vital but equally valuable reports are also available. An Item File listing, for example, is a print-out of the entire item file, describing each item, its unit of measure, and whether it is charge or non-charge; the Item File Statistics Report is a listing of the entire item file with cycle-to-cycle and year-to-date use figures for each; and there is a listing of the station inventory profiles, on all or on a selected basis. Each item in a station's inventory is listed with a description, unit of measure, charge or non-charge status and par value.

In addition to better monitoring of floor stock inventories, improved replenishment techniques, tighter cost containment and an easier way to accurately determine charges, another very valuable benefit is the improved rapport now existing between the nursing staff and the SPD Department personnel. One of the long-term problems and a source of argument was the frequent stockout situation. Stockout required the nursing station to telephone SDP for delivery of a single item, taking time and wasting labor. When that situation arose several times during a day, tempers often became frayed. With the new system, the floor stocks are always at or near par levels. The new system has helped us determine normal use figures for each item at each station.

The new system also reduced floor stock inventory values, initially by between $2500 and $3000 per nursing unit. That was a direct result of the system's installation in early 1982; we anticipate further per-unit reductions of from 15 to 30 percent during the rest of the year. We are also getting closer audits of charges (resulting in a reduction of missing charges from 85 percent to 90 percent). Cost containment was a major objective in instituting a new system, and it has been achieved successfully.

Photo 5. Whenever a charge item is removed from the floor supply, the nurse or aide removes the label and places it on the patient's charge sheet which is headed up by a patient ID label.

We can point to at least five basic benefits in addition to those already mentioned. Item and patient labels are printed clearly and concisely in man-readable and machine-readable forms, eliminating many errors; we can capture patient charges for SPD items and identify missing charges; inventories are replenished in minimum time; reports are clear and timely, keeping the SPD, nursing and finance staffs completely up-to-date; and total inventories have been reduced, thereby reducing the amount of dollars tied up.

The inclusion of bar coding was not on our original list of specifications, but after we saw the Standard Register system and how bar codes could be used relatively inexpensively, we were most impressed. We established a committee composed of people from Administration, SPD, Nursing, Finance, Information Systems and other concerned areas to evaluate the program and authorize a trial. That trial has been completed satisfactorily and we are well into daily routine use now.

The system runs smoothly, the staff is happy, and management is satisfied that we are receiving value for the investment. It is definitely the answer to the problems plaguing this important hospital function, for Desert Samaritan. □

Robert Stanley *is the Administrative Director for Hospital Information Systems at the Desert Samaritan Hospital and Health Center. The Standard Register Company, located in Dayton, Ohio, is a manufacturer and developer of the bar code products and systems.*

Sterile Bar Codes: Guiding Production for a Medical Manufacturer

USCI in Billerica, MA, a division of the C. R. Bard Company, is a manufacturer of over 2000 products used by hospitals and laboratories. USCI produces catheters and associated equipment in a clean environment.

USCI needed to keep track of each item worked on in its production lab, maintain time and cost records for the production of each item, and provide an automatic check of each step required in the manufacturing process of each item produced. Most of the products USCI manufactures require from 20 to 60 individual procedures during production; USCI has approximately 339 employees in two shifts completing these operations.

Photo 1. View of the USCI lab, with bar code station in background.

An early tracking and record-keeping system consisted of a batch-processing data collection system using an IBM 5230 controller. A keypad device was used to enter information concerning each manufacturing operation. The information, which was entered immediately upon pressing a key (and consequently could not be edited in case of error), was stored on disk. The disks were processed later by an IBM computer, producing reports the following day. The system proved to be bulky, limiting, too slow, and prone to error—mis-keyed entries could not be corrected automatically, and key punching lends itself to human error.

Today USCI uses a new system designed by Wakefield Software Systems, Inc. (WSSI), based on bar codes and their data collection software, Wand 2S. The system is faster, more flexible, can be used by each employee, is near error-free, and has the added capability of becoming a time-and-attendance record keeper, doing away with time cards and punch clocks.

The System

Fifteen stations placed on walls around the huge USCI workroom provide employees with the means to enter their attendance, work procedures, and completion or start of production on each item on the floor (see Photo 1). Each employee has a bar-coded ID number badge attached to the board near the bar-code reading equipment. The bar code reader consists of an Intermec light pen, and a 16-character display with audible beeper prompt. A template containing bar-coded labels for each function which might need to be entered is also available at each work station. Each bar-coded label is followed by an alphanumeric equivalent for human use (Fig. 1). The bar code reading equipment sends data to an IBM Series I for processing. An IBM System/34, trading data via disk with the Series I, is also used to store and produce information for this particular application. The Series I is interfaced to an Intermec S35 bar code label printer to allow USCI to produce bar code labels according to their needs. The system uses Code 39, a bi-directional code that is easy for employees to use.

Employees clock in and out by scanning the appropriate bar code on the template and their ID badge. Each time they use the data collection system they use their ID badge to identify themselves to the system.

A typical production lot is initiated by the shift supervisor, who receives a work order from the IBM System/34 production control system. This work order details all the steps in the manufacturing procedure (Photo 2). When the supervisor receives this form, he attaches an identifying bar code label to it. The IBM produces these bar code labels in the same order as the work orders.

Each work order contains detailed instructions as to how each product should be assembled: which

Continued on page 17.

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Wand 2S

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Work Center Template

Clock-In	Stop Work Complete	Yes	1	2	3
Clock-Out	Stop Work Incomplete	No	4	5	6
In From Lunch	Stop Work Indirect	Error Response	7	8	9
(WSSI) Wakefield Software Systems, Inc. 400 West Cummings Park Suite 4900 Woburn, Massachusetts 01801 (617) 935-7920	Change Start Qty	Reset	Enter	0	Back-space

Figure 1. Sample bar code template from WSSI.

Continued from page 14.

steps to take and in what order. As the product lot travels from one work station to the next, each employee identifies him or herself by scanning his or her ID badge; then the employee scans the work order label; and finally scans the template label for the assembly step just completed. Numerics on the template allow the employee to enter information on parts rejected, completed, etc., where appropriate (Photo 3).

A visual display controlled by Wand 2S prompts the employee as to the next step to scan. No information is sent to the system until an entire entry is complete; the template has a label for reset that allows the procedure to be started anew in case of error; alternatively, simply returning to any step and starting over from there will correct the previously-scanned information. Indirect codes, for repair, clean-up time, down-time, etc., are also included on the template.

Supervisors have a separate card containing a bar code allowing them to override the system. This is

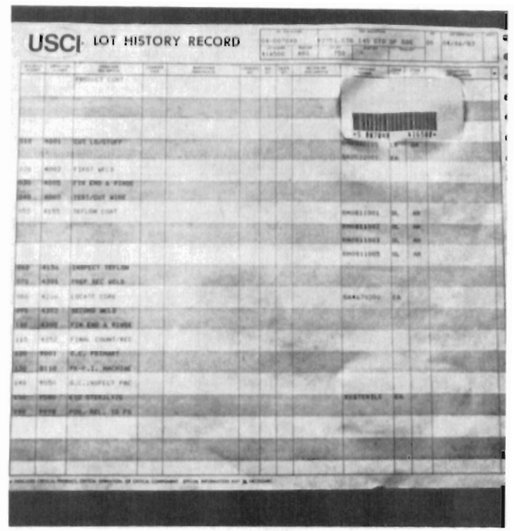

Photo 2. USCI sample work order.

necessary for clock-ins not made on arrival or to initiate an automatic override when an interrupt has been activated when a lot quantity was too high or too low.

Benefits and More

WSSI provided training in the use of this system to supervisors and the folks in data processing at USCI. The supervisors in turn trained factory employees to use the system. This training went swiftly and well, all employees apparently welcoming a system that is easy to use and error resistant. It should be noted that many employees at USCI are foreign nationals; the language barrier proved non-existent in use of this sytem.

This is the second bar code system WSSI has installed at USCI. The first was a traceability system in their shipping area designed to allow tracking individual lots through the shipping procedure to their delivery destination, in case of an FDA recall.

The Wand 2S system provides management with time and attendance reports by department and employee; standards and performance are easily monitored; manufacturing engineering is aided through the ability to locate and identify areas where there are problems; lead time information for scheduling is more accurate; production status information is available at all times, allowing problems to be identified and corrected immediately; and finally, monthly inventories have been eliminated through the system's continual updating process. This one factor alone could save USCI over $100,000 annually.

USCI is happy with its new bar code system. Once again, bar codes save time and money in various areas through one application. □

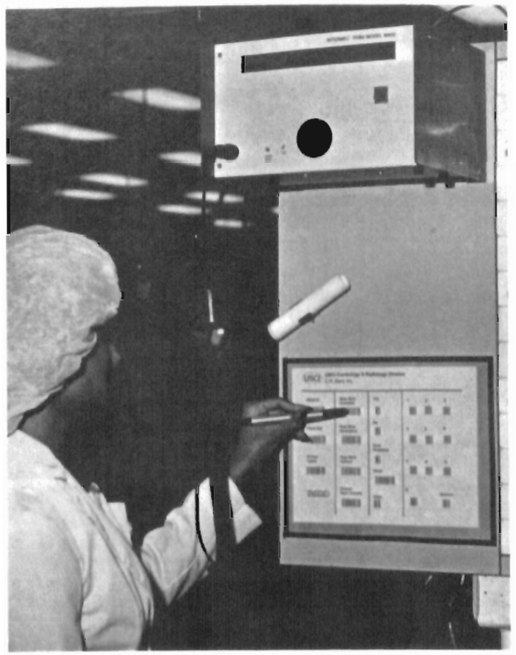

Photo 3. Employee scans template to enter information concerning a work procedure.

Wakefield Software Systems, Inc. (WSSI) *is a three-year-old company located in Woburn, MA, specializing in DDP using IBM Series I, and bar code data technology for identification and data collection. Their clients include companies such as Gillette Corp., Safety Razor Division; Nashua Corp.; Centronics Data Computer Corp.; USCI, Division of C. R. Bard; Northrop Corp., Precision Products Div.; and TRW Inc., Operations and Support Group.*

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Upgrading Blood Banks: Checking Out the Library

BY HARALD A. BAILEY

For many blood banks, the computer represents the ability to fully control the activities and products of blood centers. Most present effort, unfortunately, has been misplaced; the computers are being adapted to meet present manual operations and present bar code products.

To understand this situation, one must review the goals of computerization:

1. Computers should replace manual record-keeping and reporting—Current computer methods do not address the computer creation of various ledgers and laboratory reports.

2. Computers should provide search capabilities by donor, blood specifications, or receiving facilities.

3. Computers should collect the working data from processing and provide on-line reference to such information.

4. Computers should provide donor data on demand for check-in verification.

5. Computers should perform the necessary accounting functions for the blood center.

At the present time, the computer is asked to do very little for the blood bank. The result is a labor-intensive control system subject to many failures. There *is* an available answer, and it is found in a very unlikely place: the library.

Library Circulation's Like Blood Circulation

Today's library circulation systems could be used to collect data on donors, blood and blood products, center users, and processing. They have the ability to search that data in many forms to provide reports in the preferred (currently manual) formats. They have the ability to check in and out inventory, track the processing, and cross-reference items to items, items to donors, and items to need.

Let's look at the nature of automated library systems and needed blood management systems, and the functions they can perform:

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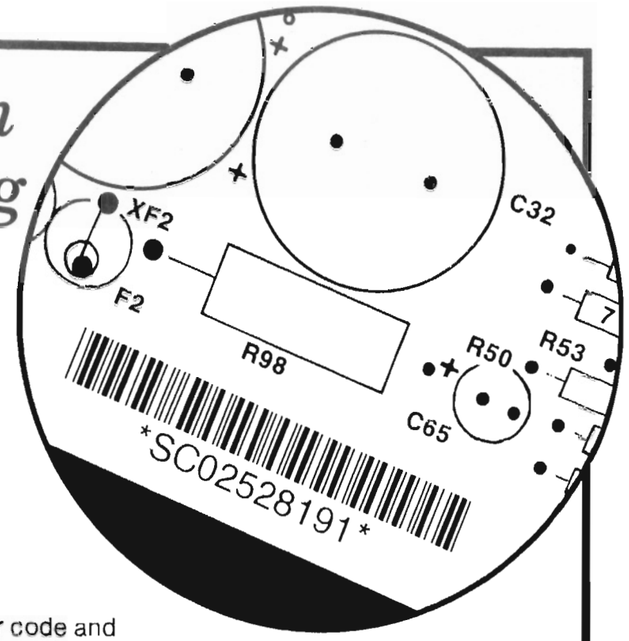

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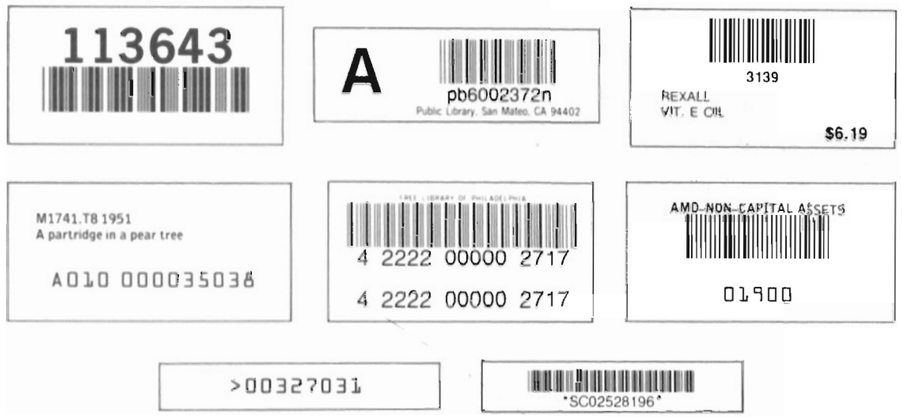

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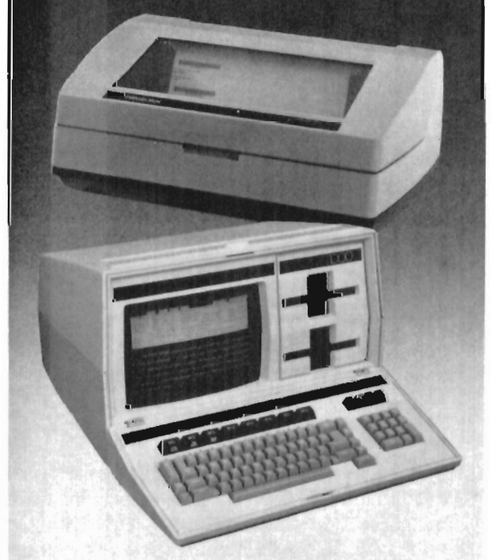

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1. The Library Circulation System (reformatted to become a Blood Resources Management System (BRMS)—The language of available systems can be changed so the information related to individuals and items reflects data on donors, blood and blood products, processes, and center users.

2. BRMS Search and Cataloging—The available systems can be developed to search available data by one or many parameters; blood specifications, donor, or a combination of those factors. This search is on-line, meaning the computer can directly receive and quickly react to requests for such data.

3. BRMS Reporting—The available systems can be developed to provide standard and custom-reporting capabilities, including accounting reports. Access is made with simple English commands, and requires little training. Most reports can be developed as a standard report, and the BRMS can provide those reports with a single scan of a function-menu bar code.

4. BRMS Tracking—The available systems can be developed to collect data from the activity of the blood bank. Time collection for employees, process data from the center, inventory control data, and donor data are all part of this function. As the blood moves from donation through the steps of processing, the BRMS tracks the steps of each activity, and the item whereabouts, so ultimate control is reached.

5. BRMS Cross-referencing—The available systems can provide the ability to internally relate items to donors, items to items, and items to needs, by any of the known data fields within the descriptions of the donors and the blood products. This means that manual products and methods are not needed to perform these tasks.

6. BRMS Networking—The available systems can provide the ability to communicate with like systems at other centers. This network provides the ability to obtain blood to need from the many centers within the area by simply making a request through a local network computer.

7. BRMS Telecommunication—The available systems can be a minicomputer that depends on an existing large computer for processing. This process is only advisable when the large computer is new enough to have full telecommunications capability and operating speed sufficient to keep up with the modern minicomputer.

8. BRMS Back-up—The available systems are sold with back-up systems so your center does not lose access to data or the ability to accept more data.

More Good News

The BRMS conceptualized above is a reality that can readily be delivered. The system is ready to serve the center and read the bar codes currently placed on blood bags. But instead of relying on the labels to make the blood control system work, the BRMS has the ability to simplify the label need, and thus provide significant savings in the cost of the labels.

Since the BRMS can internally collect data and develop printed reports, the number-only labels for the center's cards and ledgers are no longer needed. The BRMS would simply take the collected processing data and list it, including the number.

Since the BRMS can cross-reference items to items, duplicate labels are not needed for the blood bag and subsequent derivatives. A simple, unique serial label would provide all the reference necessary for the computer to relate the original bag to any subsequent product. Thus, the very expensive labels that are used today would become the very inexpensive labels of other critical material handling functions, the single serial number label.

In fact, many additional products from optical scanning can provide a simple answer to control, and can add cost-savings in labor time and processing effort. These items are: the donor identification card, the donor/reception menu, the processing menu, and the inventory control menu.

Let's review the uses of these products:

The Donor Identification Card—When a donor arrives at the blood center, his or her card is scanned and a screen image of his or her history and vital statistics concerning the ability to donate blood is called up. The card allows the computer to tell the receptionist that the person is available to give blood, and the person hasn't returned too soon, that the statistics concerning the person are correct, and whether this blood type is needed (or other prioritized controls).

The Donor/Reception Menu—This collection of bar codes is prepared to allow the receptionist to perform check-in functions on the computer without the errors and arduousness of the keyboard. The functions are literally described and a bar code is provided that includes the keystrokes for that computer function. The receptionist would scan various codes and quickly and accurately check-in the donor.

The Processing Menus—These menus would collect test results from various lab activities, collect the processing results from the lab, and collect the various time-collection requirements of the center. The combination of an employee bar-coded ID card and this group of menus would allow the center to have full knowledge of the work perfor-

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CIRCLE 11

mance of the lab. The employee would identify the item before testing or processing, identify the function to be performed, and his or her identity to the computer via the bar code. The result is accurate and timely data for reports and records.

The Inventory Control Menus—This menu would allow for the transfer and receipt of products to and from storage. The menu would provide the ability to automatically acknowledge requests for products.

The existing lack of quality programming and computer capability in blood bank applications has given rise to many products and procedures that can be simplified by the BRMS. This report only touches on the concepts of computer availability. The reader should be aware that these systems exist and are presently available to blood centers, in the form of Library Control systems that may easily be modified to a Blood Resources Management System. To get a feel for its possibilities, and to discover new areas of application, visit an automated library and see how its bar code system is used. Then contact one of the various Library Circulation Systems Vendors (listed in the accompanying box) and get your own system under way. □

The following is a list of the library circulation system vendors that have come to the attention of *Bar Code News*. We would appreciate notification of any vendors not listed here:

Universal Library Systems
W. Vancouver, British Columbia

Cincinnati Electronics
Cincinnati, OH

Avatar Systems, Inc.
Potomac, MD

Computer Translations, Inc.
Orem, UT

Sigma-Data Computer Corp.
Silver Spring, MD

Systems Control, Inc.
Palo Alto, CA

Gaylord Library Systems
Syracuse, NY

GEAC Inc.
Markem, Ontario

DataPhase Systems, Inc.
Kansas City, MO

Computer Library Systems, Inc.
Newtonville, MA

Harald A. Bailey *is a Managing Consultant with CIRCA Development Systems.*

At USCI A Division of C.R. Bard, Inc.
it's critical...

. . . to know what's happening in the Clean Room. So, they collect Labor Data and Time and Attendance with a Bar Code Data Collection System designed by WSSI. The System features an IBM Series/1 minicomputer, Wand 2S (WSSI licensed software), and various bar code data collection devices.

If accurate, timely shop floor reporting is critical to you, call on the bar code system specialists, WSSI.

(WSSI) *WE'RE SPECIALISTS IN BAR CODE DATA COLLECTION.*

Wakefield Software Systems, Inc.
400 West Cummings Park
Suite 4900
Woburn, Massachusetts 01801
(617)935-7920

CIRCLE 18

TOP OF THE LINES.

The C. Itoh dot matrix line printers deliver a new level of price/performance for a wide range of business and scientific applications—including a complete selection of graphics.

There's the CI-300, a variable speed line printer that offers 300 LPM print speeds for data processing, 80 LPM for letter quality use and up to 2400 DLPM for graphics applications.

For your highest volume applications, there's our CI-600. Its 600 LPM print speed cuts even the biggest DP jobs down to size. It also provides letter quality printing at 170 LPM and up to 4800 DLPM graphics.

Both models bring bit-addressable graphics and high resolution to Bar Codes, OCR, Form Generation, Labels, and Word Processing. An incredibly small .013" print head diameter in the matrix produces the highest quality output you can find. Resolution is enhanced still further with our unique variable shuttle speed capability.

You get tremendous flexibility too. Thanks to easy user selection of print speed and density, character and line spacing, line feed speed, print control and many functions, including 3 paper loading entry points. In addition, a vast array of download features enable the printers to match many specific computer requirements.

At C. Itoh, we don't think a printer has to look ugly to perform beautifully. That's why both of our line printers are designed to fit right into every office environment. They offer a small footprint, a low profile, and a true office environment noise level.

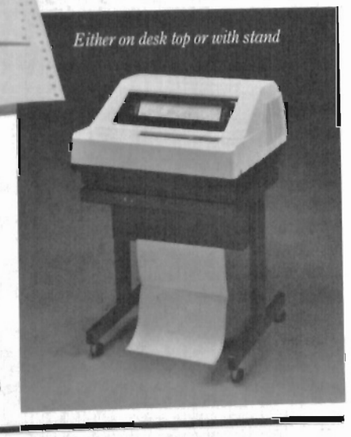
To satisfy your exact requirements, hundreds of unique character fonts are standard—plus you can design your own characters through the RAM which can be downloaded for special sets. An option board permits you to use macro selection for graphics production. Both printers come with three convenient built-in interfaces: two parallel and one serial.

For exceptional reliability, both printers feature a minimum of moving parts. Each is designed for highest duty-cycle use, making them ideal for all demanding environments, even warehouse and industrial locations. And don't forget, they're supplied by C. Itoh, one of the most experienced printer suppliers in the world with more than 250,000 units delivered in the last three years.

C. Itoh's CI-300 and CI-600 line printers. Top of the line performance—at a very low price.

For full details, contact our exclusive representative, Acro Corporation, 2515 McCabe Way, Irvine, California 92713 (714) 557-5118.

Either on desk top or with stand



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CIRCLE 21