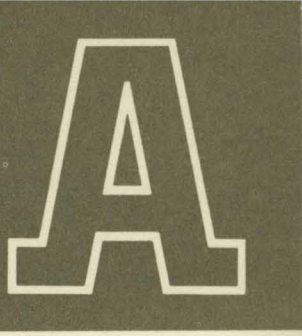

General Information Manual
IBM Data Collection
in the Factory

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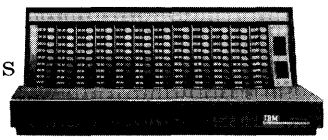
CONTENTS

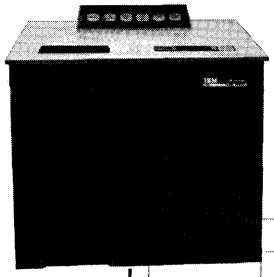
IBM 357 DATA COLLECTION SYSTEM

Model 1, 6 Slides
Model 2, 9 Slides
Model 3, 12 Slides

(Optional)



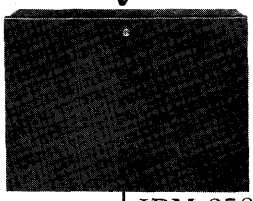
IBM 372 Manual Entry Unit — 357 Model 5 or 6 Prerequisite



Model 4, Badge Only
Model 5, Card Only
Model 6, Badge and Card

IBM 357 Input Station

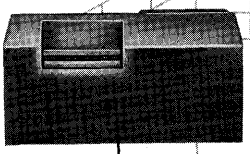
Recommended Maximum Transmitting Distance - 7,500 Feet

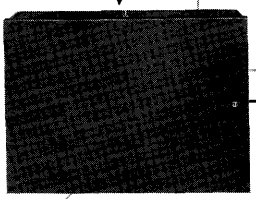


Links up to 20 Input Stations

IBM 358 Input Control Unit

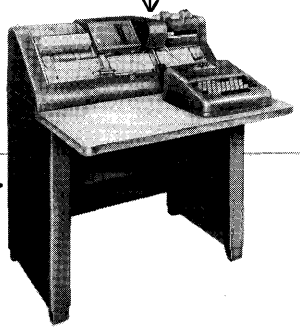
(Optional)
IBM 361
Read-Out Clock





IBM 360 Clock Read-Out Control

Supplies time for up to 35 output punches



Output Punch

24 Non-Printing Card Punch
26 Printing Card Punch
Model 1 Numerical Keyboard
Model 2 Alphameric Keyboard

INTRODUCTION

Modern data processing installations are capable of converting vast quantities of transactions into meaningful management reports at an extremely high rate of speed. The function of processing cannot start, however, until the transactions are collected. A program aimed at reducing the interval between the time when a transaction takes place and when its effect is known, should decrease the time required to collect data as well as increase the speed of its processing.

In data processing installations, a major portion of the continuing review and planning effort is directed toward obtaining source data, in a uniform format, quickly, and free of errors. The IBM data collection systems receive only required information in the correct format. Facts originate from prepunched IBM cards, plastic badges, and controlled manual entry units. Data is transmitted rapidly — 18 to 20 characters per second through multi-wire cables. IBM data collection systems improve the accuracy of data for machine processing because of the inherent accuracy of the principal input — the IBM punched card. In using a punched card as input, accuracy is further improved by reducing to the very minimum the amount of manually recorded data concerning a transaction.

The IBM data collection systems provide the connecting links by which the Management Operating System can relate the multitude of plant transactions to their effects on the total manufacturing process.

Both domestic and foreign competition is causing progressive management to become more concerned with factory operating data beyond attendance recordings, payroll and labor distribution. Today, effective management requires a responsive control system to highlight labor and machine efficiency, job progress status, inventory control, goods received, shop load, expendable tool usage, and quality control. The input cards for these multiple applications are designed so that transactions can be transmitted by any of the input stations in a system. The ability of a data collection system to automatically read multiple card formats is essential for maximum system economy.

ATTENDANCE

Now, let's take a closer look at these various applications in a typical manufacturing company. When employees come to work, their attendance must be recorded. The recording can be made with either a plastic badge, approximately one-fourth the size of a standard IBM card, inserted in an input station with a badge reader, or by using a standard 80-column IBM card in an input station without a badge reader. Both methods produce a punched record of the employee's department, man number, shift, the time and date. The system automatically emits the time and duplicates the date into each record. Clockings can be made more quickly with a badge than with a card. In addition, valuable space is saved by the elimination of clock card racks.

To further increase the speed of recording attendance "in" or "out," multiple employee clockings may be packed in one IBM card by the receiving punch. Regardless of whether a badge or card is used, an IBM data collection system used for attendance recording eliminates the preparation and maintenance of timecards.

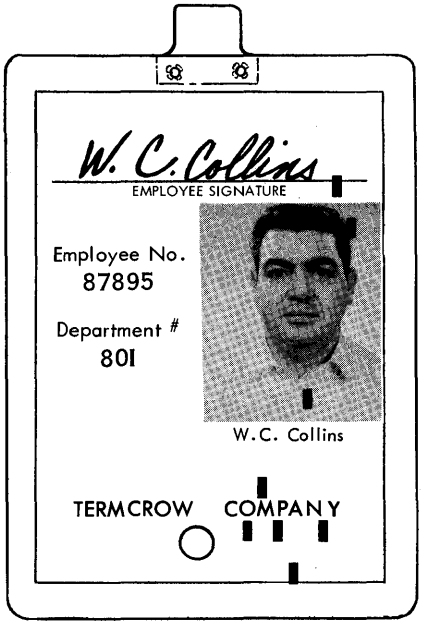


Figure 1 — Badge

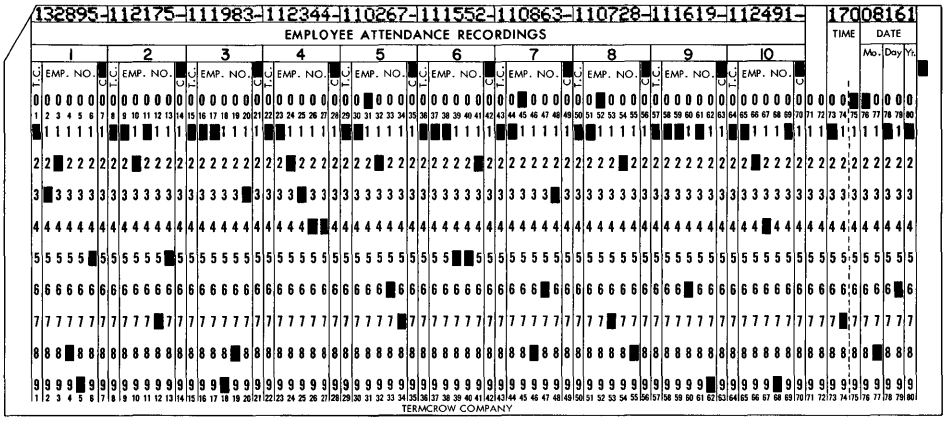


Figure 2 - Packed Output Card

STOCK ISSUES

Before an order can be started, it is necessary to withdraw material — raw, purchased parts, piece parts or assemblies. Prepunched IBM card requisitions can be used to transmit the withdrawal from stock. The quantity "filled" and other pertinent data is entered in the manual entry unit and automatically becomes a part of the single transaction initiated by the card requisition. Another source of input to the control of inventory comes from the receiving department.

RECEIVING

Frequently the receiving operation is located quite some distance from where the goods are used, and businesses operating on smaller inventories require more timely information concerning material receipts. With an input station in the receiving department, the record of a receipt is transmitted. After the received goods have been inspected by the quality control department, a transmission is made for the number of parts that went to stock, the number returned to the vendor or the number that will need reworking. The information on rejections goes to the buyer, who may have to place another order immediately so that production won't be interrupted. The information regarding the acceptance and rejection of parts may also be used to evaluate the vendor. In addition, the record of the accepted parts becomes a receipt to inventory.

JOB CHANGES

In order for the accounting department to accumulate job costs, they must know how much time the factory workers spend on the various operations. By adding the employees' identifications to the job change record along with labor standards data, the efficiency of the worker can be determined. By further identifying the machine on which the operation was performed, input to a machine load status is created. A single labor traveler card containing the constant reference information identifying the shop order, or a card for each operation containing not only the reference data but also facts relating to the specific operation as well, accompanies the order as it progresses through the factory. To assemble time chargeable to an operation, data is automatically read by the input station from the labor traveler card, the employee ID badge or card, and the manual entry unit when required. The time is automatically emitted and the date is duplicated by the system and combined with the data transmitted from the input station to form a single transaction.

When reporting a job change, data from the Labor Traveler Card

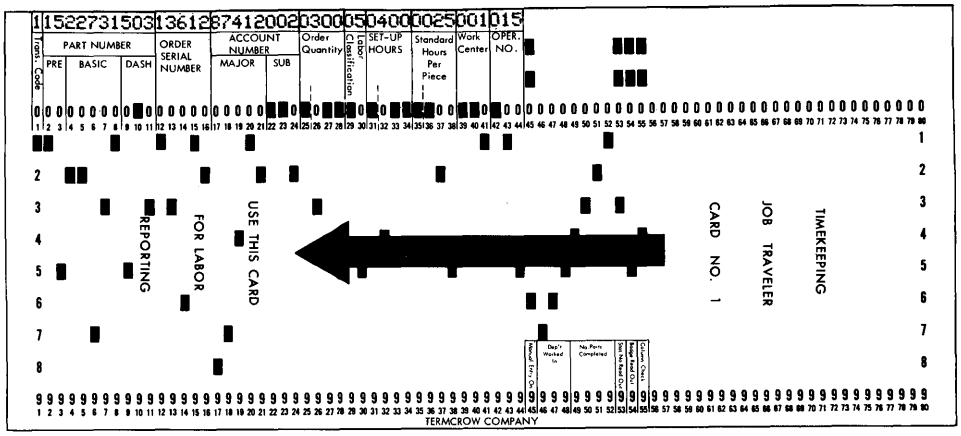
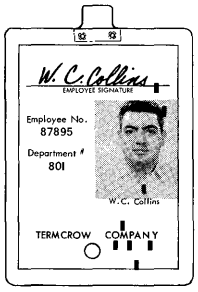
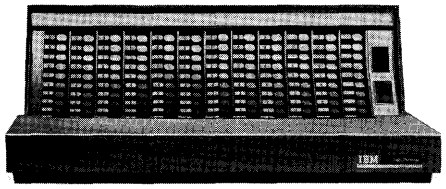


Figure 3 — Labor Traveler Card

is automatically combined with the data contained in the employee's badge



and entered in the IBM 372 Manual Entry Unit



to produce this Labor Output Card

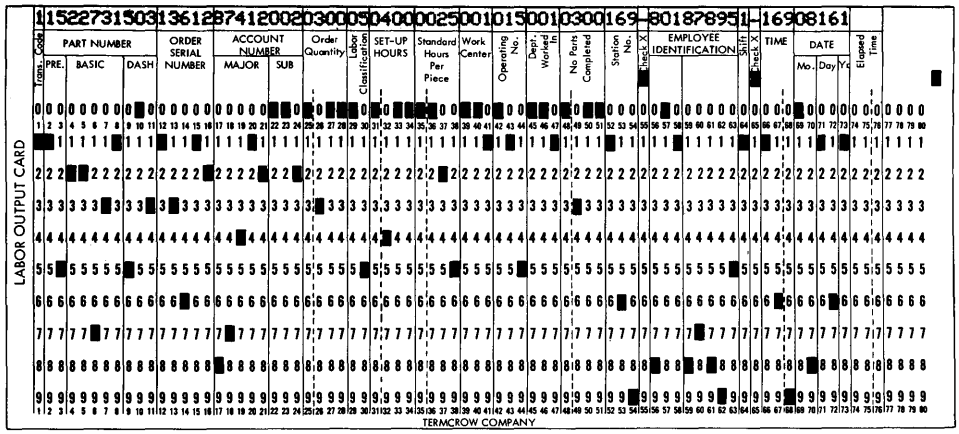


Figure 4 — Labor Output Card

Figure 5 — 372 Manual Entry Unit

Variable data is entered in the manual entry unit.

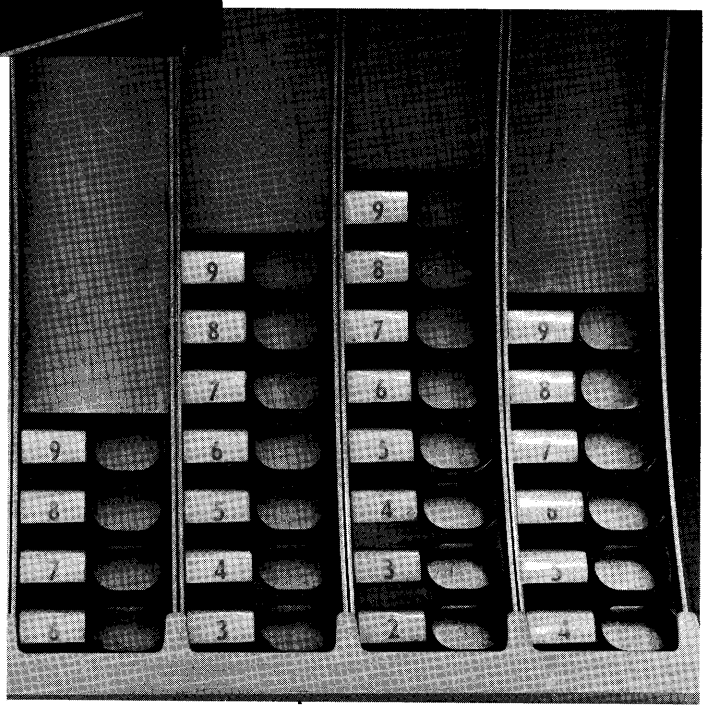


Figure 6 - (Blow-up of Manual Entry Unit)

The information entered may be visually checked by reading in a straight line. . . 6, 3, 2, 4.

Labor transactions are collected centrally as they occur and retained until the end of the shift. They are then grouped by employee number and time. The time spent on each job can be calculated by several methods. For example, one method uses the starting time of one operation as the ending time of the preceding operation. Employees' times are balanced against the number of hours in the shift. Exception hours above or below the normal shift are indicated. Though job changes are used to distribute labor charges, they are input to additional management control applications. They may be used to determine labor efficiency on each operation. When they are distributed by work center or machine number, job changes are the input to reduce, by standard hours, the applicable load.

MACHINE LOAD SUMMARY

DATE 8-18-6-

DEPT.	WORK CTR.	DESCRIPTION	PER-IOD	TOTAL CAPACITY	PRESENT LOAD	AVAIL. CAPACITY	OVER-LOAD
001	001	BENCH MILLS	1	136.0	130.0	6.0	
			2	170.0	160.0	10.0	
			3	170.0	165.5	4.5	
			4	170.0	179.0		9.0
			5	170.0	162.3	7.7	
			6	170.0	185.1		15.1
			7	170.0	150.0	20.0	
			8	170.0	162.8	7.2	
				1326.0*	1294.7*	55.4*	24.1*
001	003	SMALL HORZ MILLS	1	204.8	198.0	6.8	

LABOR DISTRIBUTION

WEEK ENDING 8-18-6-

ACCOUNT NO.	ORDER NO.	DEPT.	EMPLOYEE NO.	PART NUMBER	QTY. PARTS COMP.	STANDARD TIME	STANDARD DOLLARS	ACTUAL TIME	ACTUAL DOLLARS	DOLLAR VARIANCE	CR.
87412-002	12175	001	00659	1- 4832- 1	68	3.4	7.65	3.7	8.33	.68CR	
	11983	801	32895	1- 9768-203	150	4.5	10.13	4.3	9.68	.45	
	12344	001	69431	1- 1001- 5	500	14.1	31.73	18.5	41.63	9.90CR	
	10267	502	57469	2-21248-131	65	2.2	4.95	2.0	4.50	.45	
	11552	801	93735	2-22705-501	90	7.6	17.10	6.9	15.53	1.57	
	10836	001	43279	2-23112- 7	150	4.2	9.45	4.6	10.35	.90CR	
	10728	002	10122	2-28259- 14	1,500	32.5	97.50	32.0	96.00	1.50	
	11619	030	77949	4-14053- 88	277	10.3	25.75	9.9	24.75	1.00	

LABOR EFFICIENCY REPORT

DATE 8-18-6-

DEPT.	WORK CTR.	OPER. NO.	EMP. NO.	PART NUMBER	ORDER NO.	QUANTITY	SETUP TIME STD.	SETUP TIME ACTUAL	RUNNING TIME UNIT STD.	RUNNING TIME TOT. STD.	RUNNING TIME ACTUAL	TOTAL TIME STD.	TOTAL TIME ACTUAL	% EFFICIENCY ABOVE	% EFFICIENCY BELOW
001	001	10	00202	2- 4769- 1	09375	100	.6	.6	.021	2.1	2.2	2.7	2.8		96
		5	00202	4- 2513- 46	10971	43	1.1	1.0	.098	4.2	4.2	5.3	5.2	102	
		40	00983	3- 7657-109	09852	560	.3	.3	.006	3.4	3.1	3.7	3.5	106	
		25	00983	5-21963-501	11241	150	.7	.6	.003	.5	.8	1.2	1.4		86
		70	00983	8- 1625- 11	10733	325	.4	.4	.001	.3	.3	.7	.7		
		115	00983	10-11581- 7	12469	77	.9	.8	.022	1.7	1.6	2.6	2.4	108	
		30	01647	1- 1001- 54	11398	1,000	1.5	1.9	.004	4.0	3.8	5.5	5.7		93
		85	01647	6-19436-213	11614	275	.1	.1	.001	.3	.4	.4	.5		80
		15	01647	7- 8242- 78	10586	600	.8	.6	.002	1.2	1.2	2.0	1.8	111	
		20	05136	2- 2130- 5	10310	150	.2	.3	.006	.9	1.0	1.1	1.3		85
		20	05136	2- 2130- 6	10311	150	.2	.2	.006	.9	.7	1.1	.9	122	
		20	05136	2- 2130- 7	10312	150	.2	.3	.006	.9	.9	1.1	1.2		92
		20	05136	2- 2130- 8	10313	150	.2	.1	.006	.9	1.1	1.1	1.2		92
		20	05136	2- 2130- 9	10314	150	.2	.2	.006	.9	.8	1.1	1.0	110	
		20	05136	2- 2130- 10	10315	150	.2	.1	.006	.9	.6	1.1	.7	157	
		65	05136	15-23871-501	12467	9	1.3	1.2	.055	.5	.5	1.8	1.7	106	
		50	32895	12-50054-136	11720	840			.010			8.4	8.0	105	

Figure 7, 8, and 9 — Machine Load Summary, Labor Distribution, and Labor Efficiency Report

ORDER STATUS

As work orders progress through the factory, their location and schedule status are required for efficient production control. Expediting effort becomes more effective and greatly reduced when a central file can be interrogated for an order location. Schedule changes can be made much more easily and the effects of unplanned issues recognized when there is ready access to an up-to-date order status file. Similarly, production engineering will have all of the necessary data available to determine the total effect of contemplated engineering changes on orders in process. A central file will reduce potential shortages that can arise when orders are inadvertently not worked according to schedule. Weekly, lists are prepared for shop supervision telling them "what" should be worked "when," in part-number sequence within schedule date. A total listing of all open orders may also be prepared. Manual entry units provide the flexibility that allows one production order traveler card to transmit the record of all the moves of an order through the factory. The constant reference information concerning an order is automatically read from the traveler cards along with the variable information from the manual entry unit into a single order status record at the receiving punch. If the order is held — that is, cannot be worked for some special reason — this fact is reported.

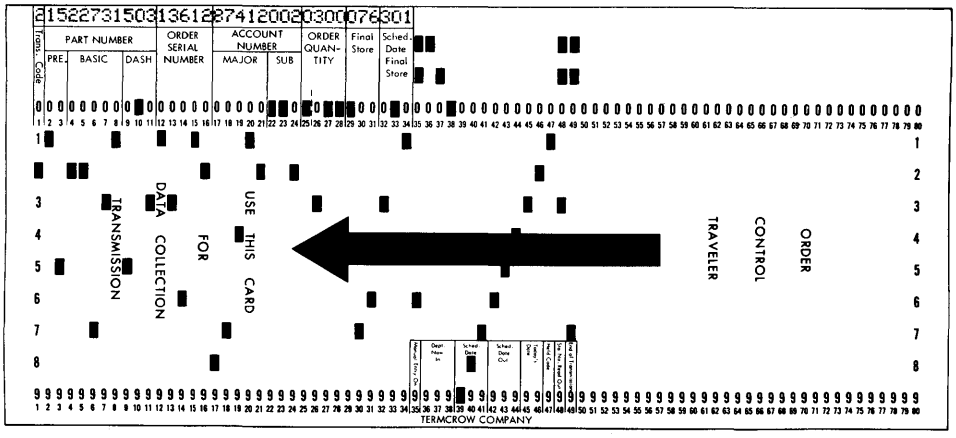


Figure 10 — Order Control Traveler

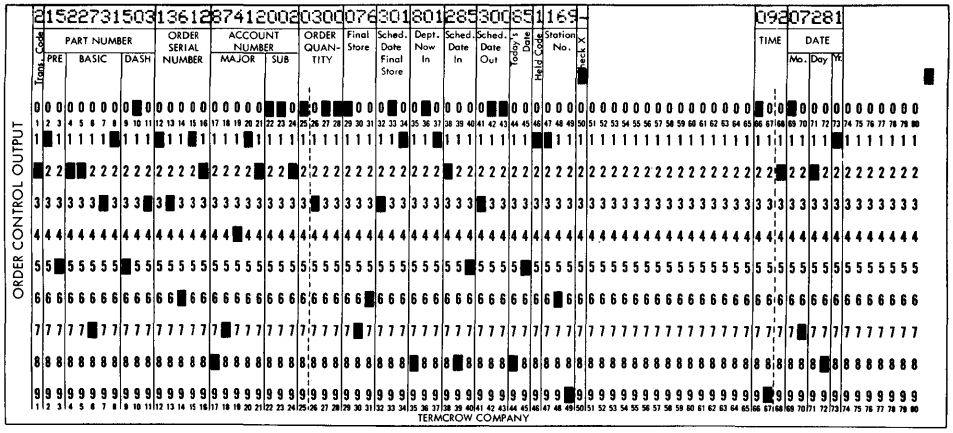


Figure 11 — Order Control Output

The order status file may be in the following forms:

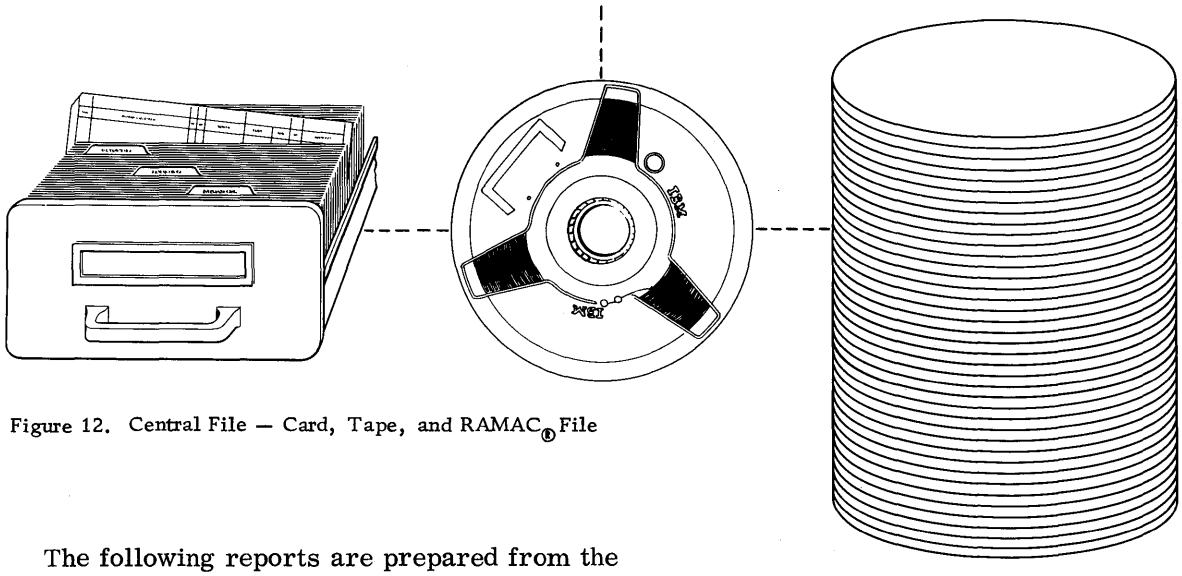


Figure 12. Central File — Card, Tape, and RAMAC® File

The following reports are prepared from the data stored in the central order status file:

OPEN ORDERS

DATE 8-18-6-

PART NUMBER	ACCT. NUMBER MAJOR	ACCT. NUMBER SUB.	ORDER NO.	ORDER QTY.	LOCATION DEPT.	LOCATION WK. CTR.	HELD CODE	SCHED. DATE
1- 4832- 1	87412	002	12175	90	1	1		325
1- 9768-203	87412	002	11983	150	801	20		315
1- 1001- 5	87412	002	12344	500	1	3		330
2-21248-131	87412	002	10267	65	502	119		310
2-22705-501	87412	002	11522	110	801	7	5	300
2-23112- 7	87412	002	10836	150	1	1		340
2-28529- 14	87412	002	10122	1,500	2	15		308
4-10018- 26	87412	002	12491	1,000	2	18		327
4-14								
4-15								
5- 9								
5-31								
9-16								
9-21								
10-34								
10-35								
15-21								
15-22								
15-23								

HELD ORDER RESPONSIBILITY

REASON HELD CODE
1. ENGINEERING
2. PROCUREMENT
3. PLANNING
4. QUALITY CONTROL
5. TOOLING

DATE 8-18-6-

RESPONSIBILITY	FINAL STORE SCHED	FINAL STORE LOC.	PART NUMBER	ACCT. NUMBER	ORDER NO.	ORDER QTY.	LOC.	WEEKS BEHIND
1	301	76	15-22731-503	87412-002	13612	300	801	3
1	300	56	15-23416- 8					
1	305	76	2- 4927- 16					
1	304	32	8- 9768- 63					

WORK ORDER PRIORITY

MFG. DAY 315

DEPT.	WORK CTR.	PART NUMBER	ORDER NO.	ORDER QTY.	SCHEDULE IN	SCHEDULE REC'D.	SCHEDULE OUT
001	114	8-09768-063	15412	100	307	307	309
	114	10-02496-101	15531	250	312	311	313
	114	15-27968-016	15606	50	310	312	313
	119	7-04101-502	15719	375	314	313	315
	119	12-37910-169	16094	150	315	310	315
	001	11-15763- 21	16127	200	314	313	315
	001	15-22735-509	16138	190	311	312	315

Figure 13, 14, and 15 — Open Order, Held Order, and Priority Report

QUALITY CONTROL

The production traveler card is also used to report the number of parts on the order that are accepted or rejected by the quality control department. The quantities accepted or rejected are entered in the manual entry unit as the reference data is read from the traveler by the input station.

STOCK RECEIPTS

When the order is completed, the production stockroom personnel can use the production traveler card to transmit an inventory receipt transaction to the data processing department for machine posting to the perpetual parts inventory record.

EXPENDABLE TOOLS

While the order is being worked, it is necessary for the workmen to withdraw expendable tools from the tool cribs. Some examples of expendable tools are drill bits, mill cutters, saw blades, taps and reamers. The stock of these items in the cribs must be replenished as they are used. In addition, they collectively represent a large amount of money. The stock of expendable or perishable tools must be controlled — that is, tools should not be kept in tool cribs for departments that will not use them, and their usage should be accumulated so that excessive withdrawals as a result of carelessness will be indicated. A master card for each tool that should be stocked by a crib is kept in the tool crib itself. When tools are withdrawn, the master card, containing data on the quantity and the using department, is transmitted to the data processing department. There the received transaction may be used to automatically create punched card replenishment requisitions and to prepare a report charging the using department with the dollars of perishable tools withdrawn.

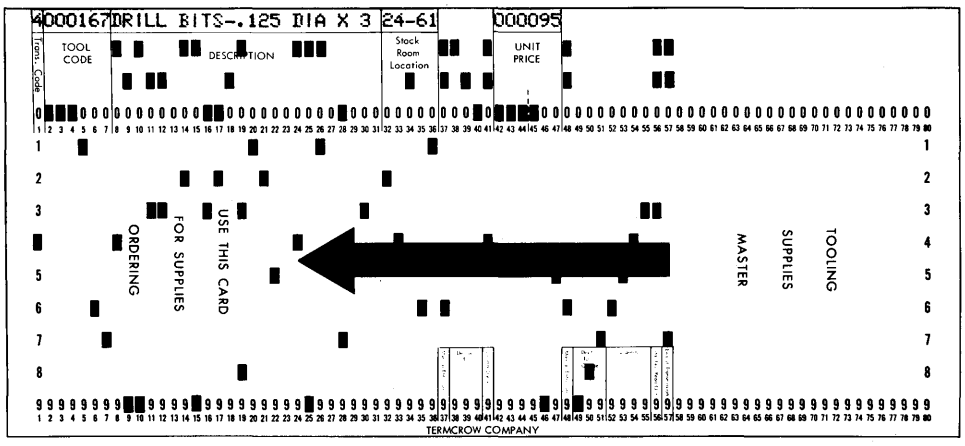


Figure 16 — Tooling Supplies Master Card

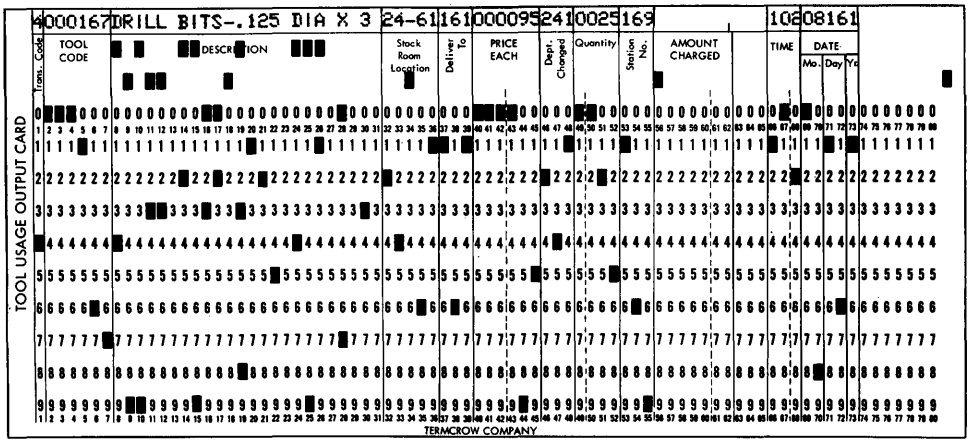


Figure 17 — Tool Usage Output Card

PERISHABLE TOOL USAGE

FOR DEPARTMENT 241

TOOL CODE	DESCRIPTION	PRICE EACH	QUANTITY WITHDRAWN	AMOUNT	NO. OF ISSUES
000167	DRILL BIT -.125 DIA X 3	.095	200	19.00	27
000183	DRILL BIT -.156 DIA X 3	.110	137	15.07	19
000199	DRILL BIT -.187 DIA X 4	.195	82	15.99	4
000222	DRILL BIT -.218 DIA X 4	.340	178	60.52	35
000316	DRILL BIT -.250 DIA X 4	.470	44	20.68	11
000357	DRILL BIT -.312 DIA X 4	.717	360	258.12	16
107628	SPOT FACER -.187 DIA X 3	.525	31	16.28	25
018351	SPOT FACER -.375 DIA X 3	1.400	16	22.40	8
019767	SPOT FACER -.500 DIA X 3	1.635	92	150.42	15
				$ 578.48	160

Figure 18 — Department Cost Report

TOOL CONTROL

Master cards in tool cribs may be used to maintain control of jigs, dies and fixtures. A record of who checks out a tool is generated by transmitting the appropriate master card and the employee ID badge. The usage of tools may be controlled from these transactions to insure that they receive the prescribed quality control checks.

CONCLUSION

All through the manufacturing cycle, many areas create and process transactions that affect the execution of the current as well as the future manufacturing plan. The applications that have been discussed cover only a few of the sources. IBM data collection systems are providing their users with the high degree of system sensitivity that is required for optimum use of manufacturing facilities and personnel.

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International Business Machines Corporation

Data Processing Division

112 East Post Road, White Plains, New York