Applications	Data Collection
Type of Industry	Vending Machine Manufacturing
Name of User	The Seeburg Corp. Chicago, Illinois

Equipment Used	Honeywell 200 Standard Register Source Record Punch

Synopsis

Seeburg's data collection system has solved a problem of obtaining, then consolidating shop floor transaction data into reports for management. Documents produced using a Source Record Punch provide data in both man- and machine-readable form. The system has improved clerical accuracy, reduced redundant writing and provided immediate preparation of computer processable data at the source. It also provides instant visual display of man and machine status, availability of each day's production data, updates of scheduled work loads aged over production lead time periods, accurate records of all transactions and management reports not previously available, such as the daily open shop report.

Founded in 1902, the Seeburg Corp. manufactures vending machines for candy, cigarettes, soft drinks and food items. Other coin-operated machines originating in the Chicago factory are many types of electronic organs, automated and packaged discotheques, electric/electronic player pianos and stereo phonographs. Four subsidiary companies produce musical instruments, hearing aids and vending machines exclusively for two nationally known beverages. Parts for Seeburg's equipment are manufactured from raw materials which arrive at the Chicago headquarters plant every day.

BEFORE AUTOMATED DATA COLLECTION

The old production control-reporting system, which was based on handwritten documents, was inadequate and could produce information for management intermittently if at all. Previously, a file of 3x5 in. Fabrication (Fab) Reference Cards made up the control reporting system. When a production release came from product scheduling and production, the necessary cards were selected and checked against a process chart file. The process chart file contained all the part numbers to be manufactured, their descriptions and source codes. It was, for practical purposes, a "bill of materials." The file would show what operations were needed to produce the various parts. A production work order card was then prepared manually. If the material for these parts was in stock, the punch press setup man filled out a three-part unit set move order. The move order was a set of forms that were separated to follow the material through production and provide payroll information for the timekeeper.

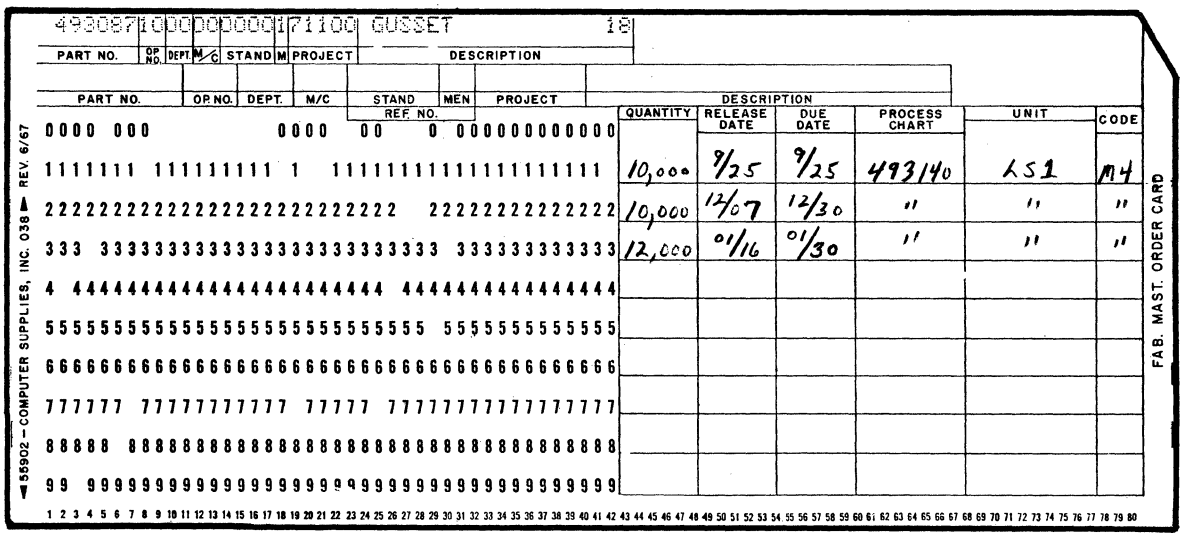
When the machine was set up, the setup man assigned an operator to produce the parts and gave him the three-part move order. This operator was clocked in by a timekeeper who removed the middle copy. After the operator had produced the materials required, he put one part of the move order with the material, reported that he was finished and surrendered the top copy to the timekeeper. After starting and ending times were recorded on the middle part of the move order, elapsed hours were figured and recorded.

If metal shearing operations were needed on raw material before starting fabricating operations, a three-part unit set requisition was prepared. One copy was used as a posting medium for the raw material stock record while the other two went to the Punch Department with the sheared stock. Since all of this information was recorded by hand, much of it was written many times. This led to transcribing errors, illegible figures and smudging.

With the new system, information flow is similar to the old, but the difference is increased efficiency, accuracy and results. Because Seeburg has made changes in document handling and communication, additional clarity was achieved.

THE SYSTEM

In order to initiate the system, as much information as possible had to be converted into permanent computer record files. This was done so that records and reports could be updated automatically by computer programs, also making status reports available to management. Inventory records, stock in production and on hand along with orders outstanding was keypunched into cards and read into the computer which stored it on magnetic tape. The data processing department then edited the manufacturing procedure charts for specific information that appeared on each -- part number, description, project number, machine center number and standards (or pieces a man could be expected to produce per hour). This information was punched into Fab Master Cards.

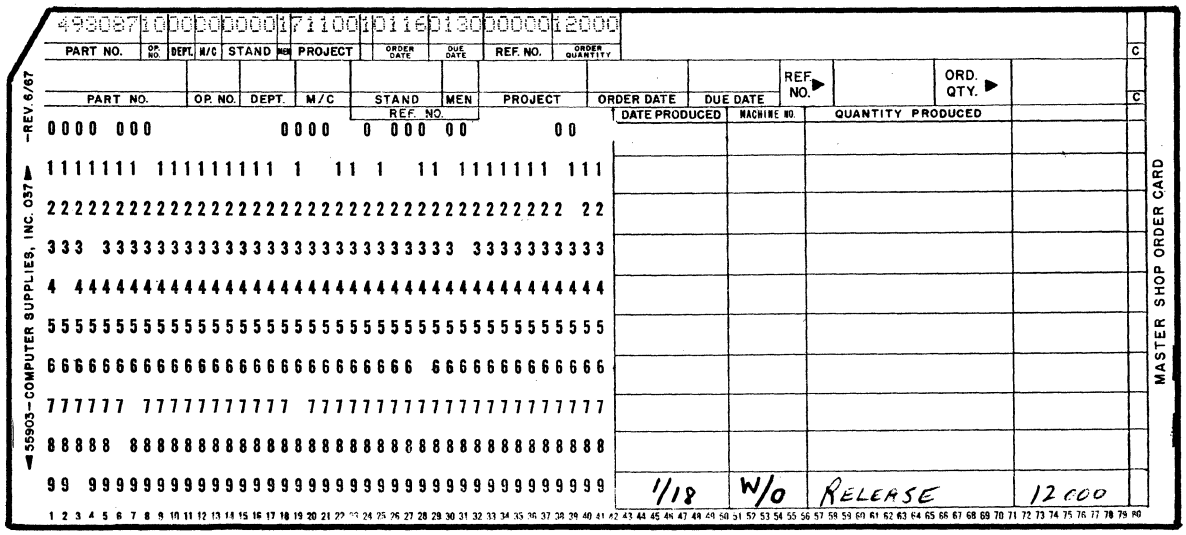


THE TOP CARD OF A FAB MASTER DECK CONTAINS HANDWRITTEN REQUIREMENTS SUCH AS QUANTITY AND DATE

Maintained in the production office, these decks, broken down by product line, contain one Fab master card for each operation required for a specific part.

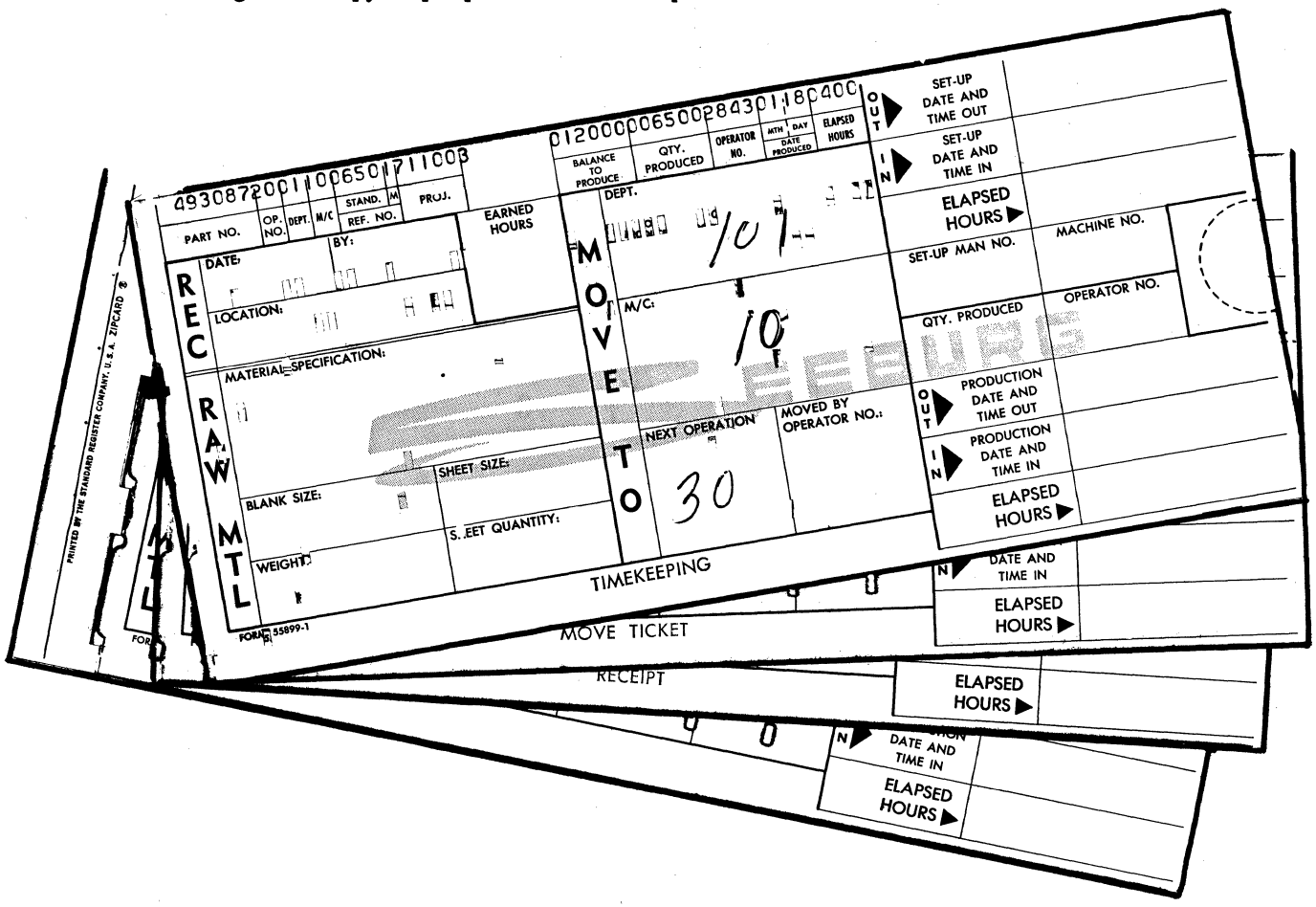
A production release comes from planning and sales and the necessary card decks are pulled. Requirements of the part, such as quantity and dates are handwritten on the first card for that part's Fab master deck. (Production release will eventually be a computerized step).

Then the Fab master deck is reproduced by a keypunching operation. This step generates a deck of shop order cards which become the masters for subsequent processing. The Fab master cards are then refiled. The shop order cards are processed through the computer in order to transfer the card information onto magnetic tape files for updating purposes. At the same time, the computer prints out a daily open shop order report, composed by merging new data with information received from the production floor during the preceding 24 hours. (This production floor information is the information gathered from the Zipsets at the record punch during the previous day. The new orders released from sales is the new data.)



THE SHOP ORDER CARDS ARE GENERATED BY THE FAB MASTER DECK AND BECOME MASTERS FOR SUBSEQUENT PROCESSING

All shop order masters go to production control where the source record punch is used to prepare a four-part Zipcard work order form, designed for Seeburg with the assistance of Standard Register's forms specialist. This Zipcard, which consists of three paper copies and one tabulating card copy is prepared for each operation.



THIS ZIPCARD SET IS PREPARED FOR EACH MACHINE AND SHEARING OPERATION

The shop order master card is placed in the front slot of the S-R punch, the Zipcard in the rear slot. A single digit constant transaction code number, three, is set up in the internal "slides" of the S-R punch. This digit tells the computer that the transaction is from the Source Record Punch and the transaction should be deleted from the "balance to produce" quantity file on magnetic tape. Then six more digits (or zeros to fill the field) are entered via the keyboard to indicate the number of parts to be produced. Pressing the "punch" button causes the unit to punch the 22 digits from the master card along with the transaction code and quantity into the Zipcard.

This way, the printed equivalents of the punched number are also stamped across the top of the Zipcard over their related headings--part number (six digits); operation number (two digits); department (two digits); machine center, (two digits); standard, (four digits); number of men required (one digit); project number (five digits); transaction code and quantity or balance to reproduce. Before the Zipcard is sent to the dispatching office "Move to" data is entered by hand. "Move to" is either the next operation required or the next department that receives the job.

The shop order master cards are filed by part number in the dispatching office and the work order Zipcards are sent to the dispatching office where they are first placed in a display file for easy reference. The Zipcard function really begins in the dispatch office at this point. A machine schedule board covers an entire wall of the dispatch office. Clipboards with Zipcards are hung on hooks attached to this board. Each machine is represented by two hooks, the top one indicating setup, the bottom, production. If a clipboard does not have a Zipcard on it, it reads "idle," if a machine is under repair, the clipboard is turned over to show the word "repair". A Zipcard on a clipboard on a machine number hook indicates that a job is waiting. Thus, when a setup man is assigned to a machine, that clipboard is removed and given to him. The Zipcard is inserted in a time clock to record date and time in; a numbered tag indicating who is doing the work replaces the clipboard. When the setup man with the clipboard returns, the Zipcard is again time-stamped to show date and time out. The clipboard is placed on the second hook, indicating that an operator is needed to work that job on the now ready machine.

A machine operator comes to the dispatching office for a job, perhaps turning in a finished assignment. For an operation in which raw steel must be cut into small sheets, the shearing operation Zipcard (with its clipboard) is taken from the machine schedule board. (In this case, no machine setup was necessary). From a raw material card file maintained by raw material control, comes the specification card for the subject and record on the Zipcard. In the space designated "raw material," the material specification, blank size, sheet size, weight per sheet and sheet quantity are entered by the shearing department foreman. After the shearing is completed, the machine operator fills in the quantity he produced, and places part two of the Zipcard form, the move ticket, with the finished material. Part three, the receipt, is sent to raw material control for posting to the raw material control record.

SHOP ORDER REPORT - OPEN ORDERS — REPORT DATE 01-25, CLOSE DATE 01-24 — PAGE 056

PART NO	OPER NO	DEPT	M/C	STANDARD	MEN	PROJECT NO	ORDER DATE	DUE DATE	REF. NO	ORDER QUANTITY	BALANCE TO PROD	STANDARD HRS.	DUE YEAR	WEEKLY PERIOD
810043	30	101	26	0212	1	75500	01-09	01-17	00000	3500	3500	16.5	8	03
810043	70	101	57	0400	1	75500	01-09	01-17	00000	3500	3286	8.2	8	03
810059	20	100	00	0000	1	74100	01-19	01-19	00000	5000	5000	.0	8	03
810059	30	101	58	0290	1	74100	01-19	01-19	00000	5000	5000	17.2	8	03
810059	40	101	57	0209	1	74100	01-19	01-19	00000	5000	5000	23.9	8	03
810059	50	101	57	0200	1	74100	01-19	01-19	00000	5000	5000	25.0	8	03
810182	10	100	00	0000	1	75500	12-27	01-15	00000	4000	4000	.0	8	03
810182	20	101	24	1250	1	75500	12-27	01-15	00000	4000	4000	3.2	8	03
810182	30	101	05	0470	1	75500	12-27	01-15	00000	4000	4000	8.5	8	03
810183	10	100	00	0000	1	75500	12-27	01-15	00000	4000	4000	.0	8	03
810183	20	101	24	1250	1	75500	12-27	01-15	00000	4000	4000	3.2	8	03
810183	30	101	05	0470	1	75500	12-27	01-15	00000	4000	4000	8.5	8	03
[illegible]	[illegible]	101	00	0000	1	[illegible]	[illegible]	01-15	00000	4000	[illegible]	.0	8	[illegible]

THE DAILY OPEN SHOP ORDER PROVIDES INFORMATION IN PART NUMBER ORDER CONCERNING WORK SCHEDULED, DUE DATES, BALANCES AND OTHER INFORMATION

PRODUCTION REPORT - SHOP JOBS — REPORT DATE 01-25, CLOSE DATE 01-24 — PAGE 005

PART NO.	OPER. NO.	DEPT. NO.	M/C.	STAND.	MEN	PROJECT NO.	BAL. TO PRODUCE	QUANTITY PRODUCED	OPERATOR NO.	DATE PRODUCED	ELAPSED HRS.	EARNED HRS.	EFF. %
806272	30	101	05	0775	1	75500	4000	2000	1698	01-24	3.4	2.6	
808252	70	101	57	0093	2	74100	32	21	1821	01-24	.6	.2	
808252	70	101	57	0093	2	74100	32	21	1499	01-24	.6	.2	
808252	80	101	63	0038	2	74100	900	105	2134	01-24	6.2	2.8	
808252	80	101	63	0038	2	74100	690	243	1566	01-24	8.3	6.4	
808252	80	101	63	0039	2	74100	690	243	1881	01-24	8.3	6.4	
808252	80	101	63	0038	2	74100	900	105	1750	01-24	6.2	2.8	
808558	10	100	00	0000	1	74100	3700	3800	1016	01-24	.0	.0	
808559	10	100	00		1	74100	3700	3800	1016	01-24	.0	.0	
808567	40	101					900	904	[illegible]		1.7	1.3	

THE PRODUCTION REPORT, SHOP JOBS, CONTAINS THE INFORMATION FROM THE PREVIOUS DAY'S ZIPCARD COPIES

The machine operator then returns the remaining two parts of the Zipcard set to the dispatch office for clocking out. A second source record punch, in the dispatch office, is used to punch handwritten information into the fourth "data processing" tab card copy of the Zipcard. The dispatcher removes the top "timekeeping" copy, places the bottom data processing copy in the rear slot, and using the timekeeping copy as reference, enters the machine operator's written information for quantity produced, the machine operator's number and the month and date on the six blank keyboard. Since "elapsed hours" are not recorded for shearing operations, the operator uses zeros for this data. This entire "tallying" operation is accomplished in three passes -- six digits for quantity produced; four for operator number; two for month plus two for day and four for hours elapsed. This last copy then goes to data processing with the remainder of that day's cards while the top paper copy is sent to the timekeeper for entering earned hours. (It is planned that timekeeping data from this tallying operation will go immediately to the computer as more of the system is computerized.) If this were a machine, not a shearing operation, the Zipcard for the next operation would be pulled from the production scheduling rack and placed on a clipboard once a machine was ready for setup, as indicated of course, by the machine operator with his finished "quantity produced" written on his Zipcard.

TOOL REQUISITION

Tools are requisitioned by TelAutograph AUTOwriter, a handwriting duplicating device connecting the dispatch office and the tool crib. This is a side improvement made while installing the new system to save searching for tools and heavy machine dies. The department foreman requests the equipment a day in advance from the men who maintain equipment in the tool crib. Tool orders, with identifying numbers are accumulated so a large lorry load can be transported to the work area the morning of the use date.

* CONTROL FIELD

MACHINE CENTER LOAD REPORT - OPEN ORDERS — REPORT DATE 12-22, CLOSE DATE 12-21 — PAGE 042

PART NO	OPER NO	DEPT	* M/C	STANDARD	MEN	PROJECT NO	ORDER DATE	DUE DATE	REF. NO	ORDER QUANTITY	BALANCE TO PROD	STANDARD HRS.	DUE YEAR	WEEKLY PERIOD
493769	40	101	57	0450	1	71100	12-10	01-10	00000	4000	4000	8.9	8	04
493770	40	101	57	0450	1	71100	12-08	01-10	00000	4000	4000	8.9	8	04
493772	40	101	57	0500	1	71100	12-08	01-10	00000	4000	4000	8.0	8	04
493772	50	101	57	0500	1	71100	12-08	01-10	00000	4000	4000	8.0	8	04
TOTAL JOBS IN THIS PERIOD			12					TOTAL STD/HRS FOR THIS PERIOD				108.3		
493491	30	101	57	0450	1	71100	12-07	01-15	00000	6000	6000	13.3	8	04
493507	40	101	57	0450	1	71100	12-07	01-15	00000	3000	3000	6.7	8	04
493507	50	101	57	0450	1	71100	12-07	01-15	00000	3000	3000	6.7	8	04
493713	40	101	57	0400	1	71100	12-07	01-15	00000	4000	4000	10.0	8	04
806289	52	101	57	0300	1	74100	12-18	01-15	00000	1500	1500	5.0	8	04
JOBS IN THIS PERIOD			5					TOTAL STD/HRS FOR THIS PERIOD				41.7		
			57	0310	1	75500	12-18	01-20	00000	1500	1500	4.8	8	04

THE PRODUCTION SCHEDULING OVERFLOW IS ARRIVED AT BY MATCHING THE ZIPCARD TAB COPIES FROM THE PREVIOUS DAY AGAINST THE OLDEST ORDER IN THE FILE FOR A SPECIFIC PART. BOTTOM: OPEN ORDER REPORT

PRODUCTION SCHEDULING OVERFLOW REPORT — REPORT DATE 01-25, CLOSE DATE 01-24 — PAGE 001

PART NO	OPER NO	DEPT	M/C	STANDARD	MEN	PROJECT NO	ORDER DATE	DUE DATE	REF. NO	OVERFLOW APPLIED	EXCESS PROD.	STANDARD HRS.	DUE YEAR	WEEKLY PERIOD
493201	30	101	20	0140	1	71100	12-18	12-18	00000	2685	185-	.0	7	02
774047	30	101	59	0350	1	74100	01-19	02-02	00000	5614	594-	.0	8	04

END PRT=0 FILE 5

END FILE TAPE=+C FILE 1 REEL 001 COUNT 00451

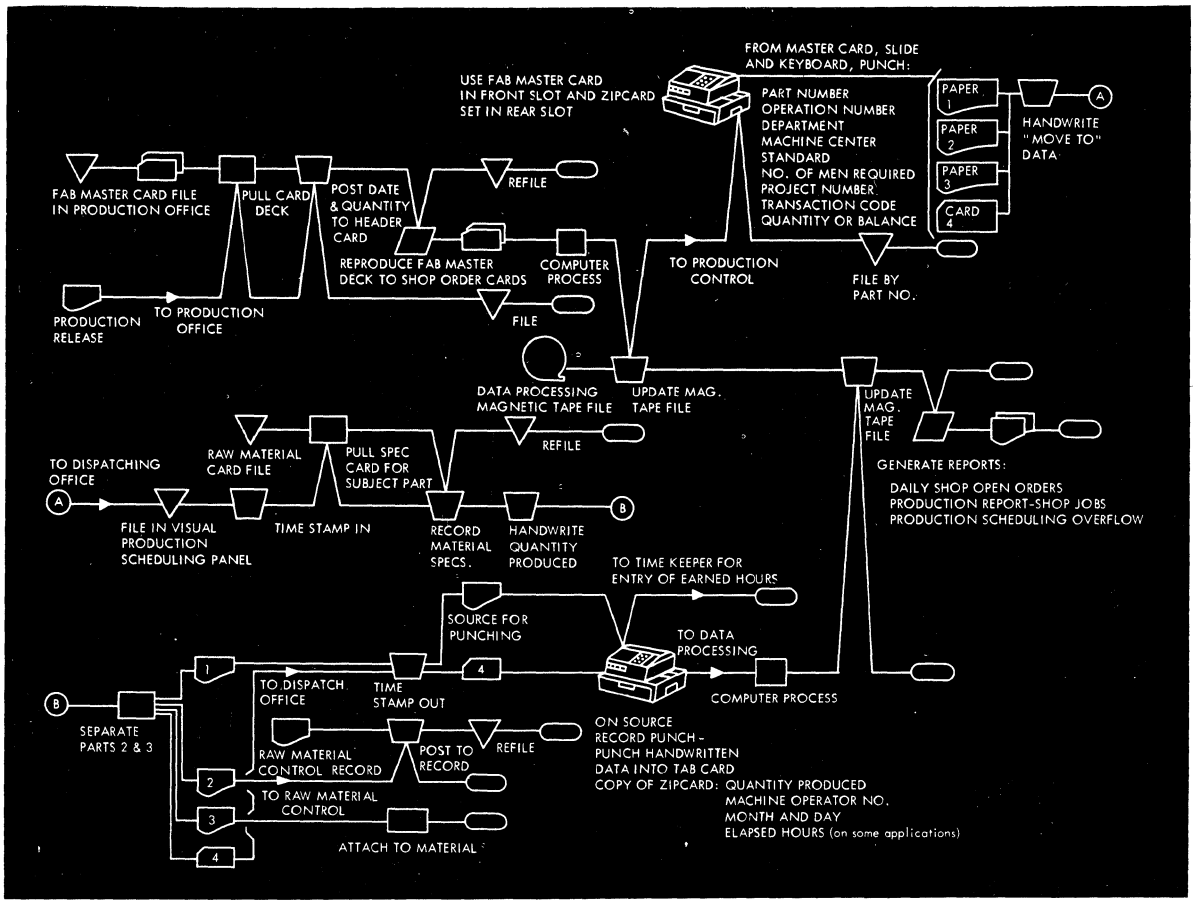
END FILE TAPE=+D FILE 2 REEL 001 COUNT 00451

When the tab card arrives at data processing, the information from the fourth tab card copies of the Zipcard sets can be fed immediately into the magnetic tape files of the computer and merged with information on new shop orders. One of the first reports processed, as noted before, is the daily open shop order. This provides information in part number order concerning what work is currently scheduled and the due dates, balances and other basic information.

Another printed output is the production report-shop jobs, obtained from the Zipcard copies of the previous day. This also lists in part number sequence and refers to actual output per operator. For this, the computer uses the elapsed hours and earned hours to figure an efficiency percentage.

A third report is production scheduling overflow. To generate this report the Zipcard tab copies of the previous day are matched against the oldest order in the file for a specific part. This advises how much of the part's production is to be applied against a later order (overflow) and what the excess production is, if any.

Since all of these reports are ready for review by management early in the day, action can be taken whenever and wherever necessary without any undue delay. The new system runs smoothly and provides more accurate information than the firm has ever been able to obtain before. James Borelli, former dp manager for the Seeburg Corp. admits that one of his favorite corners of the system is the scheduling board -- non-automated though it is: "It shows," he explains, "how useful the simplest manual timesaving system can still be. It's our reminder that how good the big things are sometimes depends on how good the little things are."



SEEBURG'S DATA COLLECTION SYSTEM