Applications	Real Time Order Entry-Retrieval System
Type of Industry	Manufacturer of Computer Equipment
Name of User	Control Data Corp. Data Display Div., St. Paul, Minn.

Equipment Used	CDC 3200 computer system
	CDC 210 visual display system
	CDC 211 CRT terminals (10)
	CDC 218 printer station

Synopsis

In order to retard paperwork proliferation, bulging files and constant searching for order status reports, Control Data's Data Display Div. designed a real time entry-retrieval system to operate in the purchase of production parts. Clerks use the cathode ray tube terminals to enter information on each order into the computer; buyers, expediters and personnel on the receiving dock use the CRT system to gather instant information on the contents and status of each arriving order. They also input changes, where necessary. Control Data's PROFITS system (Purchasing Receiving Order and File Inquiry Terminal System), has generated several immediate benefits, including greater speed and accuracy of order entry and the generation of daily, weekly and monthly reports which have not been available before to the firm.

Background

The design of the PROFITS system began in 1967. Before, the Terminal Div. handled all of its purchasing and receiving manually. Dean Eberhard, supervisor of systems and programs for the Div., who oversaw the design and testing of the PROFITS system, reports that the original entry of information took about 1-1/2 months. The data base for the two master files was built using the cathode ray tube display stations which are also the means for system update and maintenance. Two computer shifts operate the system, which is dedicated and operates in real time for five hours each day, from noon to 5 p.m.-- the hours of greatest activity. The Terminal Div.'s EDP staff is comprised of 6 operators and 10 programer-analysts. Departments that use the system are purchasing, receiving, receiving inspection, production/inventory control, accounting and systems and programing.

The System

There are 10 CRT displays attached to the CDC 3200 system. Nine are in use in the purchasing dept., buyers' offices and the receiving dock and the 10th is in the computer room and is used to check the status of the system. The two main data files are the master vendor file and the master parts file. The master vendor file contains the name, address, FOB point, invoice terms, method of shipment and oustanding purchase orders for each vendor from whom the division buys parts. The master parts file contains a full description of each part used in production, its specification, standard costs and outstanding orders. A third file is initiated when purchase orders are listed. The file contains all active outstanding purchase orders by vendors.

The primary source documents in the system are the purchase order requisition, the history (traveling requisition), requisition to purchase, and the computer purchase order special instruction worksheet. All initiate the purchase order. To be dealt with later in this report is the change requisition which initiates the purchase change order, the shipping order which produces the return transaction on the master purchase order file and the vendor packing slip which initiates the receiving report.

When a requirement for a part is determined, the production control department submits the requisition (called a traveling requisition) to the purchasing department for procurement of that part. Though much of the data on the traveling requisition is constant, other data must be filled in by the expediter and by the purchasing department during the time the requisition is being processed.

A special form, the "requisition to purchase form" is submitted along with the traveling requisition to call attention to special charges, such as for tooling, that apply to the part being ordered. This form can be initiated either by production control or by the assigned buyer.

The buyer completes a special instruction worksheet by checking an appropriate box and writing in special instructions for the display typist at the same time that she enters a purchase order on the display station. (This internal form is used in the purchasing department only.)

Operator guides for entering information via terminal keyboard for immediate display are built into the system, that is, indicators appear on the screen to guide the CRT operator in typing the required data for proper file initiation and updating. By depressing the SEND key, page 1 of the purchase order form may be retrieved. The clerk types the basic header information onto the display screen via the display keyboard and then depresses the RESET, BKSP and SEND keys to transmit the entire page to the computer. The computer edits the data and validates the order number, the vendor code and the part number to ensure that a duplicate order number has not been issued and that the vendor and part are on the appropriate master files. The computer (program) then stores that "page" data on the disc file work track. Subsequent pages (a total of six may be displayed) are handled in the same fashion and the data stored on the work tracks is assembled and written on the master purchase order file and on the purchase and change order activity tape.

PURCHASE ORDER REQUISITION AND HISTORY

PART NO. ①　②	PURCHASE ORDER REQUISITION AND HISTORY		
ACCOUNT NO.	DESCRIPTION ④		
PROCUREMENT LEAD TIME ③			⑤ MATERIAL SUPPLIED BY

USED ON ⑥	INVENTORY LEVEL MIN. ⑦ MAX.	OPERATION ⑧ STANDARD COST ⑨ DATE ⑩

Vendor ⑪	Vendor's Name and Address ⑫	Via ⑬	F.O.B. ⑭	Terms ⑮	Comments ⑯

Req. Date	Log Date	On Hand	QUANTITY Required	QUANTITY Need By	Ordered	PURCHASE ORDER Number	PURCHASE ORDER Date	Ven	Prom. Date	Unit Price	Confirm	Reference	Comment	Operation	Inspection	RECEIVED Date	RECEIVED P.O.No.	RECEIVED Quan.	Days Late	ACCEPTED Date	ACCEPTED Quan.	Back Order	REJECTED M.R.N.	REJECTED Quan.	Shipping Order
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	㉑				㉒	㉓	㉔		㉖	㉗		㉙				㉚ ㉛ ㉜	㉜	㉜ ㉝ ㉞		㉞		㉟	㊱	㊱	㊱
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All standard (or constant data) for production control includes: (1) Drawing number which is assigned to the specific part or material being procured; the latest revision level of the part is used. (2) Overhead or inventory account number to which the part is charged, (3) lead time required, in terms of weeks, from the time a need is determined until the parts are received and processed into inventory, (4) a complete description of the part. The description may contain the vendor part number, dimensions, operational instructions, etc. (5) Not applicable. (6) Assembly number or finished product on which the part is used, (7) minimum and maximum inventory levels established for the part, (8) manufacturing operation identification and (9) and (10) which are prestamped with a standard price and the date when the standard price was established.

Other constant data are (11) a sequential number set up to identify from which vendor the parts are to be purchased, (12) the complete vendor's name, street, city, state and zip code, (13) instructions to the vendor regarding shipment of the material, (14) free on board point of the material shipped. This determines who is responsible for the payment of the transportation charges. (15) Invoicing terms and conditions and (16) a space used to enter the 6-digit vendor code which corresponds to the vendor code established by corporate accounts payable department.

Production Control completion requirements include (17) the date the traveling requisition is processed by production control, (19) the total number of parts required by production control, (20) delivery date the parts are required at data display.

Purchasing completion requirements are (21) the date purchasing received the traveling requisition, (22) total quantity ordered by the negotiating buyer, (23) the 6-digit number assigned to the purchase transaction. All purchase orders entered into the PROFITS system begin with a 2. (24) Confirming date the order was placed with the vendor, (25) the number which identifies the vendor to whom the order is placed, (26) promised delivery dates established by the vendor, (27) price negotiated by the buyer for the part being purchased and (28) method of confirmation between the buyer and vendor--phone, verbal, wire or quote; (29) Name of the person with whom the buyer confirmed the order.

Purchase Order Requisition and History (Continued)

Inventory Control completion requirements are (18) current inventory of parts in stock in the crib, (30) and (31) not applicable, (32) date, purchase order number and quantity received as provided on the receiving report, (33) total days difference between the date received and promised delivery date, if the receiving date is greater than the promised date, (34) date and quantity accepted by receiving inspection, (35) total quantity not yet received; total quantity ordered less the total quantity received and (36) materials rejection notice number, total quantity rejected, and shipping order number on parts that are defective and being returned to the vendor.

To pull out the information on an order, a clerk needs only to enter on the CRT a purchase order number, vendor and part number codes, along with price, quantity and delivery schedule. The computer calculates the quantity and price figure and notifies the operator on errors of input, if any. The various elements of information that comprise the order are directed to the appropriate files.

Error correction

The change requisition is the source document used by production control or purchasing to authorize a change to or correction of errors on a purchase order. Changes that cannot be made to a purchase order are changes in purchase order number, vendor number and part numbers. Changes can be made, however, in the account/project number, the vendor's address, the required delivery date, quantity, part description, part revision letter, specification for print, price, promised delivery date, ship via and FOB. Entries on the change requisition form are keyed to entry explanations for operator convenience. A change order format on the CRT screen is displayed along with a brief procedural outline of the action necessary to complete the change order. Then the computer assembles the new data, updates the purchase order on the master purchase order file (disc) and writes a record on the purchase and change order activity.

Discrepancies such as invalid purchase order numbers and overshipments are shown immediately on the receiving dock for corrective action.

Receiving

In order to generate a receiving report, the receiving department uses information from a vendor packing slip. The packing slip information is entered on the display station and sent by the computer to the master purchase order file. From this file, the receiving report is automatically assembled (in real time) and displayed to the operator. The clerk types in the quantity received and other pertinent information. After the receiving clerk enters the receiving data on the display, he strikes the send key and the actual receiving report format is redisplayed from the computer. The clerk strikes the PRINT key, and the information is printed on a continuous form at the printer station to produce the receiving report. The receiving transaction is also written on magnetic tape for activity reporting and for alternate processing in case of printer station failure.

The information contained on the packing slip (and which becomes part of the receiving report) is the data display purchase order, the vendor name, the vendor packing slip number, the quantity shipped and a description of the part shipped. The "move" copy of the receiving report is used to transfer parts received to the receiving inspection department. One copy is sent to purchasing for filing in the Control Data buyer's file and the remaining copy is sent to accounting for accounts payable processing. The receiving transaction is also written on magnetic tape for activity reporting and for alternate processing in case of printer station

failure. At the same time, the receiving transaction is updated by the computer on the master purchase order file.

Even after an order is received, it is kept on file for at least three weeks after it is closed. This way, if some parts are rejected in materials inspection, the purchase order can be re-activated.

During the scheduled processing time for the PROFITS system, all display users can retrieve vendor records for review from the master vendor file disc in real time. Also, part records can be retrieved, purchase order records can be retrieved (either the complete purchase order or delivery schedules and transactions). A complete cross-reference system within the computer's memory allow users who have only a minimum of information to find an order. If either the part number or the vendor number is available, the cross-reference file will refer to the purchase order for that particular report.

Twice each day, the purchase orders and purchase change orders are formatted on magnetic tape, and printed out on preprinted forms. These are delivered to the purchasing dept. for final buyers' approval.

Each evening, all the input transactions and errors which occurred are processed through a series of computer programs producing status reports as follows: purchase order activity, change order activity, receiving activity and shipping activity. These show the number of purchase orders issued and the volume of activity in change orders, receiving and shipping (returned goods).

Once a week, the master purchase order disc is formatted onto magnetic tape to generate the open purchase order status report, the open purchase order delinquency report and the purchase order inquiry letter for those vendors whose orders require more than three weeks for delivery. The status report is used by the buyers; the delinquency report is printed for the purchasing and materials managers. The purchase order inquiry letter is used as a follow-up notice to the vendor regarding promised delivery schedules. Once a month, the backup master purchase order file (on tape) and the purchase order history tape are processed through a series of programs to generate a variance report, a price history report, a commitment report and a delivery history report. These reports are divided into non-control data affiliated vendors and Control Data Interdivisional accounts.

As a by-product of entering purchasing and receiving data into the system via the display units, valuable reports are available to management for review and decision-making. These include:

1. Daily Purchase Order Activity Report -- Provides an audit list of purchase orders entered into the system via the displays and added to the master purchase order file. The report is routed through the system and programing department for control recordkeeping and then to the purchasing department for internal use. Overall entries shown include the total orders issued for the day; the total line items of the day; the total commitments for extended cost, charge cost and order total.

2. The Daily Change Order Activity Report -- Provides an audit list of change orders entered into the system via the displays and altered on the master purchase order file. The report includes the purchase order number and change number, the change order data, buyer code, vendor name and number, business type, part number with revision and description, quantity ordered, unit price, extended cost, charge costs (if any), order total and the change reason code.

3. The Daily Receiving Activity Report -- Provides an audit list of receiving trans-
actions entered into the system via the displays and updated on the master purchase order
file. The report total is the number of receiving transactions that took place during the day.
Routing of the report is through the systems and programing dept. for control recordkeeping
and then to the receiving inspection and purchasing departments for internal use.

4. The Daily Shipping Order Activity Report -- Provides an audit list of returned
goods transactions entered into the system via the display terminals and updated on the
master purchase order file. The report total is the number of receiving transactions that
took place during the day. Routing is through the systems and programing department for
control recordkeeping and then to receiving inspection and purchasing for internal use.

5. Open Purchase Order Status Report -- A weekly report showing outstanding
orders by buyer and vendor. It is divided into two sections: external vendors and Control
Data interdivisional. The external vendor section of the report assists the buyers in their
followup procedure with the vendor to find out why deliveries are not on time or to inquire
if the vendors will meet the scheduled delivery dates. The interdivisional purchases are
listed separately because the buyers have no control over procurement prices and delivery
dates of interdivisional purchases.

6. Open Purchase Order Delinquency Report -- A weekly exception report for man-
agement showing, by vendor, all orders overdue and the number of days late. Both sections
of the report (external vendors and interdivisional accounts) carry the same basic information
as the open purchase order status report with the exception that the buyer's code is included
with each part listing. A recap at the end of each section of the report shows total deliveries
delinquent by buyer and total deliveries late over 21 days or more.

7. Commitment Report -- A monthly report by vendor listing all outstanding orders
and their associated dollar amount in the month delivery is scheduled. Copies of the commitment
report are distributed to the accounting department and the purchasing department who use it
for financial planning and commitment reporting to corporate accounts payable. A section for
interdivisional commitments is separate from independent vendors. Summaries included in the
report are subtotal by vendor, grand total of vendors, recap of commitments by buyer and
summary by business type.

8. Variance Report -- A monthly report by purchase order number showing purchase
price, standard cost, and the extended variance from standard cost. The purchasing depart-
ment uses the portions of the report which list standard costs. Production control uses the
portions that do not. Total in each section are the final total variance and a recap by buyer.

9. Price History Report -- A quarterly report by part number showing the history of
all purchase orders for that part. It was developed to provide a means for analysis of the
purchases against each part, unit prices paid and quantities ordered. As history is developed,
the report becomes more valuable. Six copies of the report are routed to the purchasing
department.

10. Delivery History Report -- A monthly report by vendor showing the performance
on on-time deliveries as opposed to late deliveries. The report is produced at the close of
business each month, when the master purchase order tape is edited and a work tape is created
which represents the month's delivery schedules and receiving transactions. This tape is sorted
by account number, vendor name and number, purchase order number and transaction code.
One copy of the report is generated and routed to the purchasing manager.

Because of their small volume, shipping orders are not generated on the computer but
are typed manually. They are picked up through the displays as a return transaction on the
master purchase order file. The system does not include customer shipping orders.

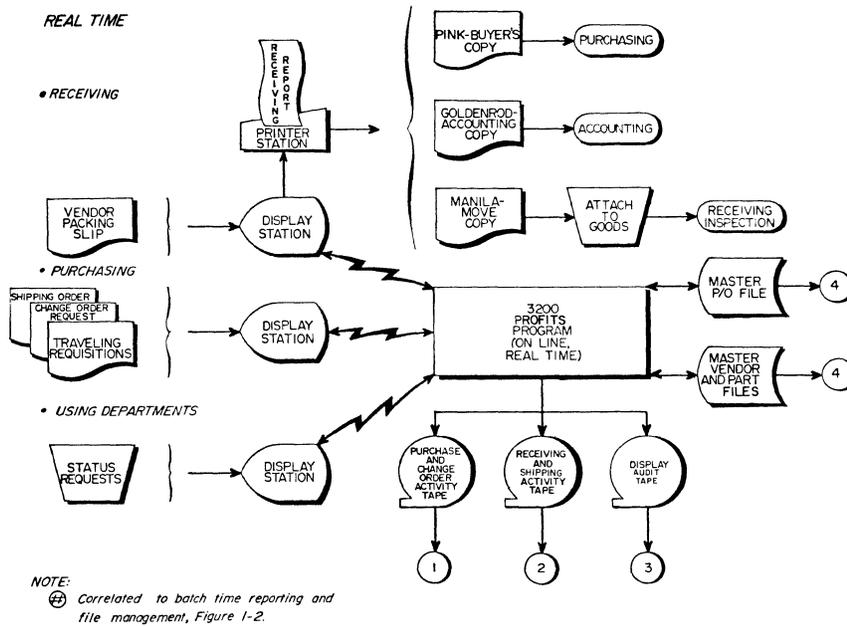## PROFITS System: Real Time and Batch Time
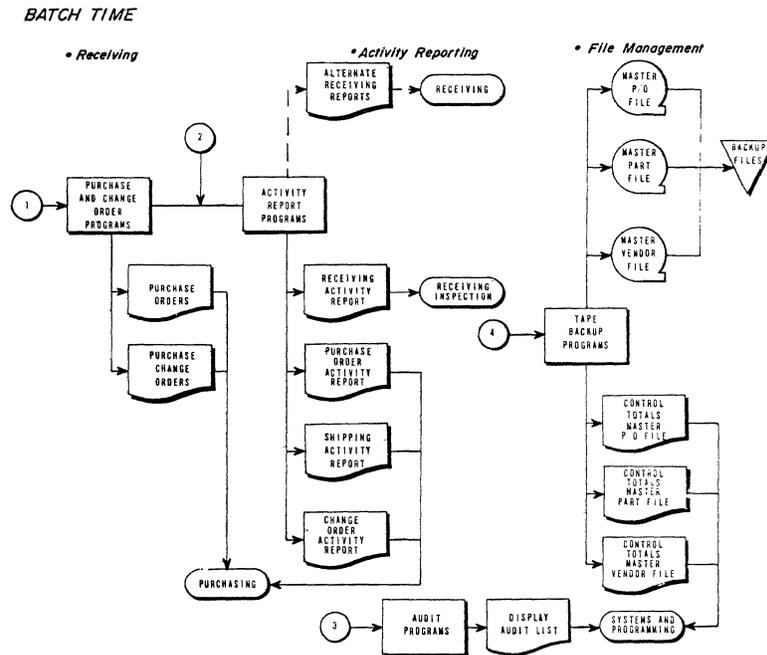

Figure 1-1. PROFITS System Flow Chart

Figure 1-2. Reporting and File Management Flow Chart

THE REAL TIME PROFITS SYSTEM FLOW CHART SHOWS INTERFACES, MAJOR INPUTS
AND MAJOR OUTPUTS. THE FUNCTIONS INDICATED ARE ACCOMPLISHED DAILY IN
REAL TIME (A FIVE-HOUR PERIOD FROM 1 TO 5 PM). THE BATCH TIME REPORTING
AND FILE MANAGEMENT FLOW CHART REPRESENT THE ACTIVITIES THAT TAKE PLACE
SEVERAL TIMES A DAY, AND AT LONGER INTERVALS. SOME OF THE PURCHASE ORDER
REPORTS, FOR INSTANCE, ARE GENERATED ONCE A WEEK.

Results and future plans

The system has been especially helpful to the company buyers, in that it provides the the economic order quantity for volume purchases. The buyers may query the PROFITS system for instant information on where price breaks occur in each vendor's particular price list. Due to this closer management, purchase order volume on piece parts have increased 30 percent without a corresponding increase in personnel.

According to Eberhard, the supervisor of systems and programs, vendor deliveries have also improved. About 90 percent of the vendor deliveries are on time; a larger percentage than in the division's past. Vendor accuracy has improved from 70 percent during the first months of the system to 95 percent at the present time. The new abilities to monitor deliveries has provided a corresponding concern on the part of the vendors, according to Eberhard.

The PROFITS system is designed and organized for expansion to include other areas of the division's business which relate to the purchasing function. It can easily be expanded to include production and inventory control, quality control, and other accounting functions, such as accounts payable. Initially, the system includes only production parts procurement. Nonproduction procurement will be added later.

Presently, there are two real time programs--one to update the master part file and master vendor file and the other to process purchasing and receiving transactions. Only one of these programs can operate at any one time. The master part file and master vendor file update program is scheduled for about 1/4 hour each day. The purchasing and receiving transaction program is scheduled for normal purchasing and receiving hours. Retrieval of part and vendor records is available in both programs.

Speed of transaction is another of the benefits of the system. According to the users, a purchase order may be generated in an average of 55 seconds, a receiving report, 90 seconds and a change order in 15 seconds.