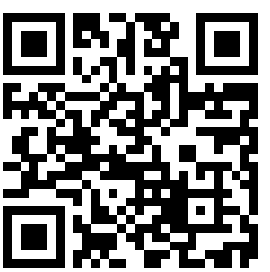

TABULATING EQUIPMENT AND WORK MEASUREMENT

title inside

U.S. DEPARTMENT OF COMMERCE

BUREAU OF THE CENSUS

TABULATING EQUIPMENT
CARD PROCESSING OPERATIONS

Standard Time Values for Determining Operational Effectiveness for Planning Estimates and for Budget Preparation

U. S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
Management and Organization Division

1966

PREFACE

This is a booklet of standard time values for card processing operations on tabulating equipment. It is one of a series of manuals on clerical standard data and machine standards prepared by the Management and Organization Division of the Bureau of the Census.

The tabulating equipment standards in this publication were developed and installed in the Census Bureau early in 1962. They have been used for measuring individual and group performances, determining eligibility for incentive awards, and estimating and budgeting work activities. While they reflect the work layout and procedures of the Census Bureau, it is felt that these standards are substantially applicable to card processing operations on identical machines located elsewhere in the Federal service. The method of operating the machines is fairly uniform, and the standards are sufficiently detailed to measure almost any arrangement of cards and jobs. Their use should result in greater operational efficiency in a card processing installation. These standards replaced "Percent Normal Working Time" standards which had been in effect for about four years, and measured only the physical activities of the operator during machine operations.

It is hoped that this publication proves to be informative and useful to the readers and that it contributes to the advancement of scientific management in the Federal service.

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Part I

Estimating Large Volume Tabulating Machine Operations

INTRODUCTION

Immediately following this text is a table of standard time values, on a per card cycle basis, for various types of tabulating equipment. Most of the machines are used wherever automatic card processing is being performed. A card cycle represents the passing of a punch card from the card hopper of a machine, through the feed mechanism, into the eject pocket. The standards are in decimal minutes. They should be used for estimating large card processing operations for which detailed specifications for each machine job are not available. (Estimates for specific jobs should be determined from detailed standard time values or related charts shown elsewhere in this booklet.)

It is quite simple to use these standards. Once the estimated volume of card cycles is known for each machine, either multiply the volume by the standard minutes per card cycle and then convert to man-hours or man-days, or divide estimated volume of card cycles by the standard production per hour or per day shown on the adjoining table.

On most machines, total card cycles processed is the same as total cards in the job. When using the sorters, however, cards may pass through the machine more than once, depending on the number of columns on which the cards have to be sorted, so that the card cycle count may exceed the actual number of cards in the job by one or more times. For example, if a large operation calls for a 1-column sort of 500,000 cards, there will be an equal number of card cycles. If it calls for a 2-column sort, there will be 1,000,000 card cycles because each card has to pass through the sorter twice. If the operation calls for a 10-column sort, the card cycle total will be 5,000,000 (10 X 500,000).

When determining card cycle volumes for the collators, count only those cards which will pass through the major or primary feed. Do not include the cards for the minor or secondary feed. Standard time values are based on the card cycle count from the major or primary feed.

The card cycle count for the hookup of the accounting machine and reproducer should include only the total cards which will be processed on the accounting machine. Do not include the cards which will pass through the reproducer for summary punching.

The standard time values provide for the complete machine job; i.e., getting the machine assignment from the supervisor, moving the cards to the appropriate machine and arranging them for processing, changing boards as necessary, getting and inserting tabulating paper as necessary, running tests when required (card cycles of tests are counted for standards purposes with the card cycles in the job), performing the actual card processing on the machine, making necessary recordkeeping entries, assembling and labeling the finished work, and securing the machine when the job is finished.

The bar chart following the table graphically presents card cycle volume per day at 100% effectiveness for the different types of tabulating equipment.

TABULATING EQUIPMENT

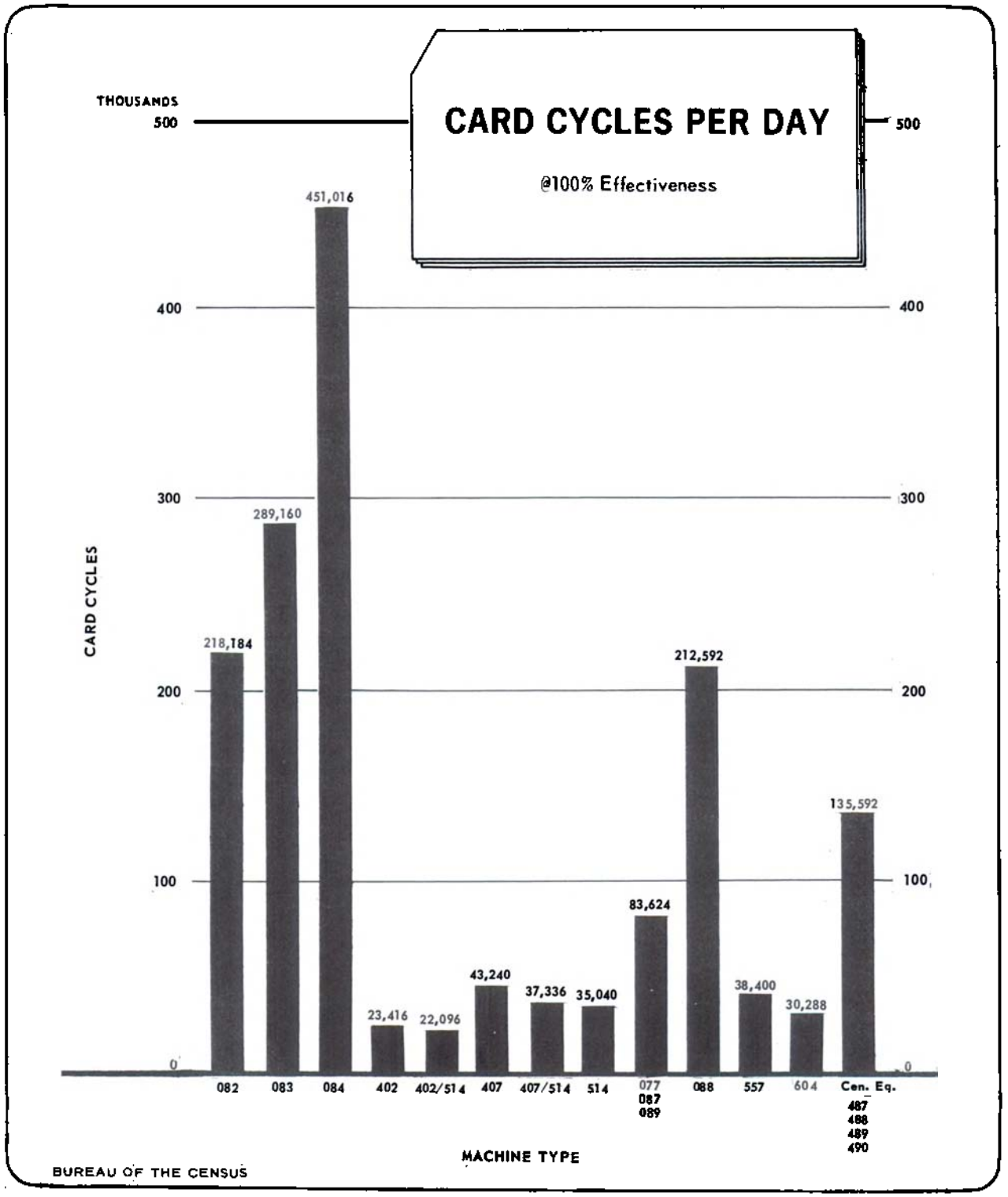
TIME VALUES & OUTPUT

Machine Type	Standard Minutes Per Card Cycle	Card Cycles Per Hour @ 100%	Card Cycles Per Day @ 100%
IBM 082 Sorter *	.00220	27273	218184
IBM 083 Sorter *	.00166	36145	289160
IBM 084 Sorter *	.00107	56377	451016
IBM 402 Accounting Machine	.02050	2927	23416
IBM 402/514 Summary Punch Hookup **	.02180	2762	22096
IBM 407 Accounting Machine	.01110	5405	43240
IBM 407/514 Summary Punch Hookup **	.01290	4667	37336
IBM 514 Reproducer	.01370	4380	35040
IBM 077, 087, 089 Collators ***	.00574	10453	83624
IBM 088 Collator ***	.00227	26574	212592
IBM 557 Interpreter	.01250	4800	38400
IBM 604 Calculator	.01590	3786	30288
Census Equipment 487, 488, 489, 490 (Select, Check, etc.)	.00354	16949	135592

*For the sorters, card cycle volume usually is determined by multiplying total cards in the job by the number of times they will pass (columns sorted) through the machine; e.g., 10000 cards sorted on 5 columns equals 50000 card cycles.

**The time values for the hookups are based on the number of cards processed on the Accounting Machines only. Do not include summary cards.

***The time values for Collators are based on the number of cards passed through the machine from the primary feed only.



ORIGIN

A brief explanation of the development of these standards is presented below.

Detailed engineered production standards, developed in the Census Bureau in 1962, were available for each type of tabulating equipment. These standards were used for measuring individual performances of tabulating equipment operators. The operators recorded specific details of each job on a "Daily Time and Production Record" form. Monthly operator performances were computed from the data reported. Data was compiled for a selected three-month period (July, August, September, 1961) to develop the card cycle time values for each machine type. Production records for this period provided a large number and an extensive variety of machine jobs for the study.

Pertinent details of every machine job on the production records were summarized on "tally" forms for each type of machine. A copy of one of the "tally" forms with actual jobs posted on it is shown on page 9. This sample form was selected from the 083 Sorter group in the "work unit" range of 2801-4000 cards. The form was designed to list the jobs separately by ranges of "work unit" size shown in the detailed standards to simplify the final computations.

Total minutes produced and total card cycles processed were determined for each type of machine, using the detailed engineered standards for computing minutes produced. These figures were computed for each page of jobs and then the page totals were summarized by machine

type. An example of the computations performed for each page is shown on page 10. The computations in the example summarize the data for the 083 Sorter jobs listed on the "tally" form.

When all computations were completed there were two totals for each machine type - standard minutes produced and card cycles processed. Standard minutes produced was divided by card cycles processed for each machine type to determine the standard time value per card cycle.

An interesting bit of information is that during the sample period of three months, a total of 155,060,075 card cycles was processed during 6,840 machine jobs. In addition, 2,152 of the jobs were performed on the 083 Sorters, and they required 126,706,292 card cycles for processing.

083 SORTER JOBS

Size of Work Unit: 2801–4000 cards

Section	Elapsed Minutes	Work From Box or Rack	Number of Cols. Sorted	Problem Cards				No. of Work Units	Machine Cycles	Total Cards in File	Cards per Work Unit	Operator
				No. of Occ.	No. of Cards Rej.	Jam	Seq.					
SS	10	B	2					1	7264	3632	3632	Keys
"	30	R	10					1	35000	3500	3500	"
"	48	B	10					1	35000	3500	3500	"
TF	90	"	17	3		6		1	55641	3273	3273	Cunningham
"	84	"	18					1	56592	3144	3144	Lewis
"	212	"	5					12	212500	42500	3542	"
"	60	"	9					1	26370	2930	2930	"
"	192	"	10					5	155560	15556	3111	"
"	132	"	6	3		3		5	113100	18850	3770	"
AP	126	"	8					3	69224	8653	2884	Kelly
"	42	"	8					1	27824	3478	3478	"
"	34	"	6					1	20838	3473	3473	Cunningham
"	54	"	5					2	37720	7544	3772	
"	48	"	7					1	27181	3883	3883	"
"	42	"	9					1	25857	2873	2873	"
SS	124	"	10					2	74800	7480	3740	Neal
"	84	"	5					2	30985	6191	3096	"
"	30	"	4					2	22932	5983	2992	"
"	36	"	7					1	22372	3196	3196	"
"	66	"	5					2	28405	5681	2841	"
"	60	"	6					3	54000	7000	3000	"
"	204	"	12					3	141396	11783	3928	"
"	60	"	3					2	19500	6500	3250	"
"	48	"	3					3	28500	9500	3167	"
"	18	"	3					1	8691	2897	2897	Norfolk
"	72	"	10					1	31340	3134	3134	Robb
"	90	"	12					2	70356	5863	2932	"
"	96	"	12					2	78864	6572	3286	"
"	216	"	10					4	120000	12000	3000	"
"	114	"	10					2	80000	8000	4000	"
"	198	"	11					3	108482	9862	3287	"
"	96	"	10					2	64100	6410	3205	"
"	102	"	19					1	61598	3242	3242	"
"	36	"	2					2	14420	7210	3605	"
"	90	R	20					1	79720	3986	3986	"
"	150	R	10					3	84720	8472	2824	"
"	138	B	10					4	123600	12360	3090	"
"	30	"	2					3	20000	10000	3333	"
"	42	"	3					1	12000	4000	4000	Cunningham
"	54	"	6					1	24000	4000	4000	"
"	60	"	6					2	48000	8000	4000	"
"	36	"	3					1	11240	3750	3750	
"	30	R	5					1	20000	8000	4000	"
"	36	B	5					1	20000	4000	4000	"
"	42	"	5					1	20000	4000	4000	"
"	24	"	5					1	20000	4000	4000	"
"	30	"	4					1	16000	4000	4000	"
				—		—			—			"
47 Jobs				6		9			2465662			

EXAMPLE OF COMPUTATIONS

(The standard minutes per unit below were selected from the 083 Sorter tables of detailed standards.)

Unit of Measure	Units of Measure Reported	Standard Minutes per Unit	Standard Minutes Produced
Set Up (1001 cards or more)	47	3.00	141.000
Occurrence of Problem Cards	6	.70	4.200
Problem Card	9	.55	4.950
(Work Unit Size--2801-4000 cards)			
Working from Boxes:			
Work Unit - 2-column sort	6	4.243	25.458
" " - 3- " "	8	4.792	38.336
" " - 4- " "	3	5.341	16.023
" " - 5- " "	21	5.889	123.669
" " - 6- " "	12	6.438	77.256
" " - 7- " "	2	6.987	13.974
" " - 8- " "	4	7.536	30.144
" " - 9- " "	2	8.085	16.170
" " - 10- " "	21	8.634	181.314
" " - 11- " "	3	9.183	27.549
" " - 12- " "	7	9.732	68.124
" " - 17- " "	1	12.476	12.476
" " - 18- " "	1	13.025	13.025
" " - 19- " "	1	13.574	13.574
Working from Racks:			
Work Unit - 5-column sort	1	4.243	4.243
" " - 10- " "	4	6.987	27.948
" " - 20- " "	1	12.476	12.476
Card Cycle	2,465,662	.00105	2588.945
		Total Standard Minutes Produced	3440.854

GROUP MEASUREMENT

In the Census Bureau group performance of tabulating units are measured with the machine card cycle standards. The operators record the machine type code number, total card cycles processed, start and stop time, and other identifying information for each machine job. The automatic data processing equipment computes, summarizes and tabulates the information.

The table on the following page furnishes performance results for nine months using the group standards which were officially applied in January, 1965. The results are very favorable as shown by the steady improvement in performance and the high level attained.

If any organization has a large tabulating activity with a consistent, heavy workload of diversified machine jobs, it seems reasonable to assume that these standards would work out fairly well for measuring group productivity.

BUREAU OF THE CENSUS

TABULATING EQUIPMENT OPERATIONS
GROUP PERFORMANCE

	1965									Total
	January	February	March	April	May	June	July	August	September	
Total Card Cycles Processed	75195122	77927915	102093764	94397110	90941627	81255426	76913354	82149164	83530333	764403815
Hours Worked On Tabulating Equipment Operations	2961	2916	3736	3332	3133	2782	2471	2642	2423	26396
Decimal Mins per Card Cycle	.00236	.00225	.00220	.00212	.00207	.00205	.00193	.00193	.00174	.00207
Cost of Hours Worked	$7288	$7187	$9338	$8205	$8046	$7272	$6323	$6858	$6265	$66782
Cost per Card Cycle	$.0000969	$.0000922	$.0000915	$.0000869	$.0000885	$.0000895	$.0000822	$.0000835	$.0000750	$.0000874
Group Performance	106%	106%	101%	108%	117%	121%	123%	125%	128%	114%

Part II

Charting Standard Time Values for Specific Jobs on Tabulating Equipment

INTRODUCTION TO CHARTS

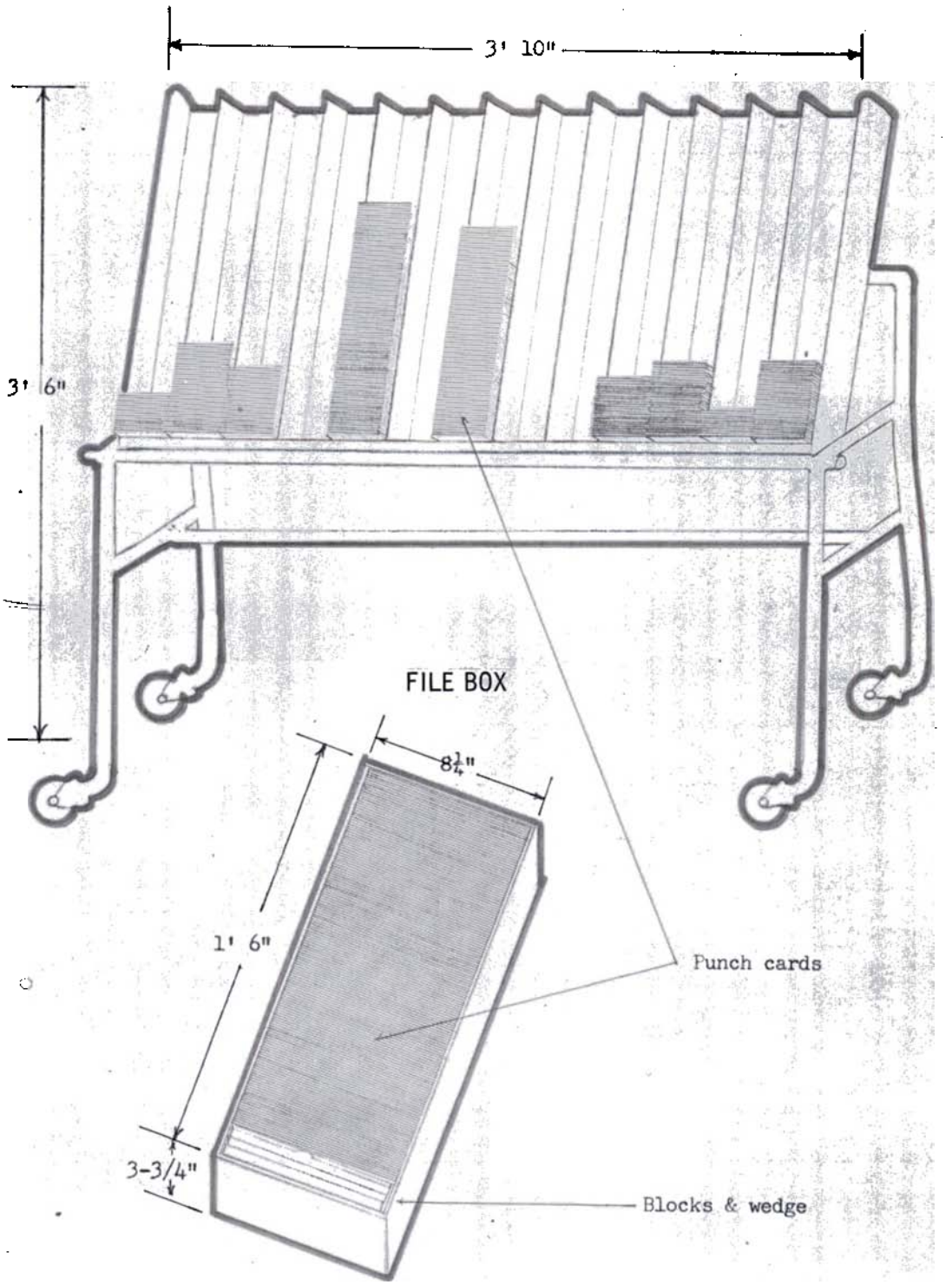
The charts on the following pages provide a quick and easy method for determining total standard minutes required to perform card processing jobs on tabulating equipment. To use the charts, it is necessary to know the type of job to be performed and the total number of cards in the job. Select the appropriate chart, find the point on the abscissa (base line) for the total number of cards in the job, trace a line vertically up to the intersecting point of the appropriate "Work Unit" line on the chart, trace a line horizontally from there to the ordinate scale, then read the standard minutes required for the job at the point of intersection.

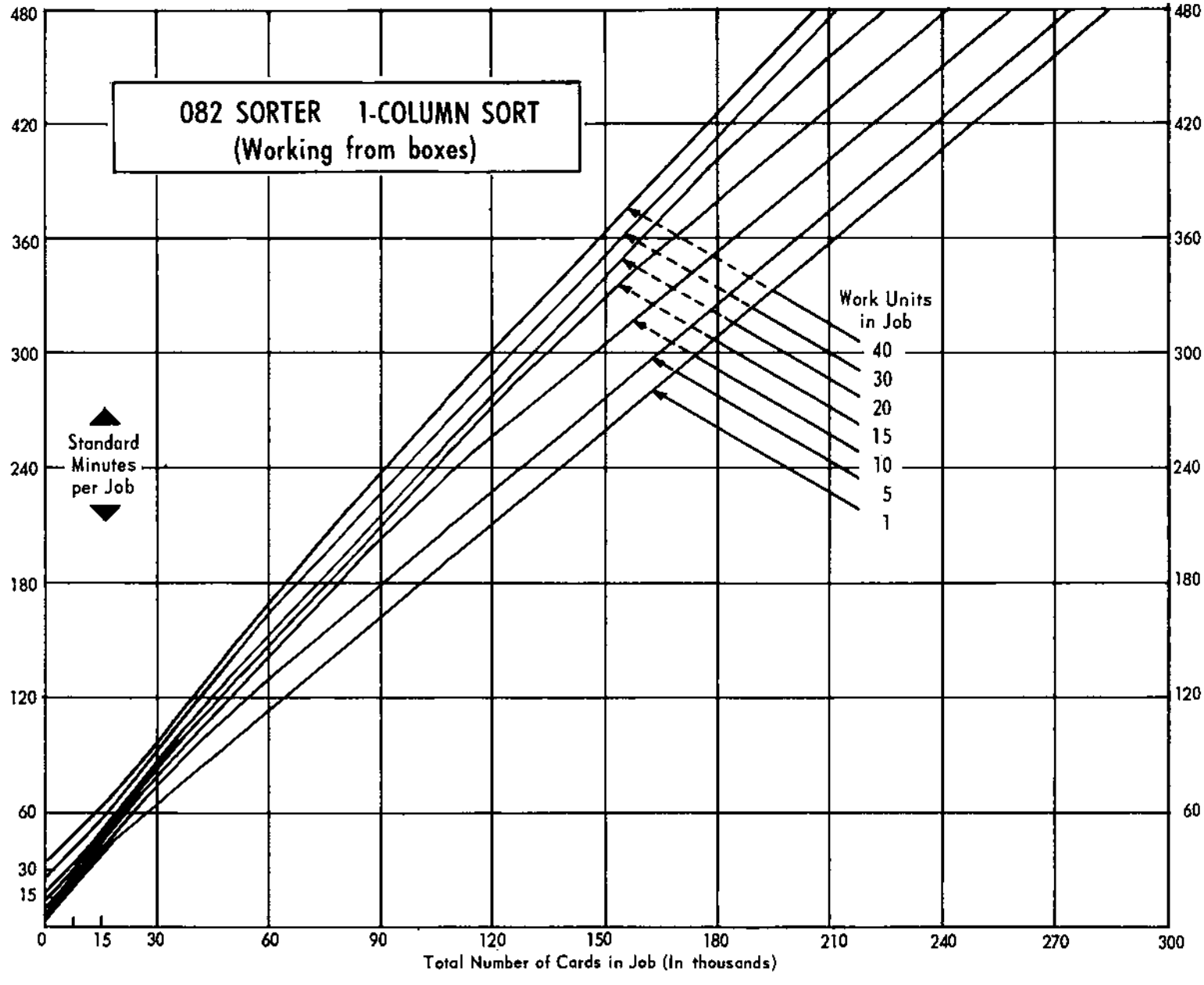
The charts contain separate lines for selecting time values according to the number of work units in a job. In many machine jobs the card deck is divided into groups which represent distinct categories such as county, region, state, commodity, etc. Each group is a work unit if it is machine processed separately. All cards in a work unit must be processed together, removed from the machine pockets before starting the next group, and boxed and identified by their category. The processing of each work unit requires machine stoppage, additional card handling, and other operator activity external to the machine time so that the total time span for a job is increased somewhat in relation to the number of work units in the job. A job must be considered as one work unit if the entire card deck is to be machine processed in one continuous run, irrespective of how the cards are arranged.

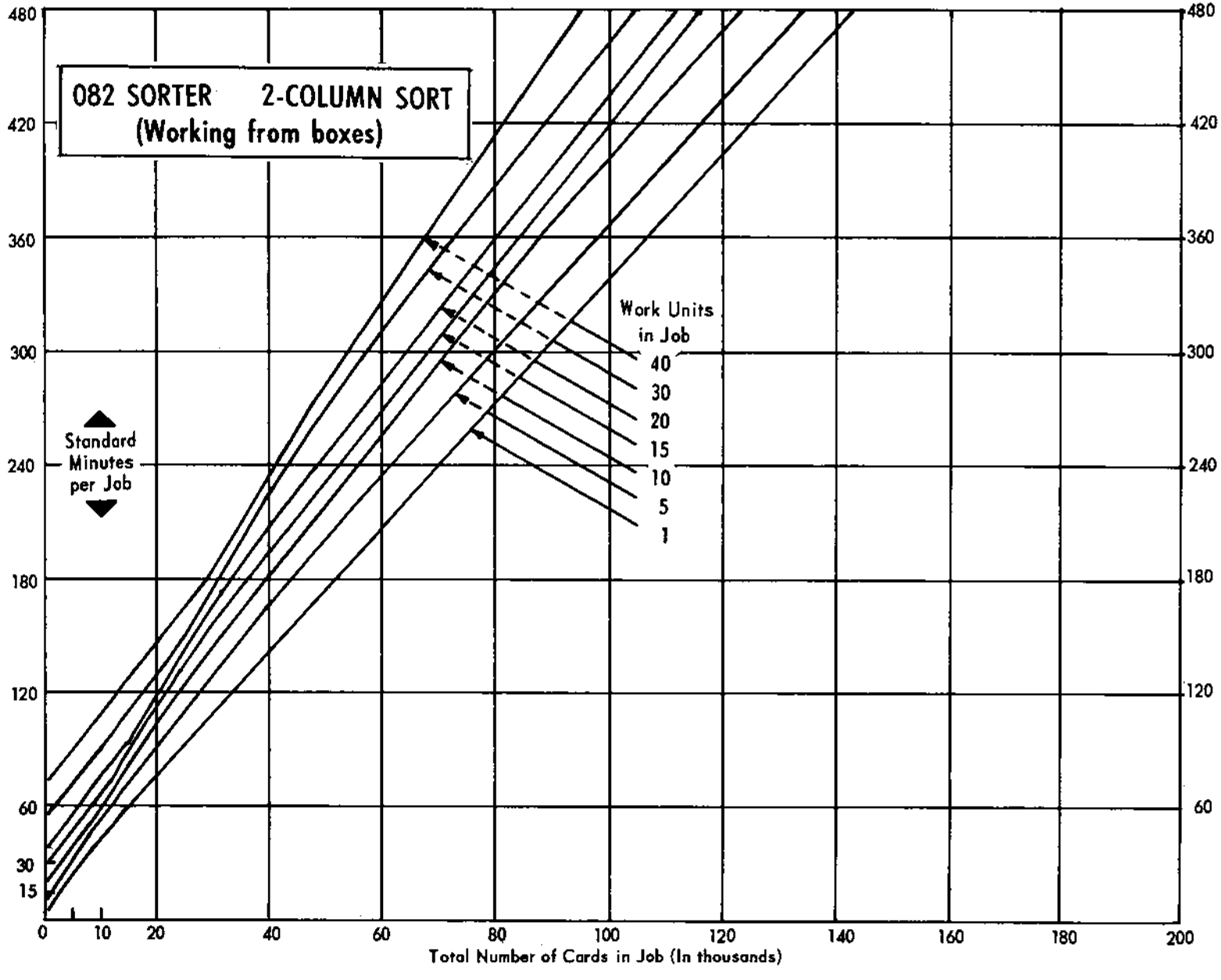
The lines plotted on the charts were constructed from detailed, engineered standards which are shown in this booklet. The time values provide for all work necessary to complete the machine assignments. This includes receiving instructions, getting the work and arranging it at the appropriate machine, preparing the machine for operation, running the job, performing recordkeeping, and securing the cards and machine when finished. Variables such as tests and problem cards (jams, out-of-sequence, etc.) have been included in the time values according to their frequency of occurrence based on work experience in the Bureau of the Census. If a more precise time value is desired on a job for which all actual units of measure (set up, problem card occurrence, problem cards, tests, work units, card cycles) are known, it is suggested that the detailed, engineered standards be used.

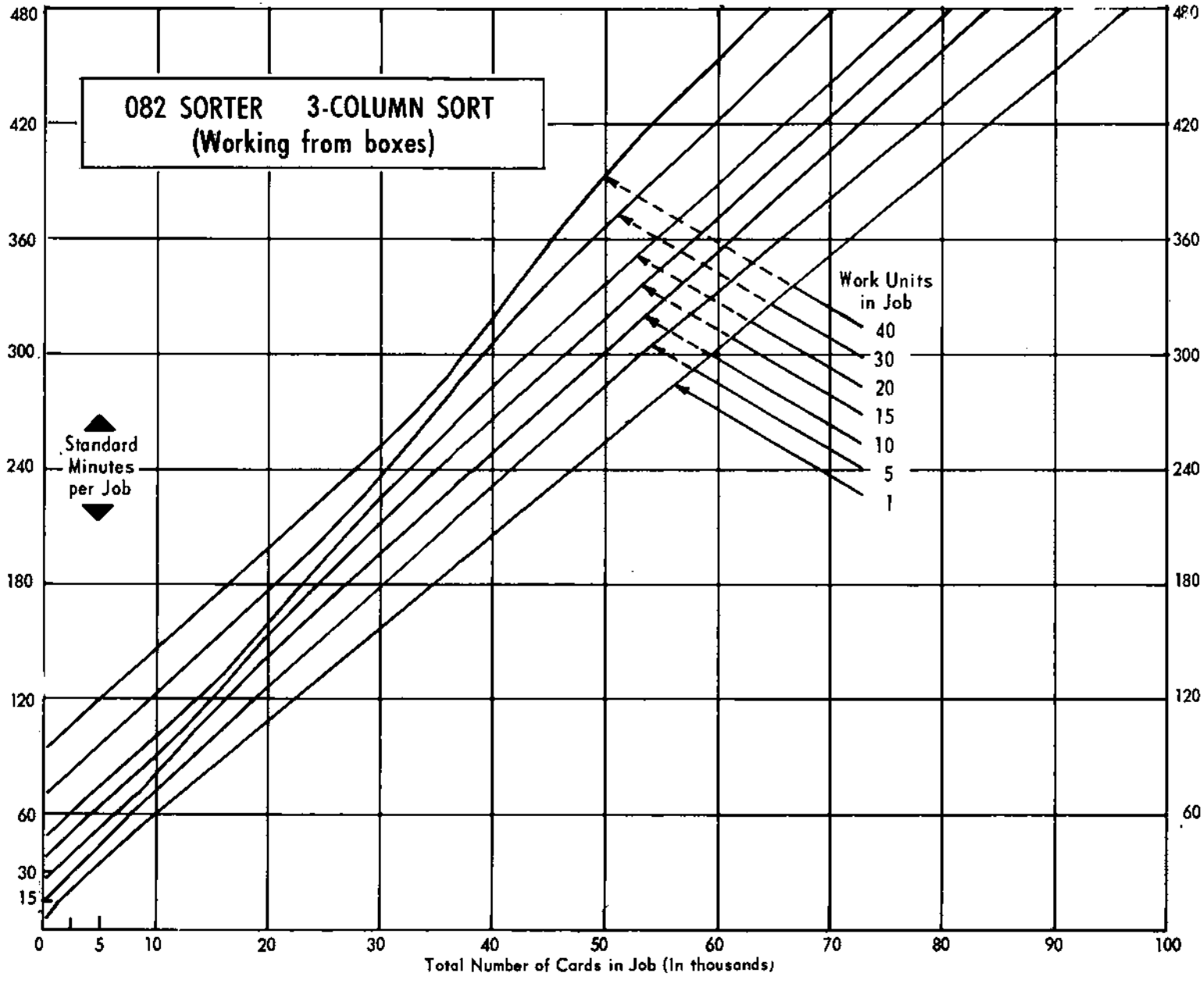
Charts for several of the faster machines, such as sorters and collators, specify "Working from boxes" in the titles. This indicates that the card deck is filed in boxes rather than racks. The machines with this distinction have two series of detailed "Work Unit" standards, one for boxes and the other for racks. Some of the jobs take a little less time when the cards are filed in racks. Charts were not developed for jobs using racks because of the infrequent occurrence of these jobs in the Census Bureau. Generally, it is more convenient to identify, handle, and store card files when they are in boxes. No distinction between working from boxes and working from racks is made for the slower machines. Sketches of a card rack and file box are shown on the following page.

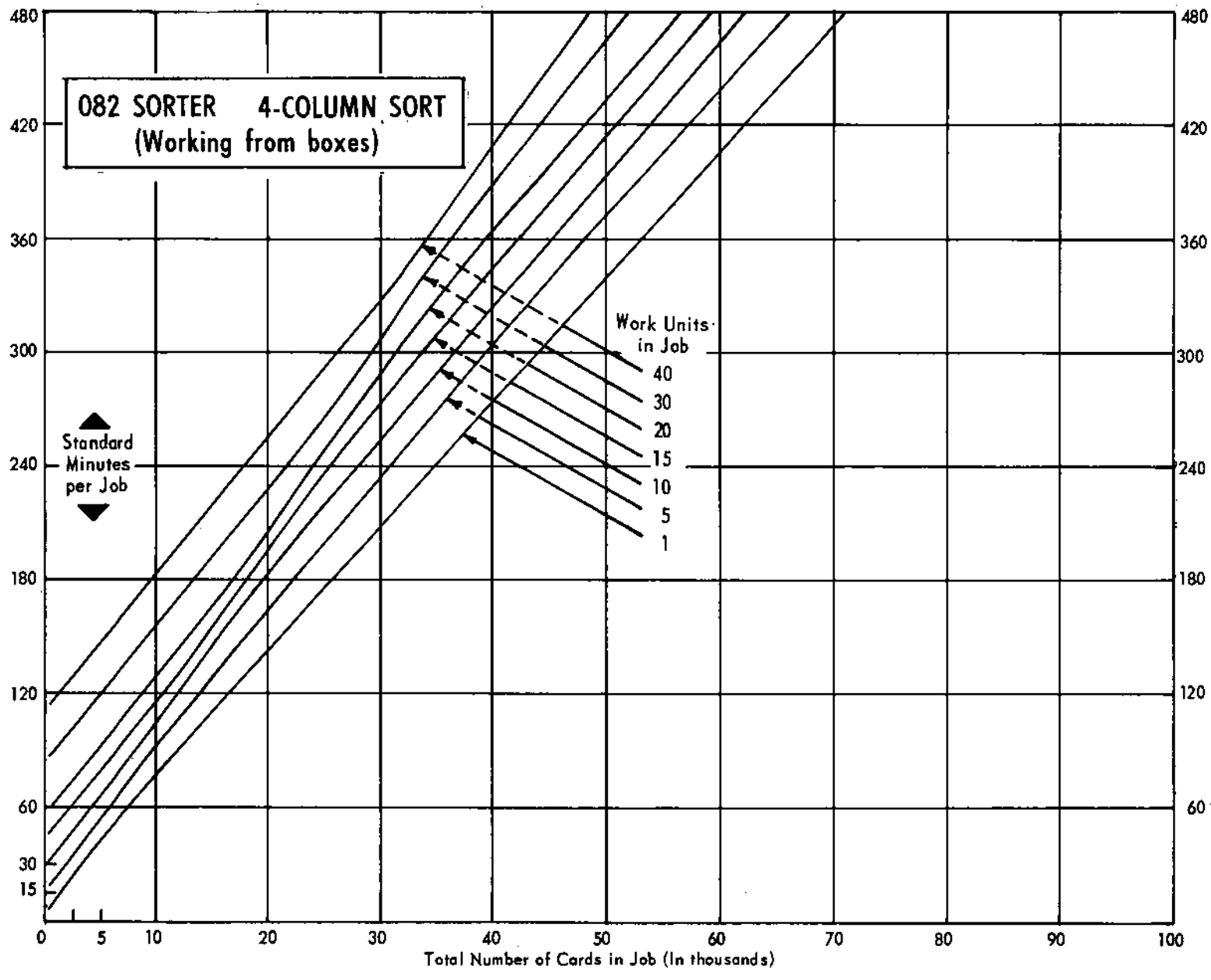
PORTABLE RACK

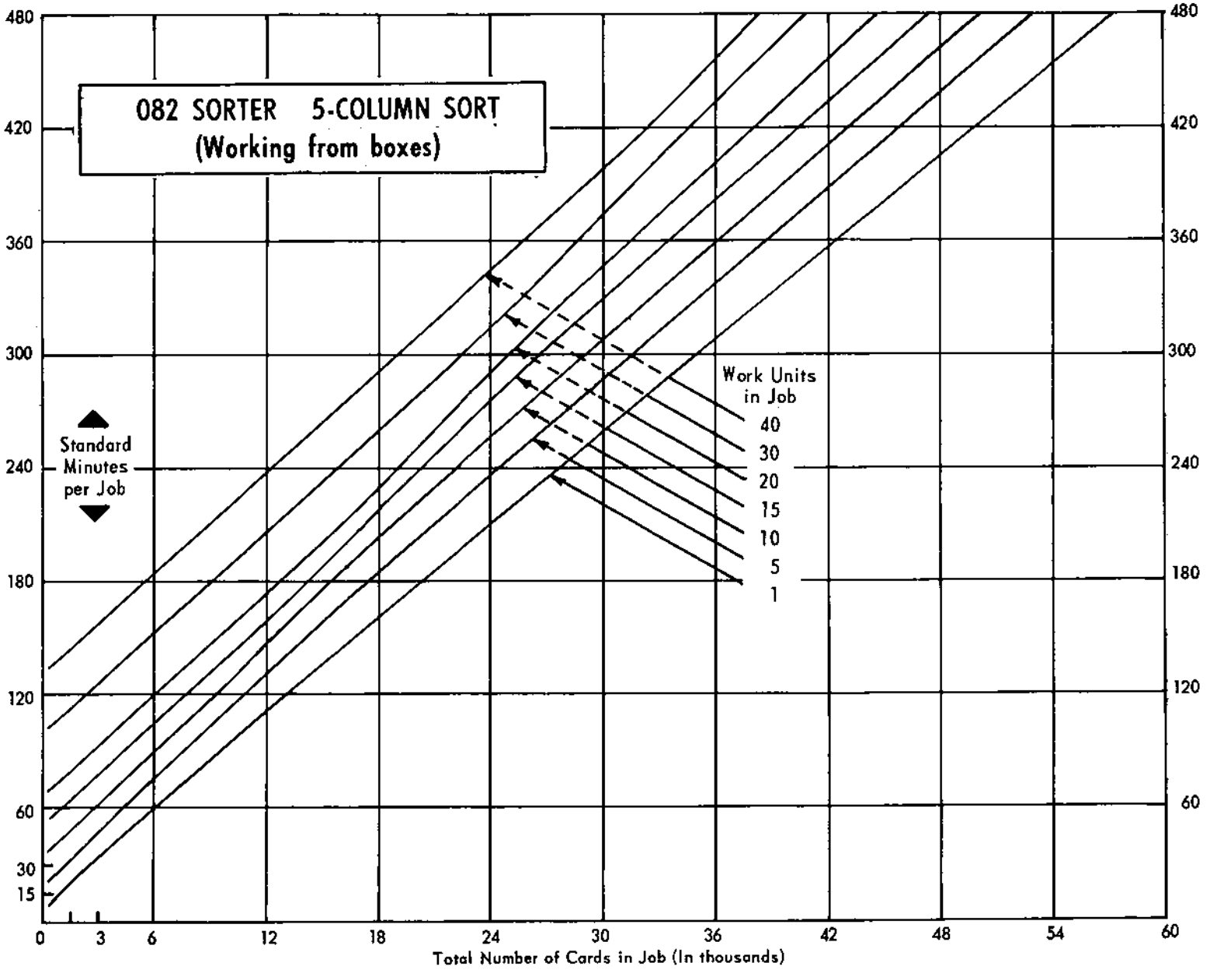


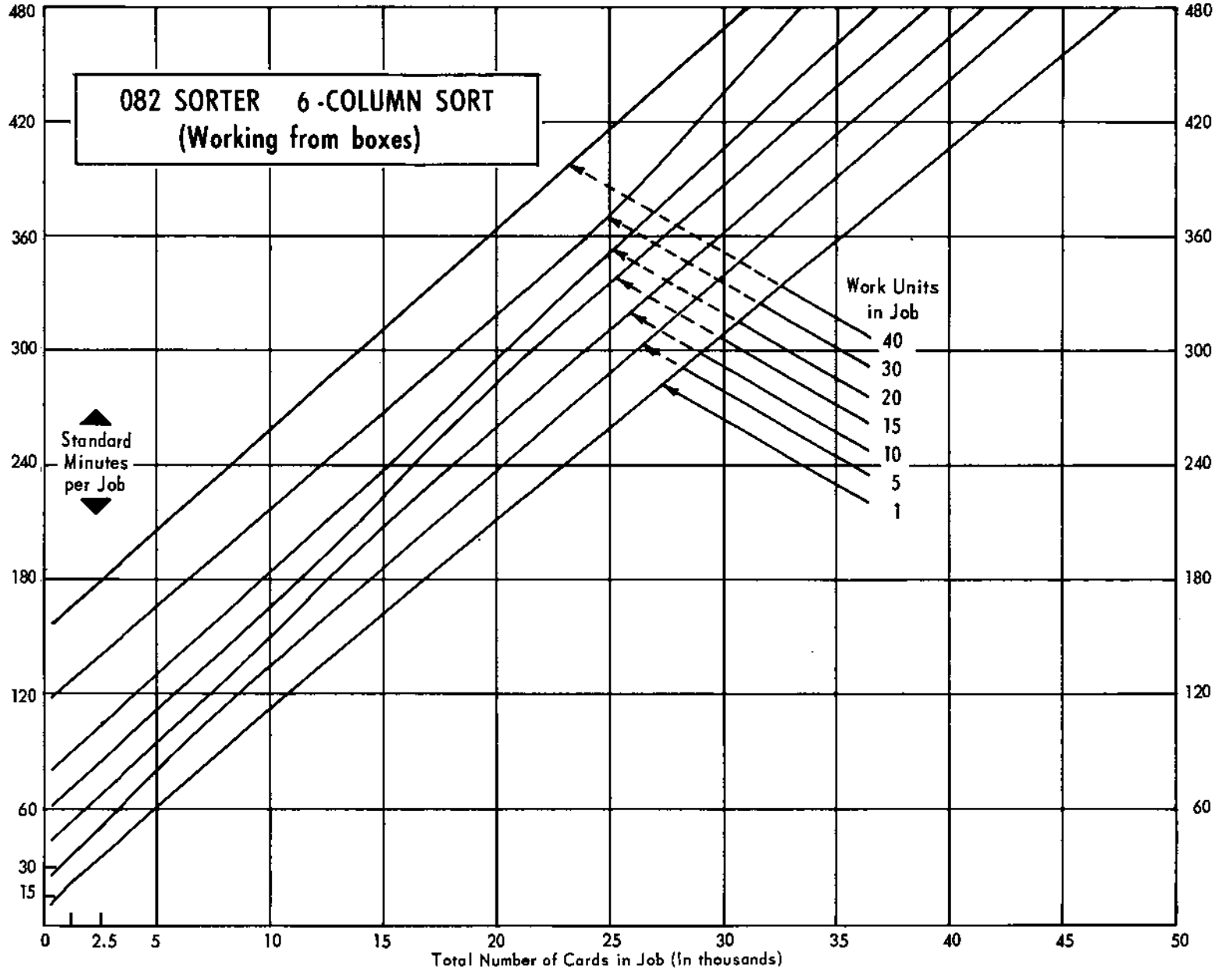


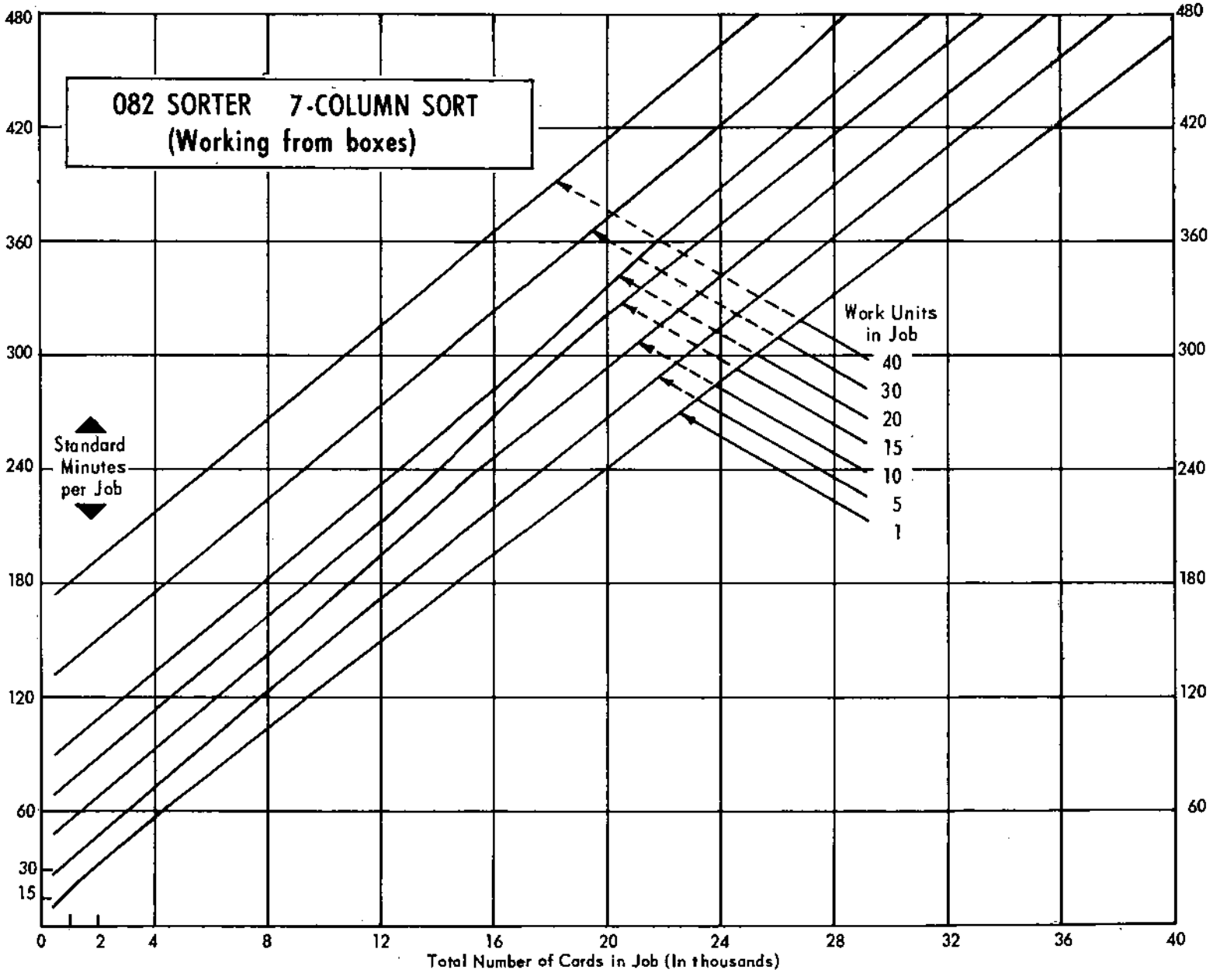


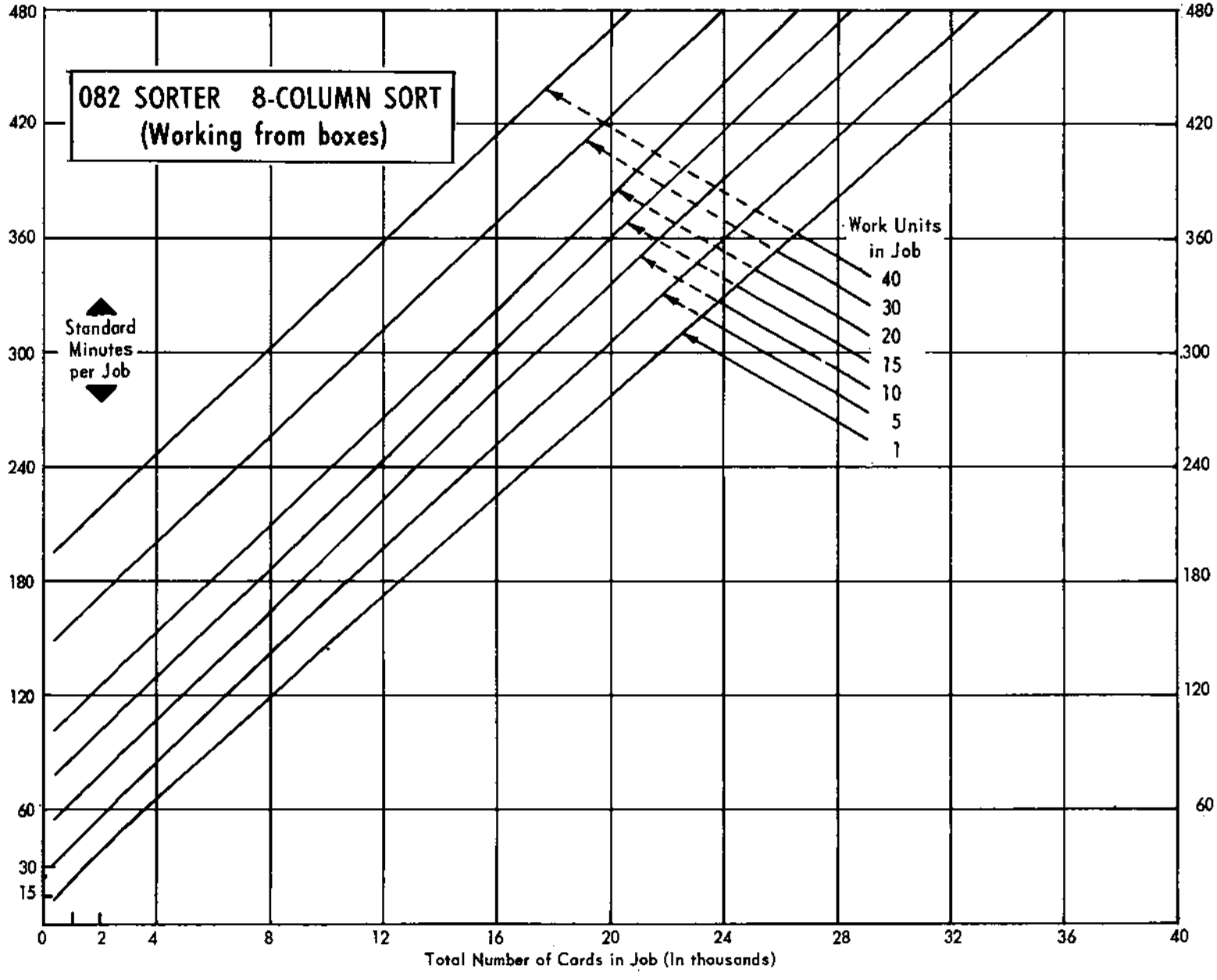


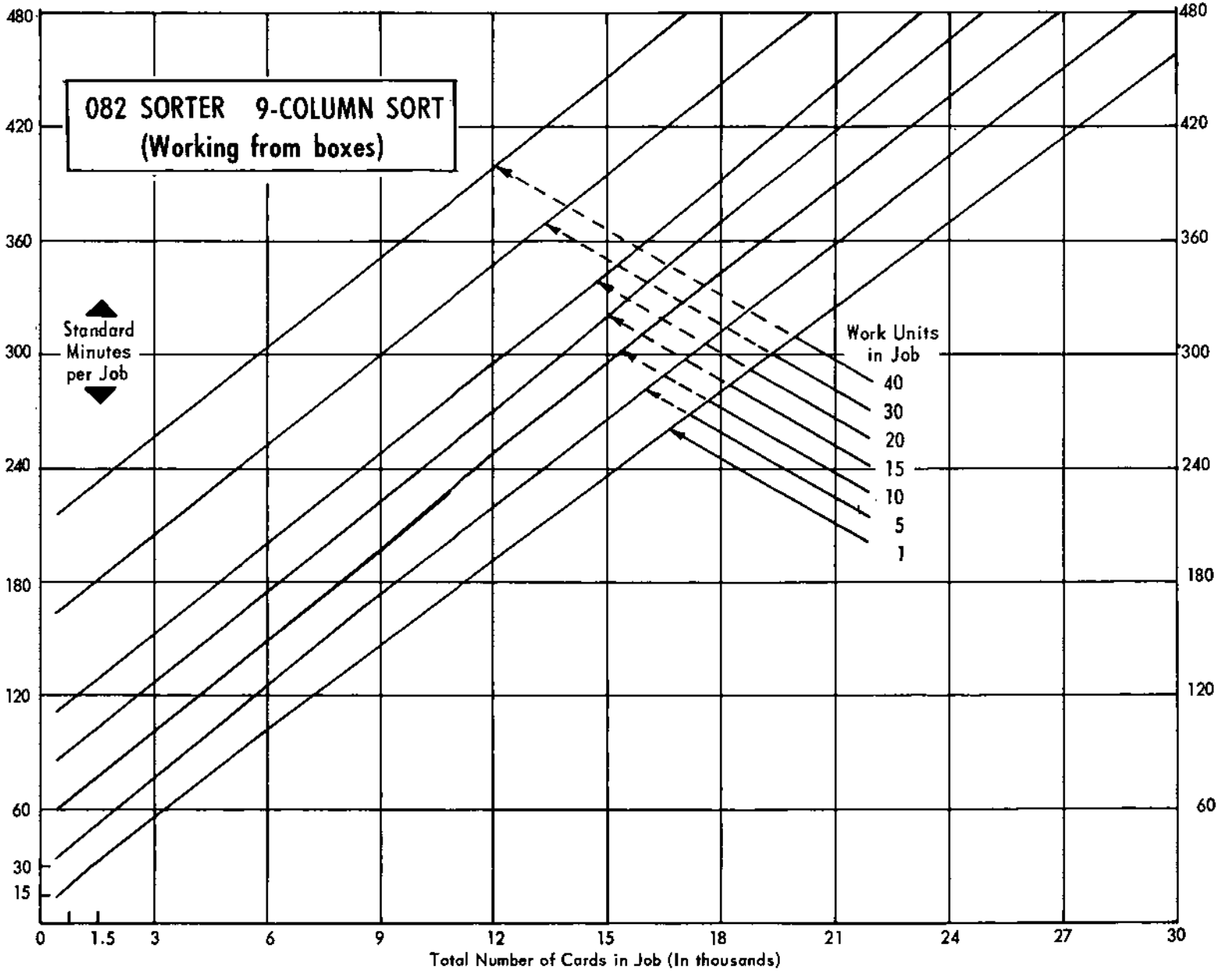


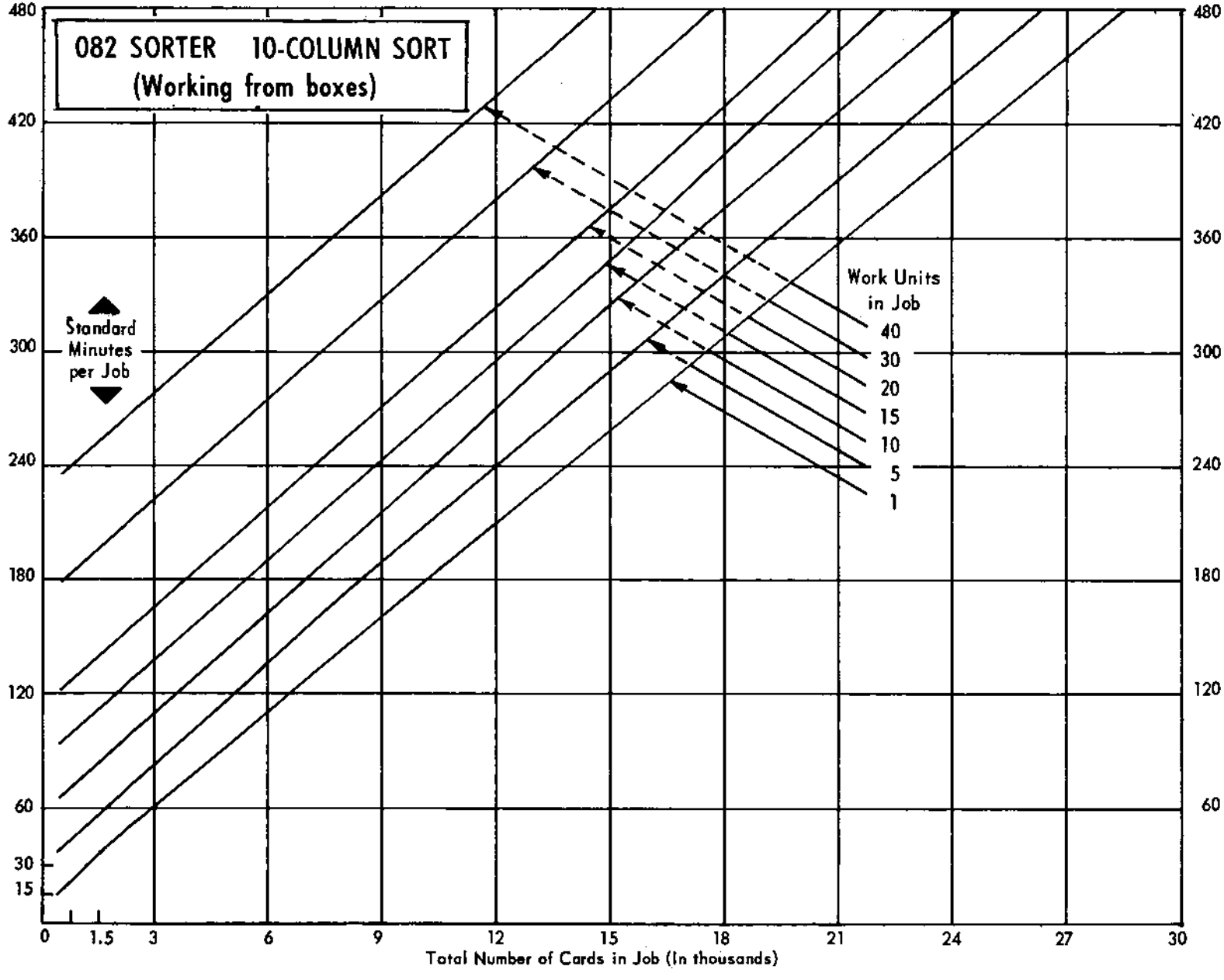


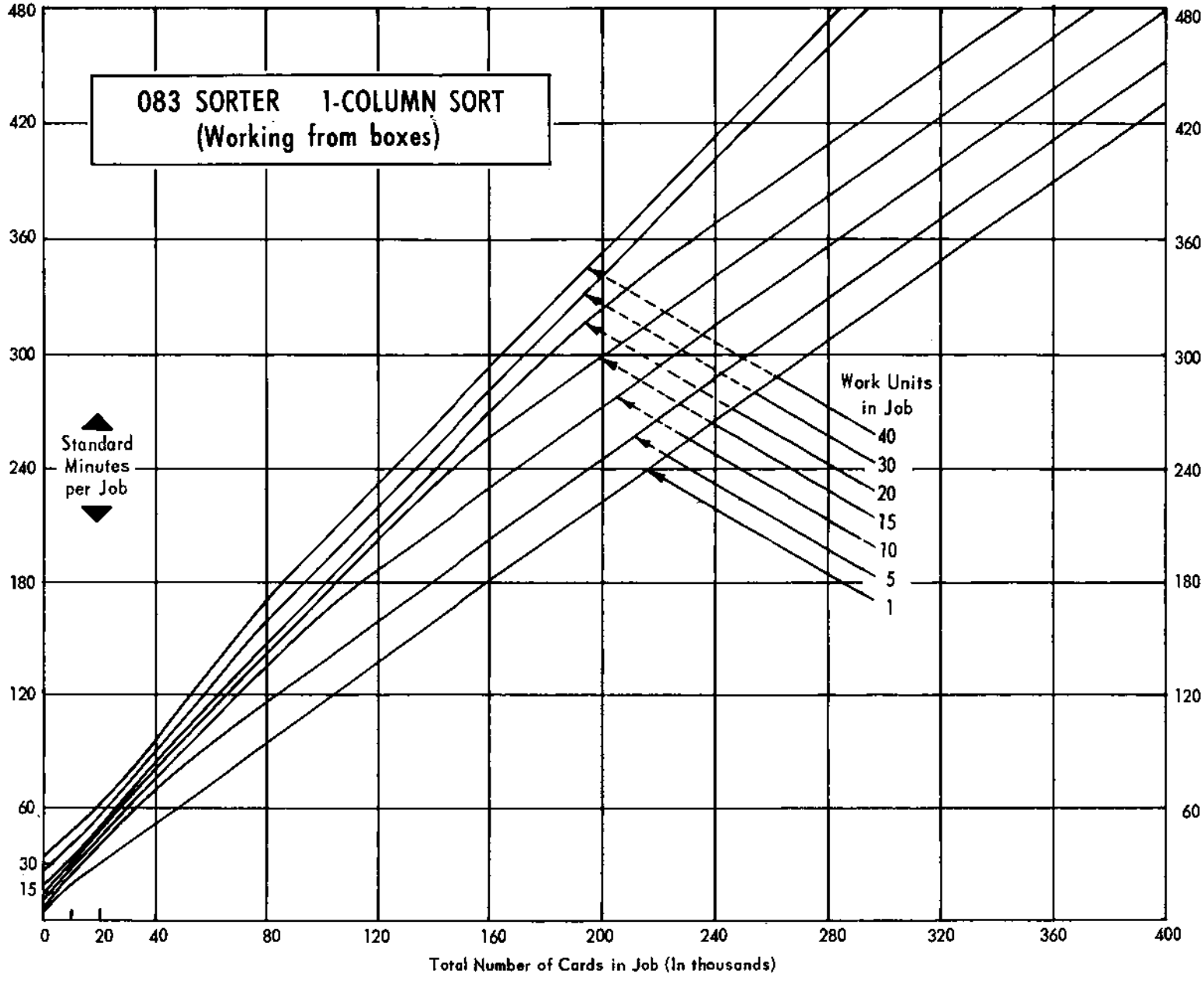


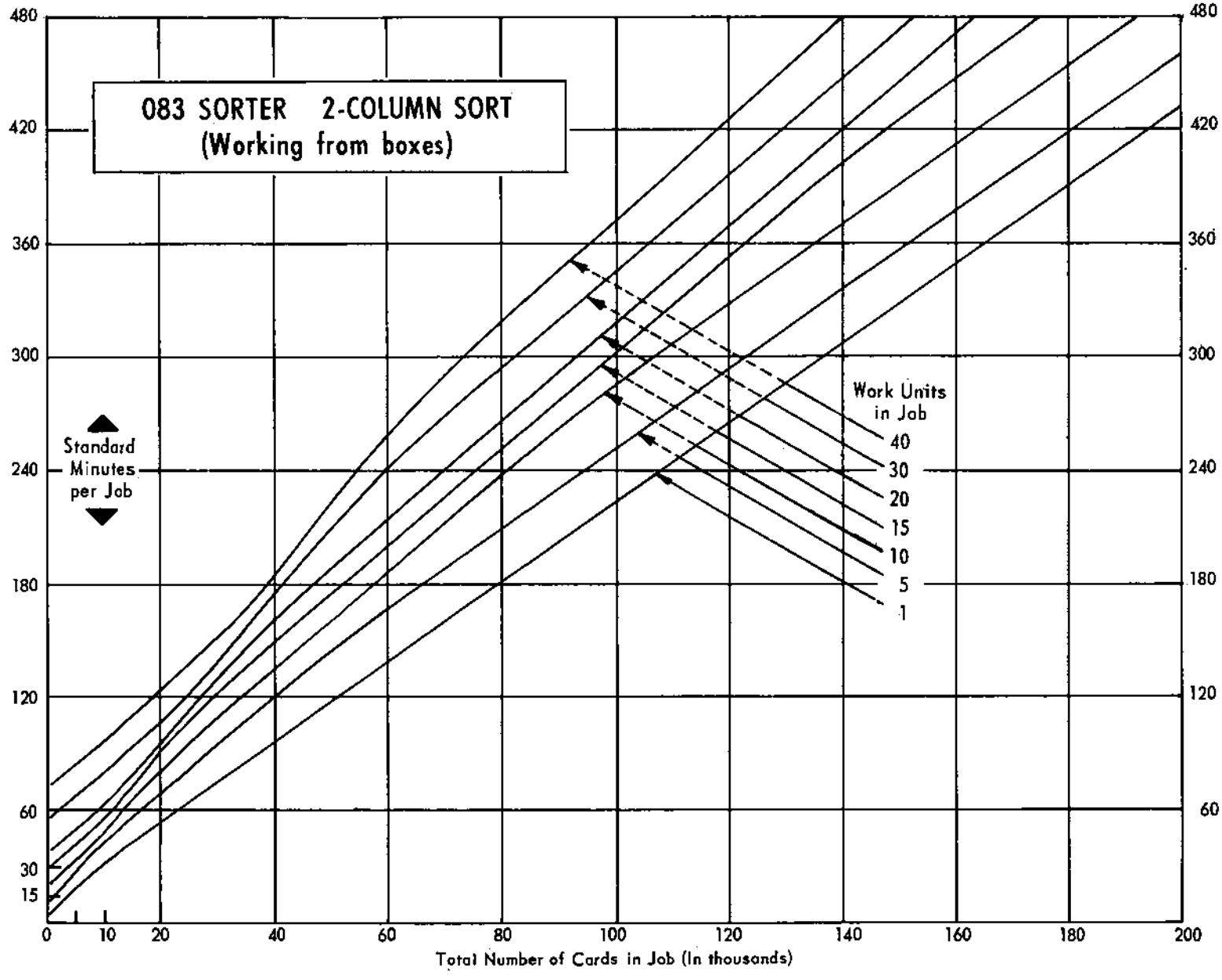


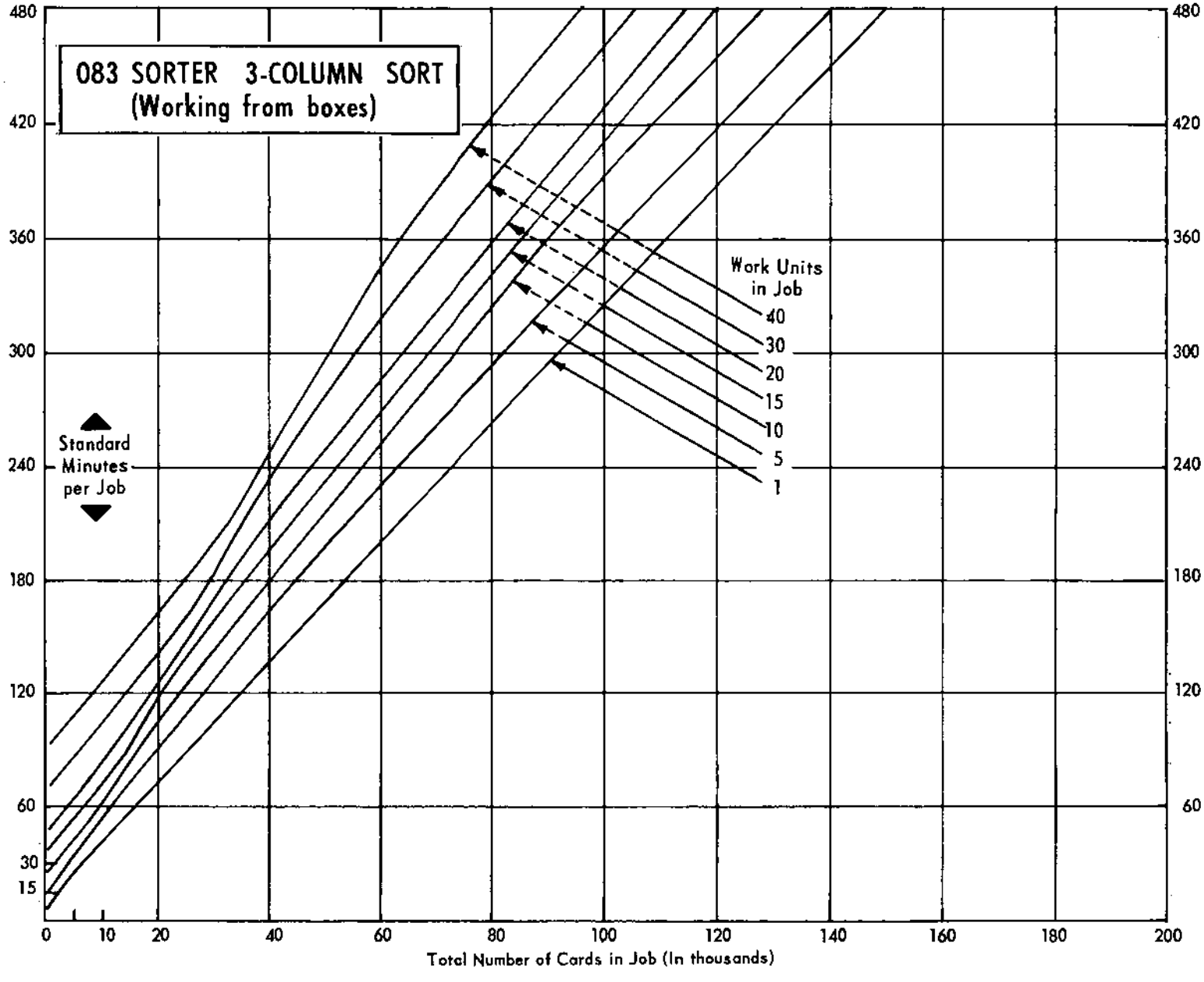


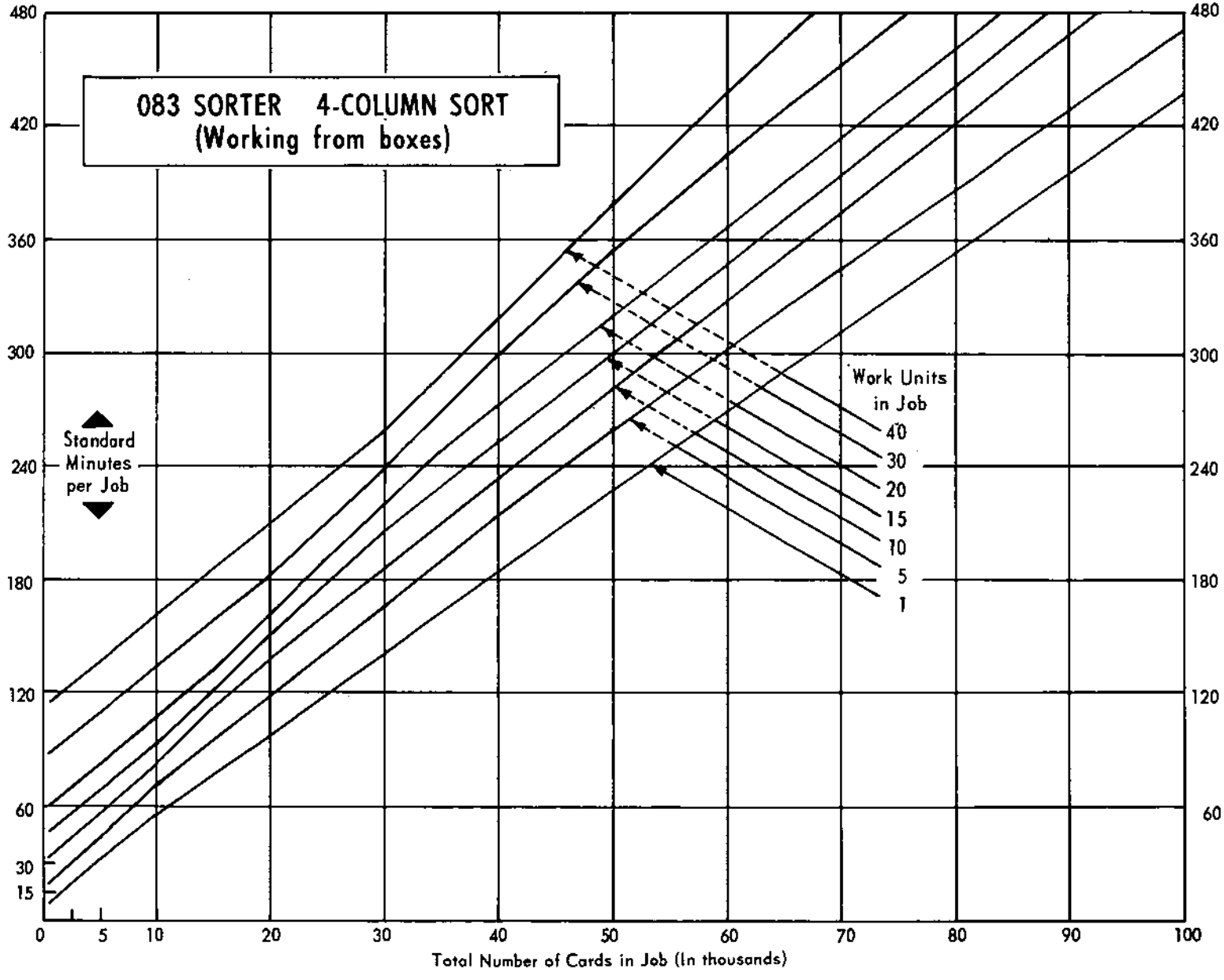


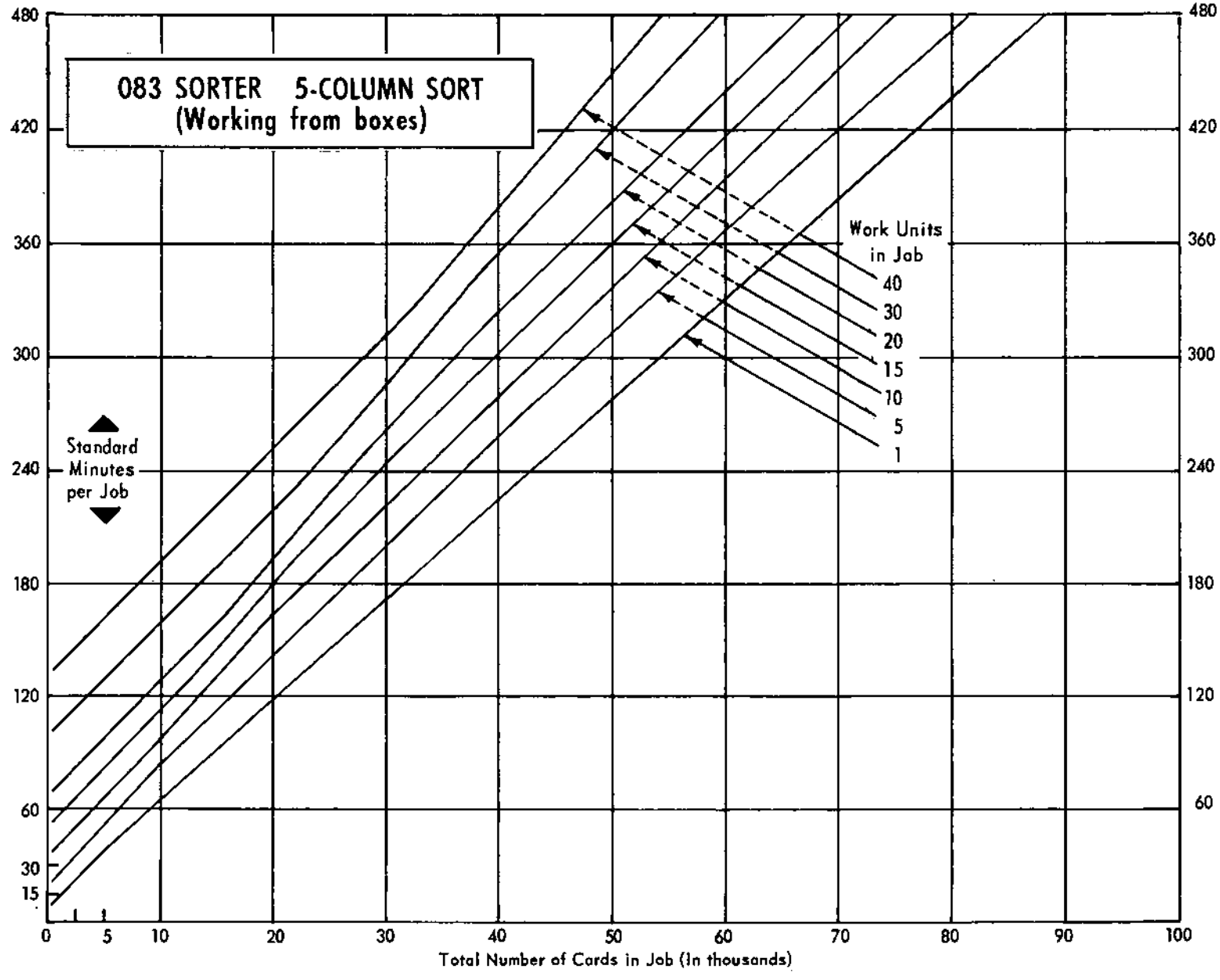


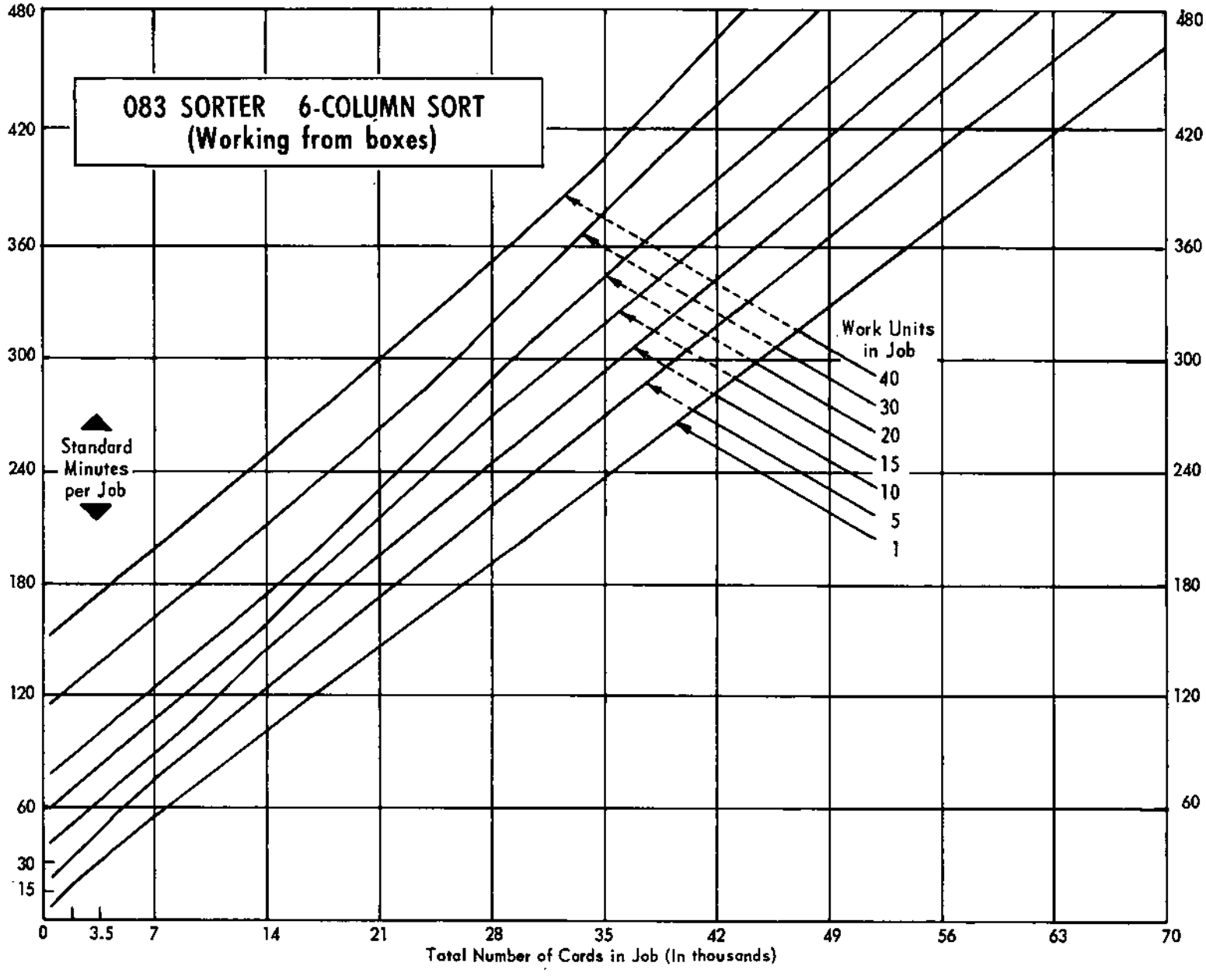


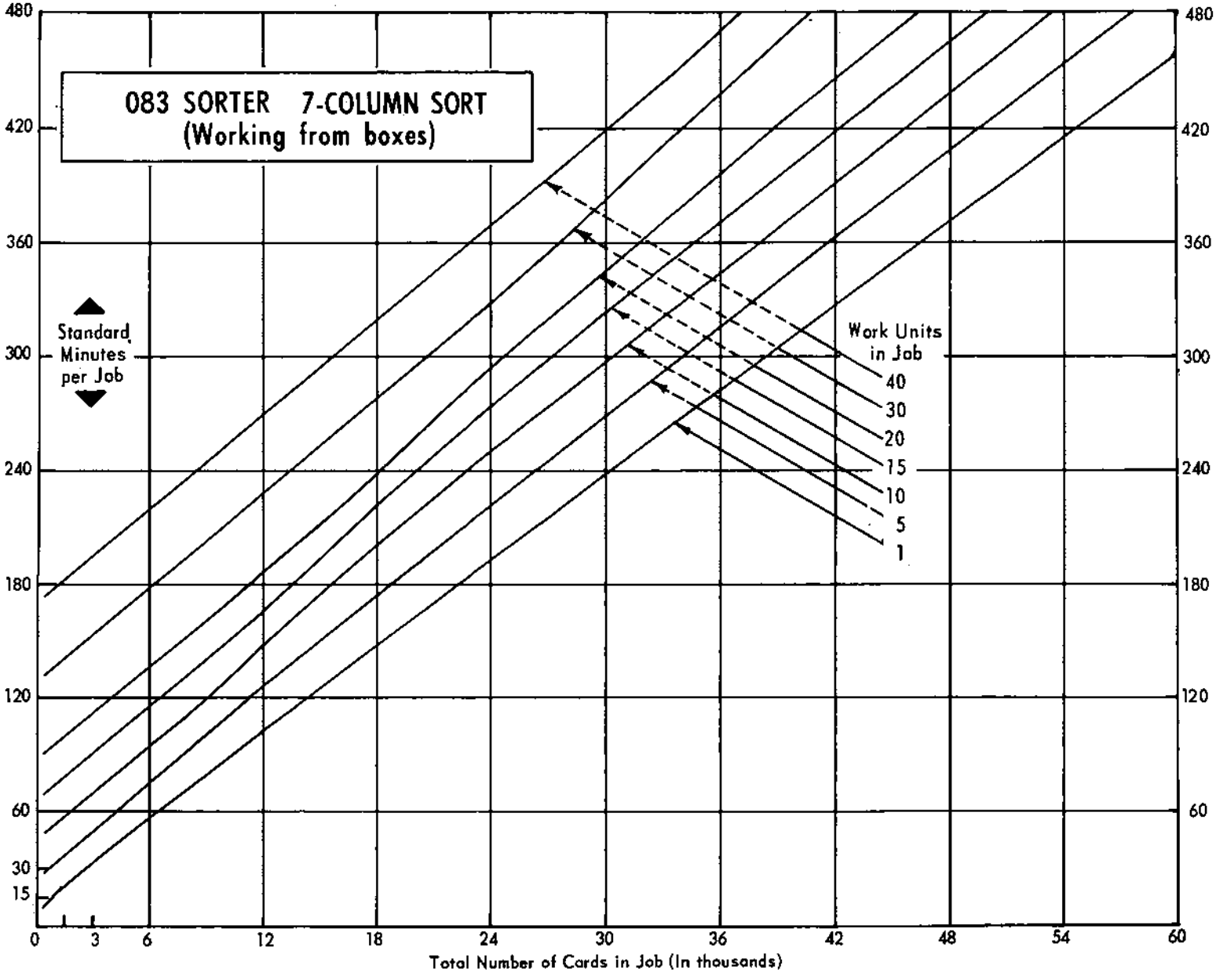


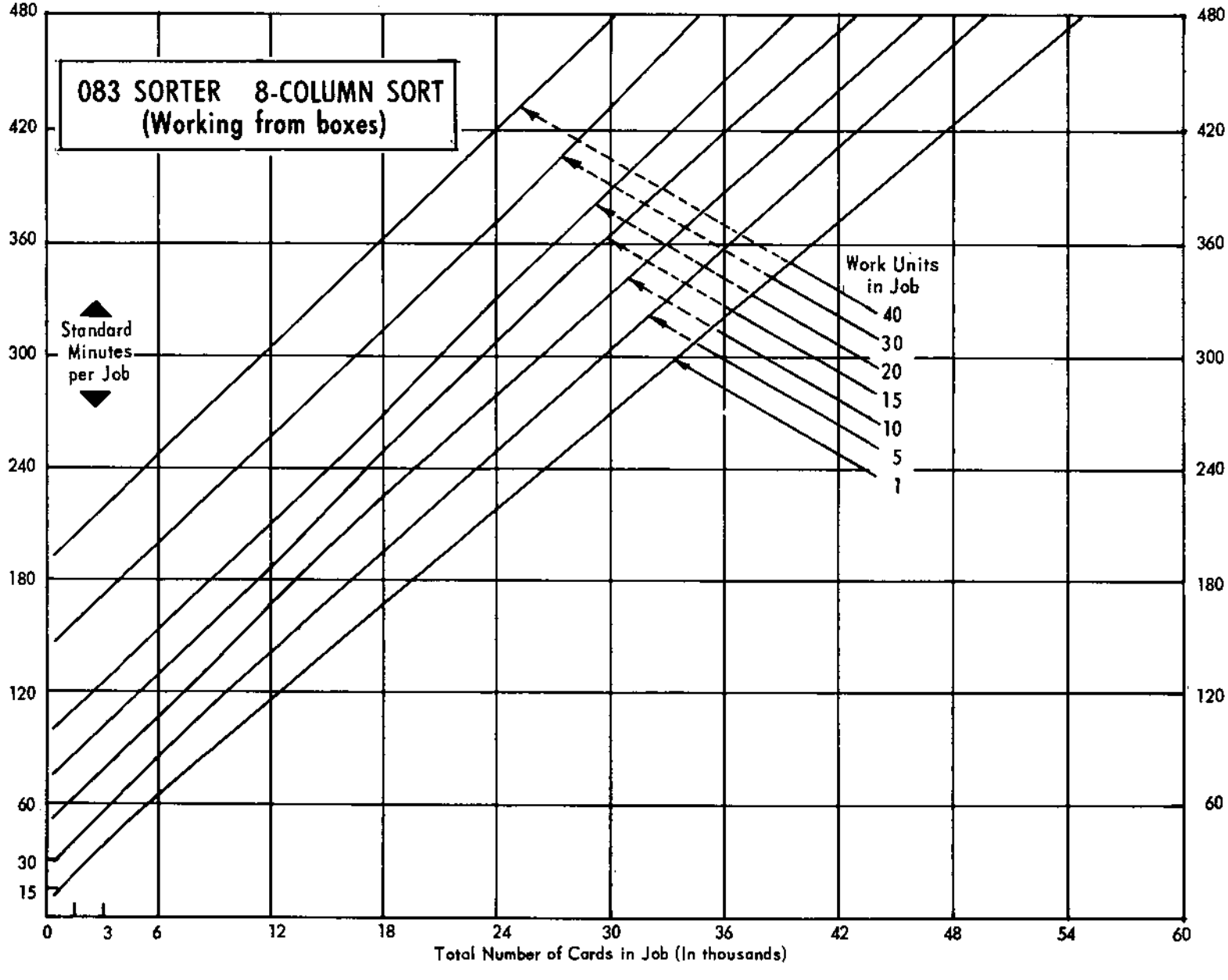


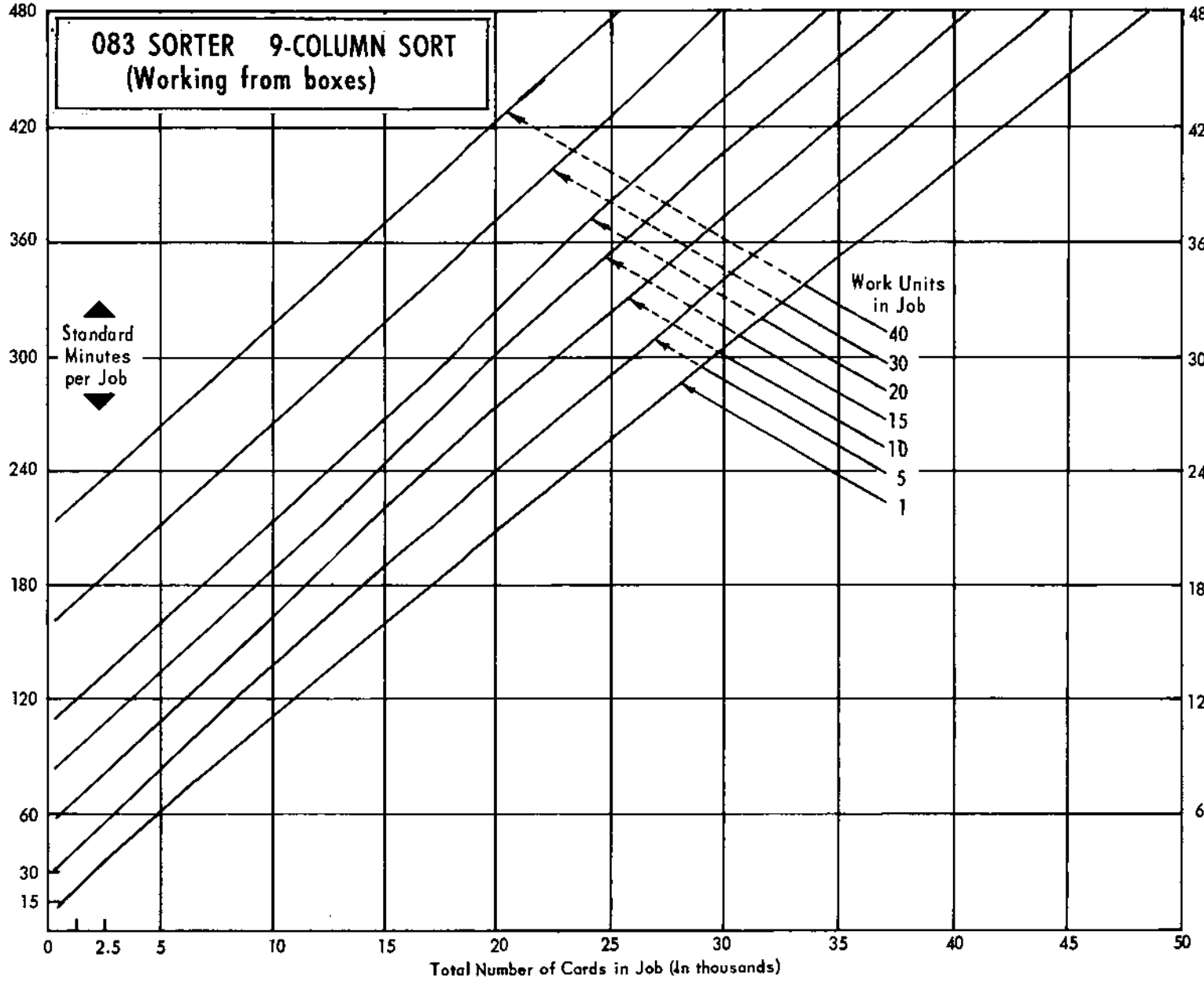


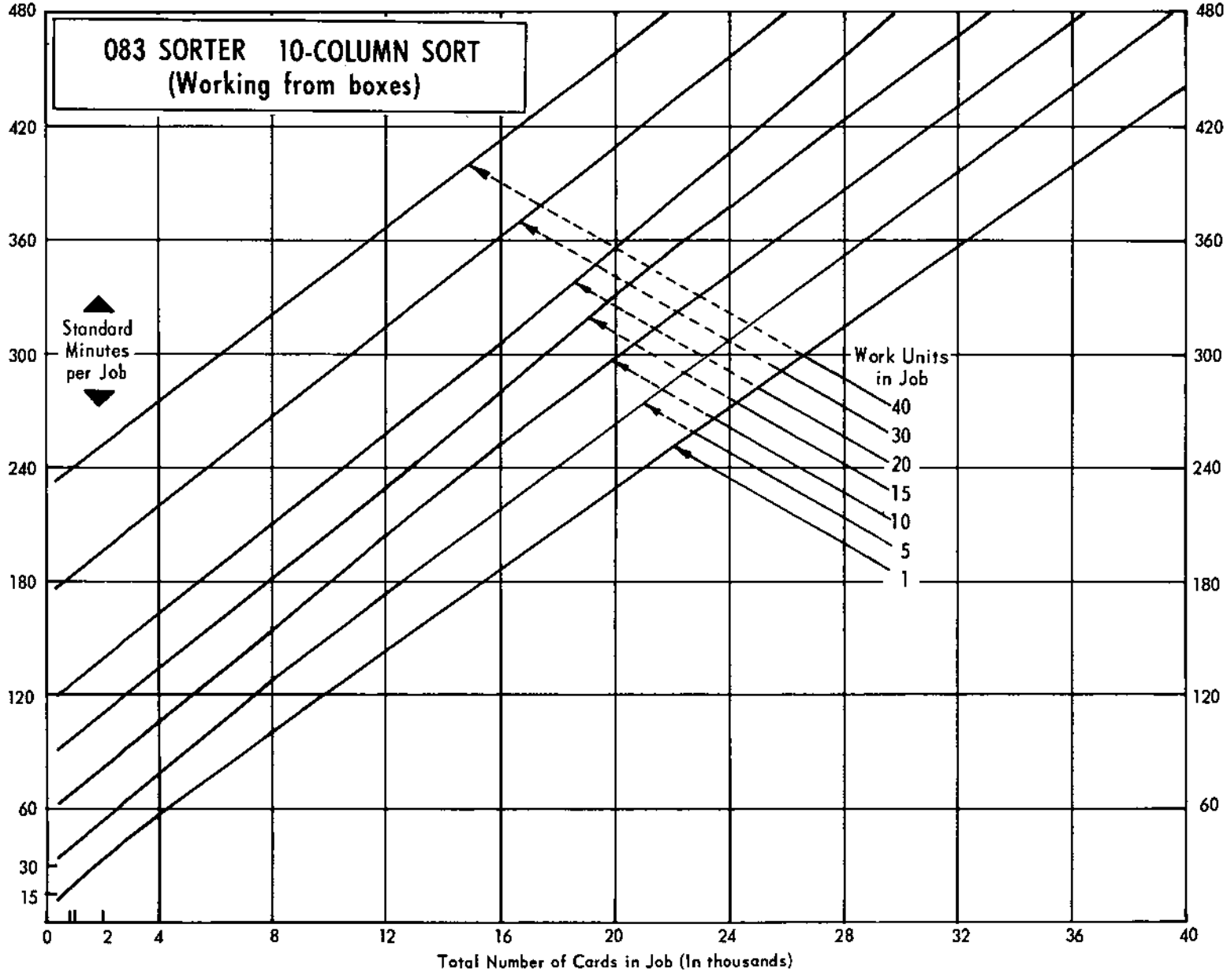


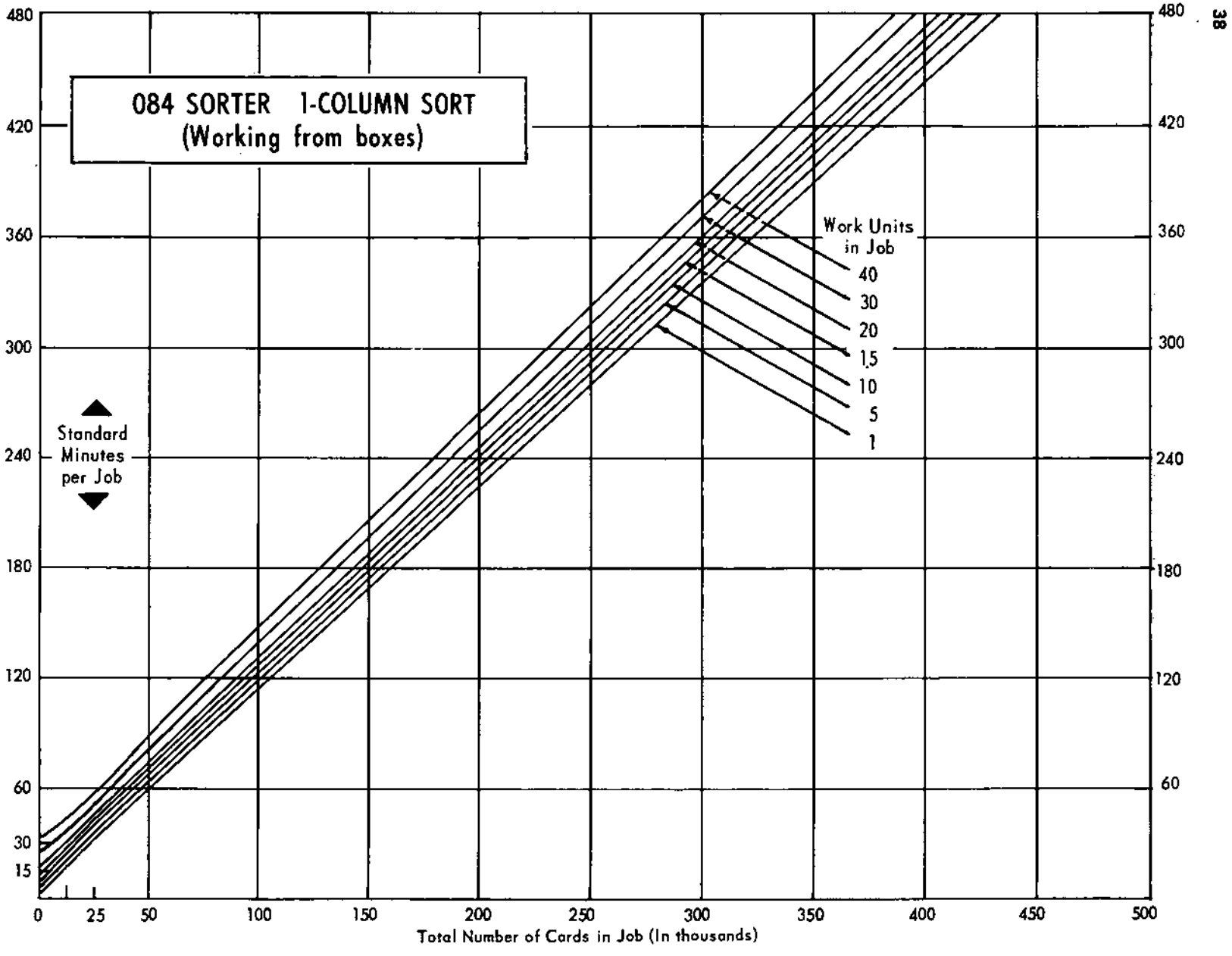


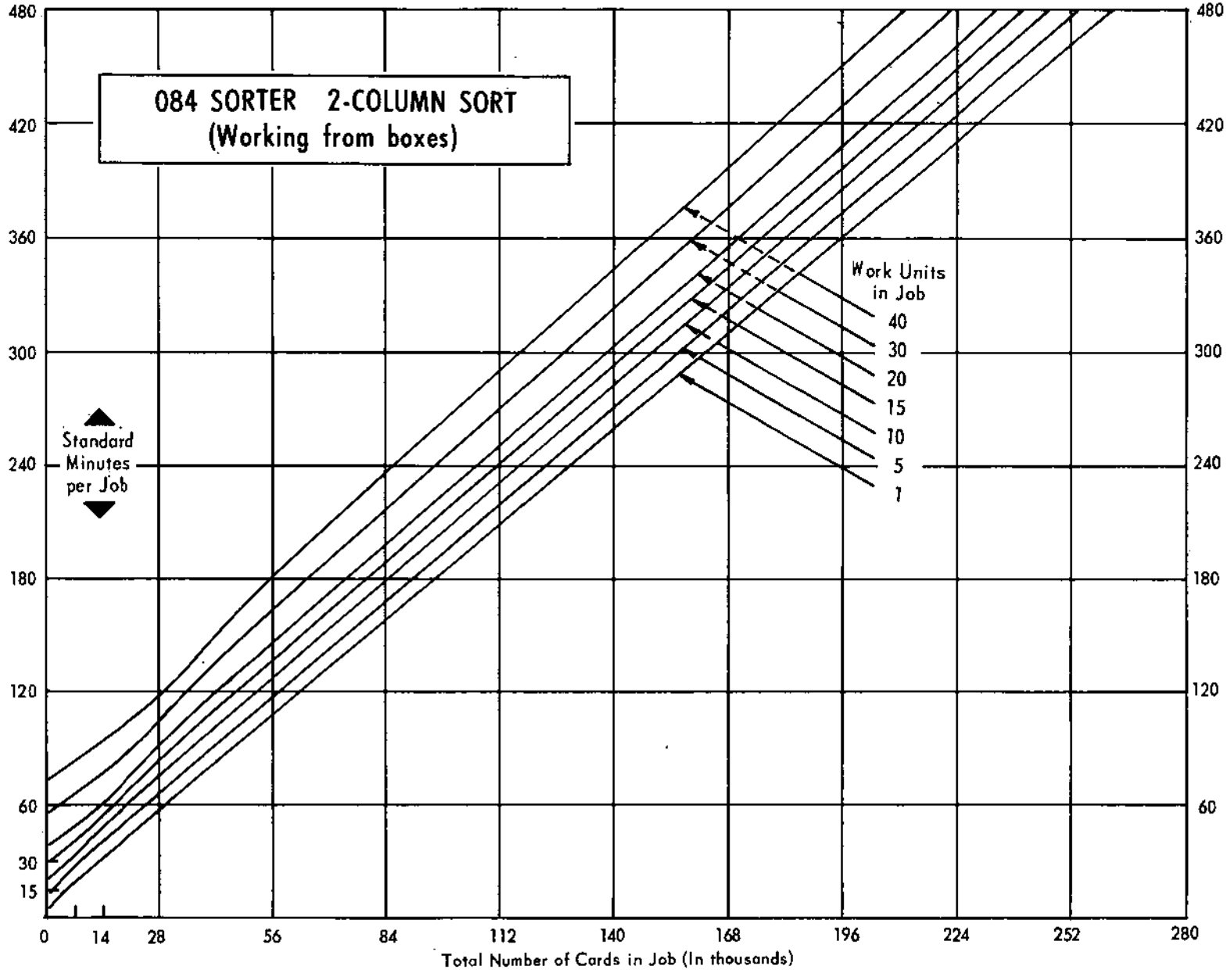


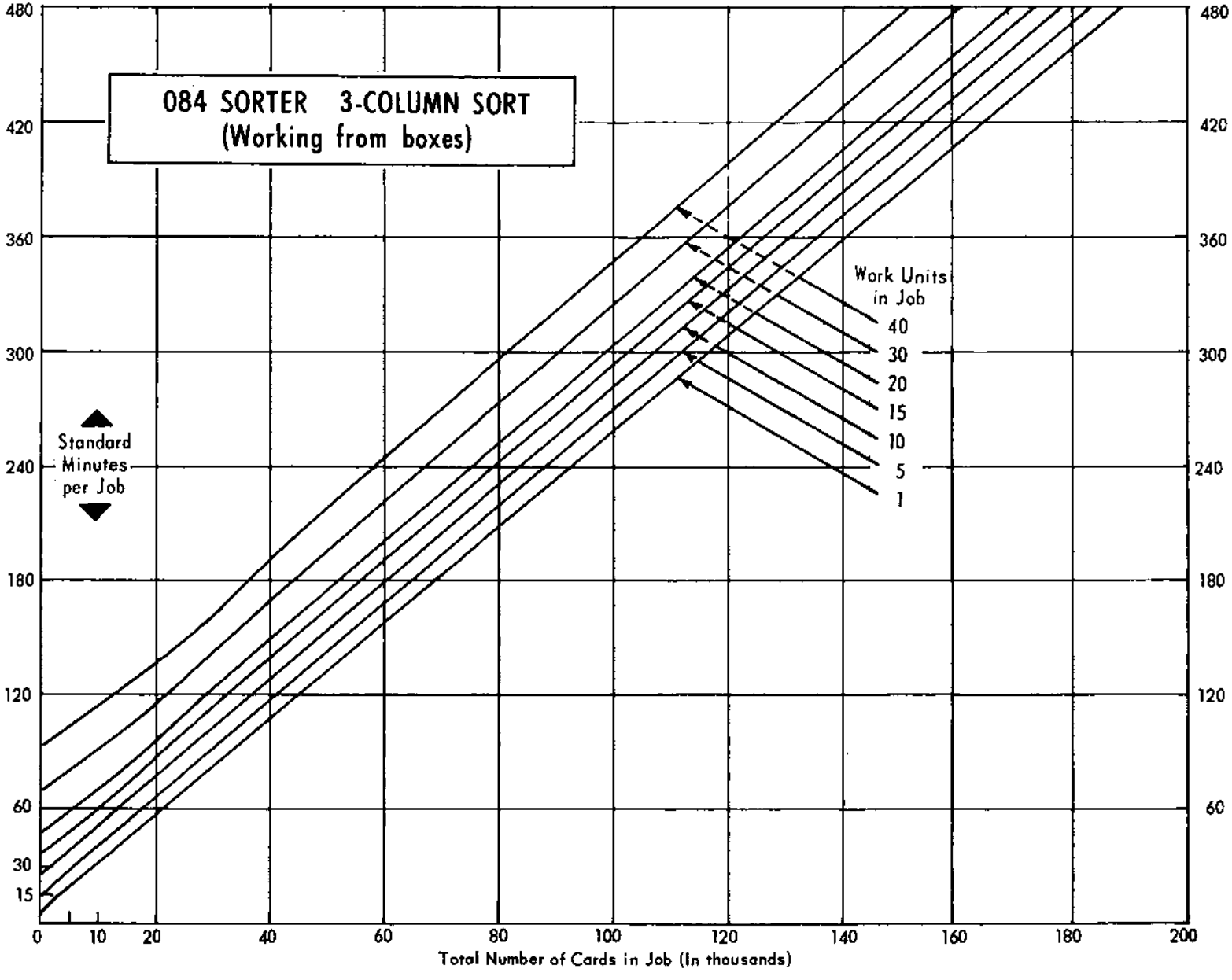


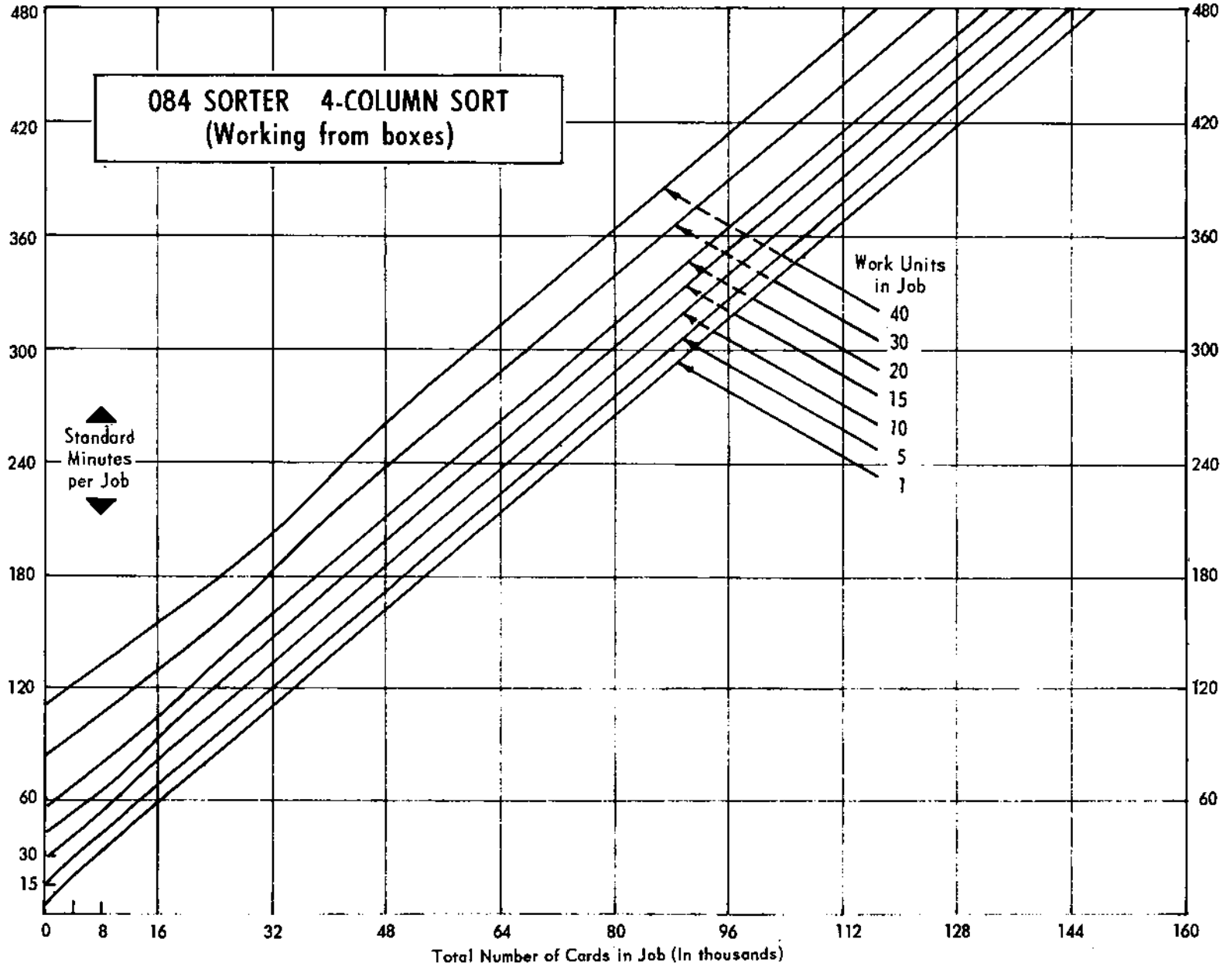


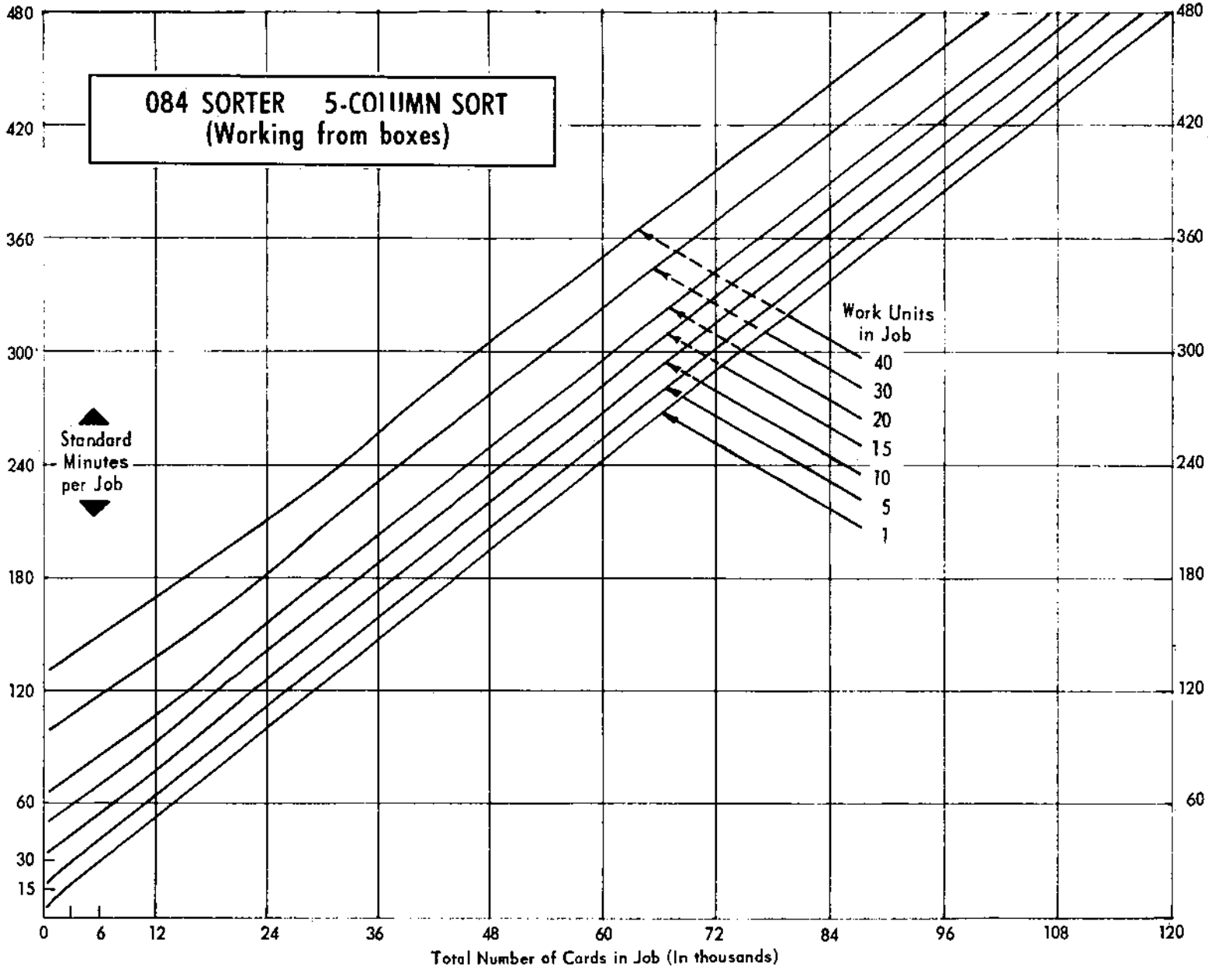


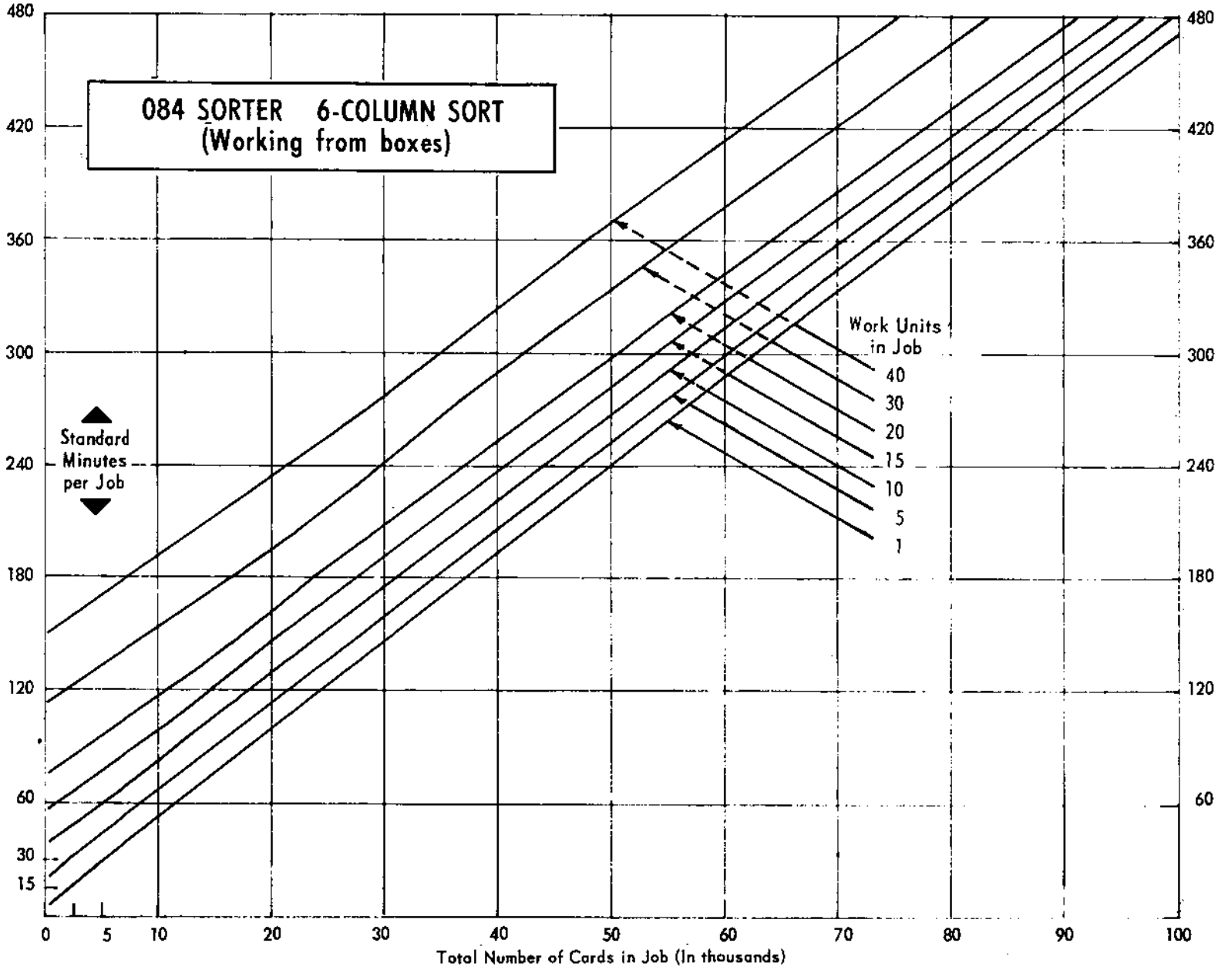


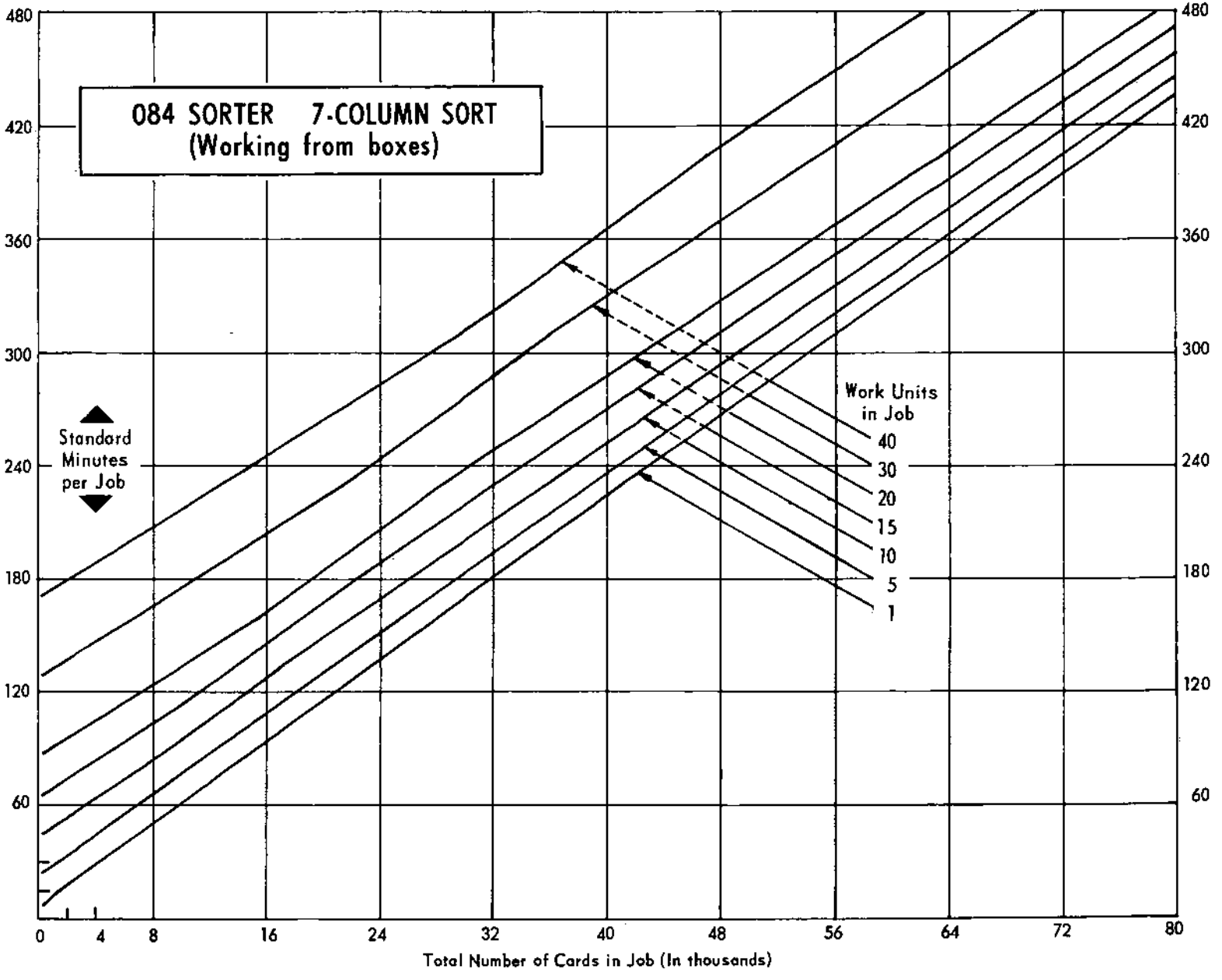


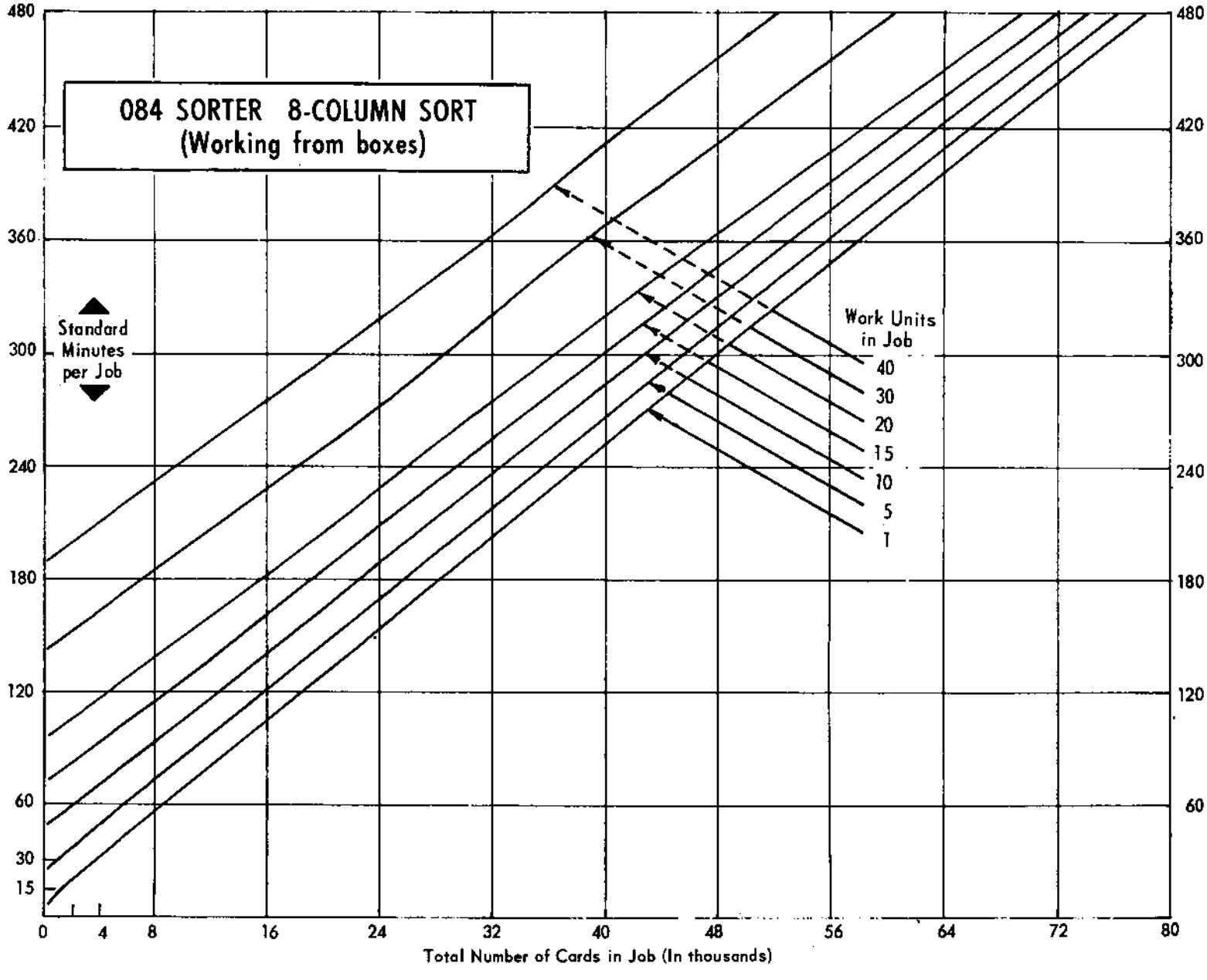


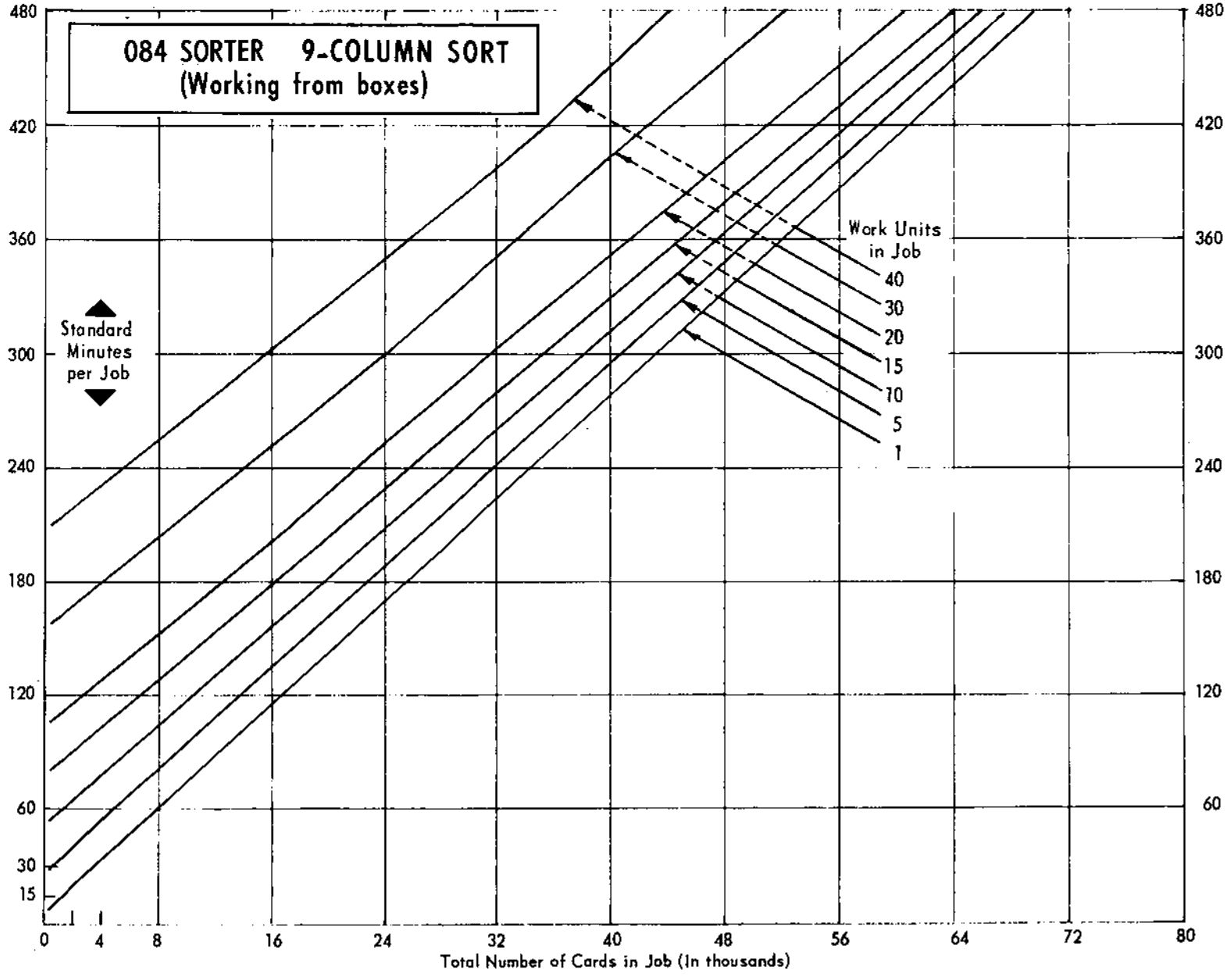


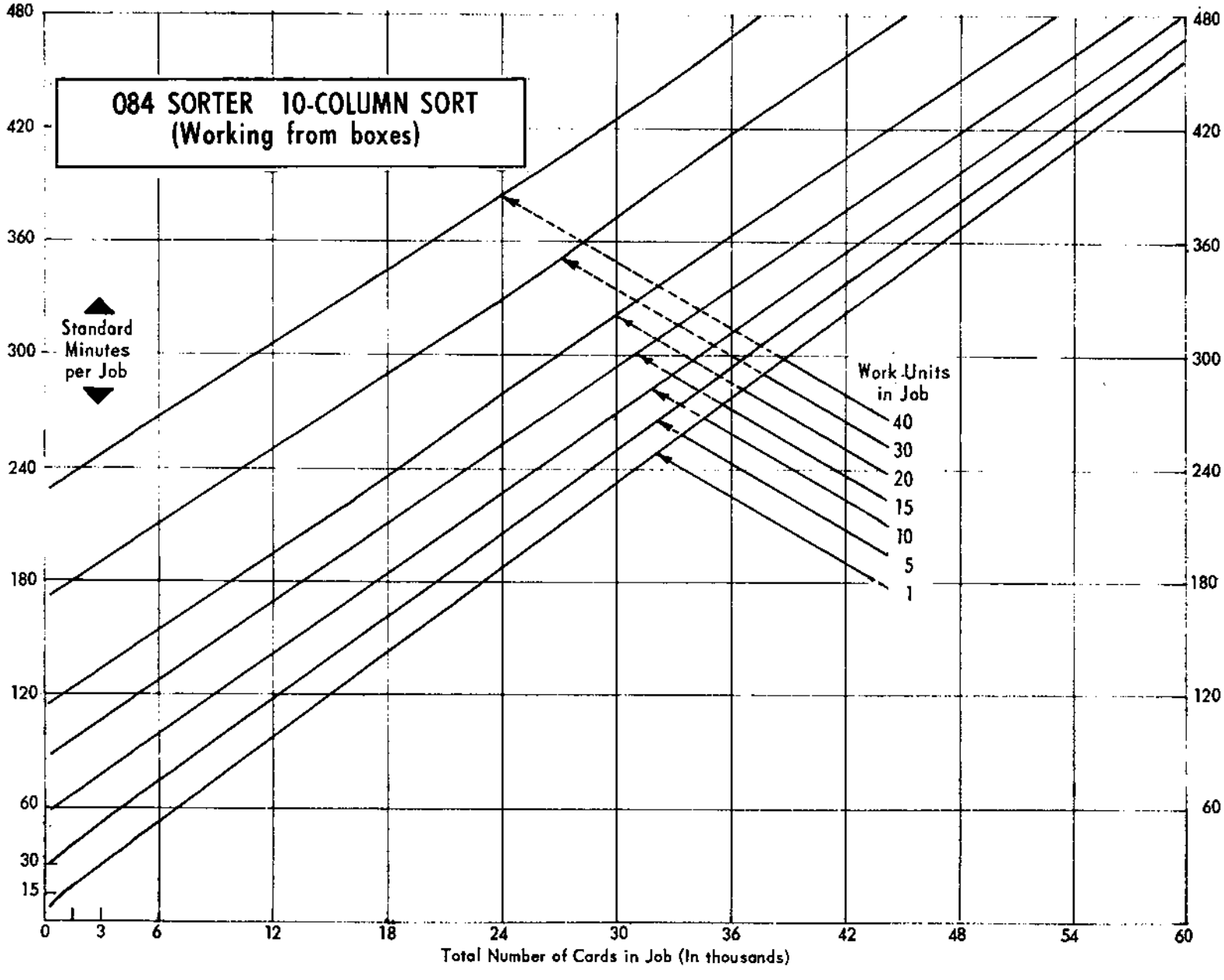


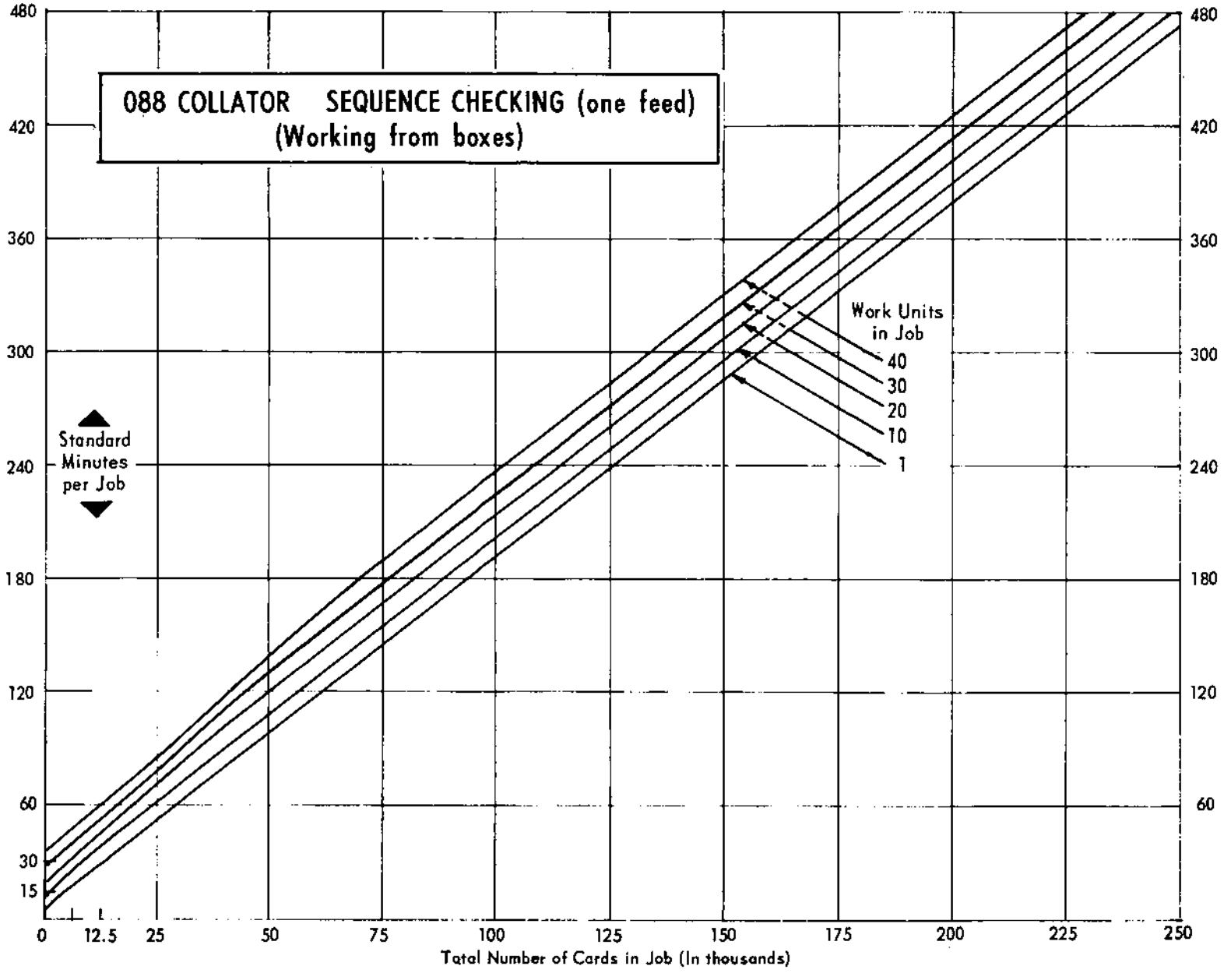


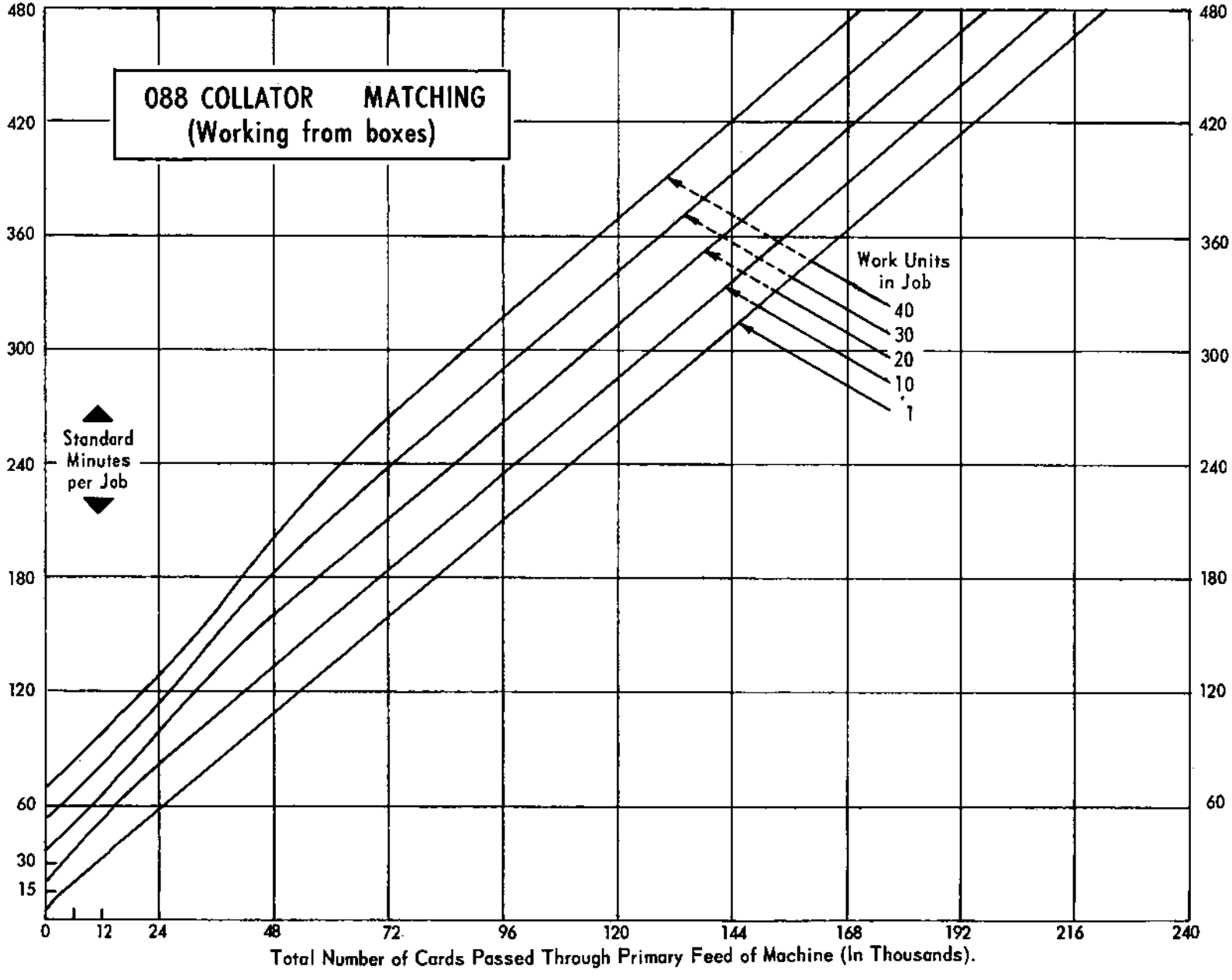


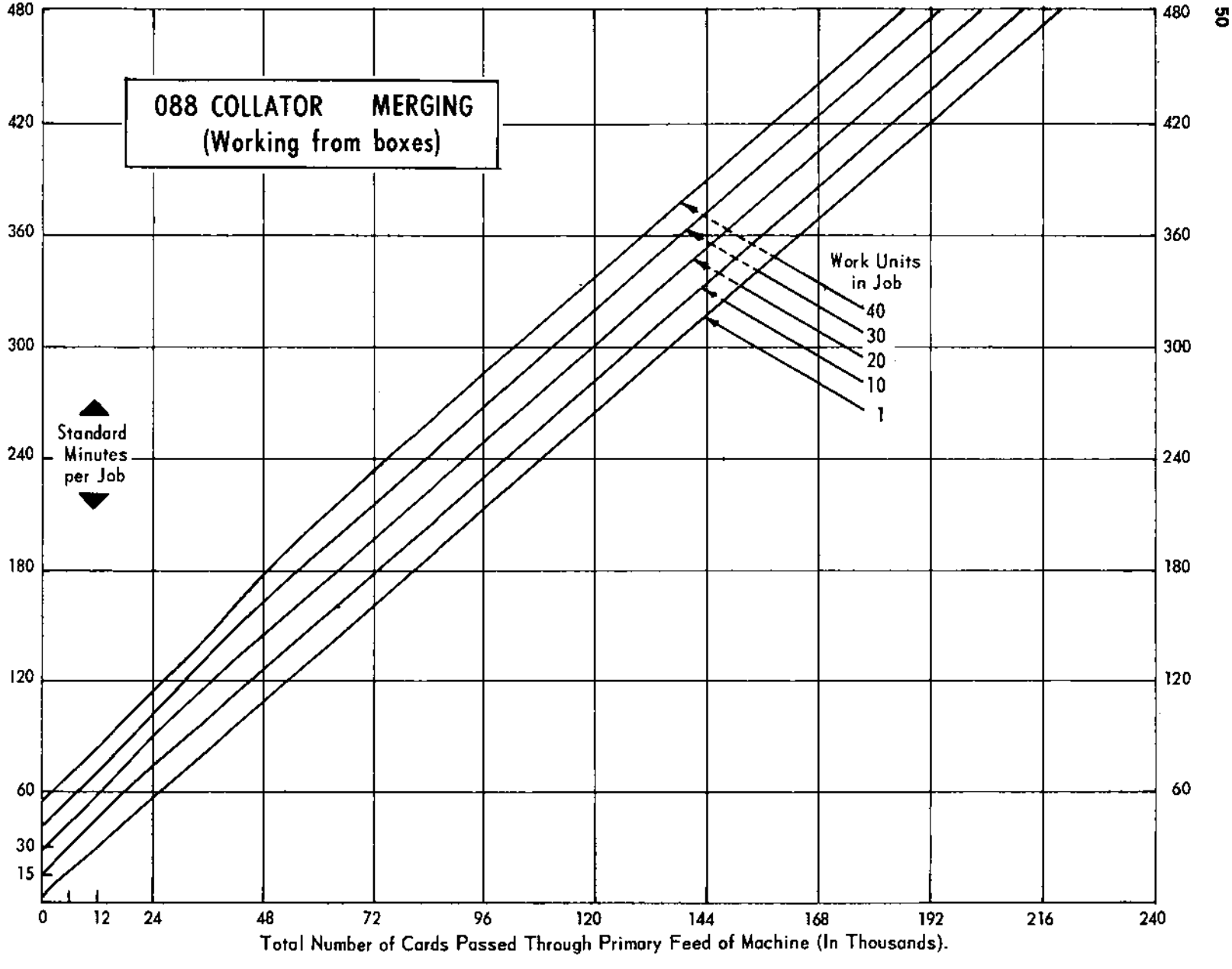


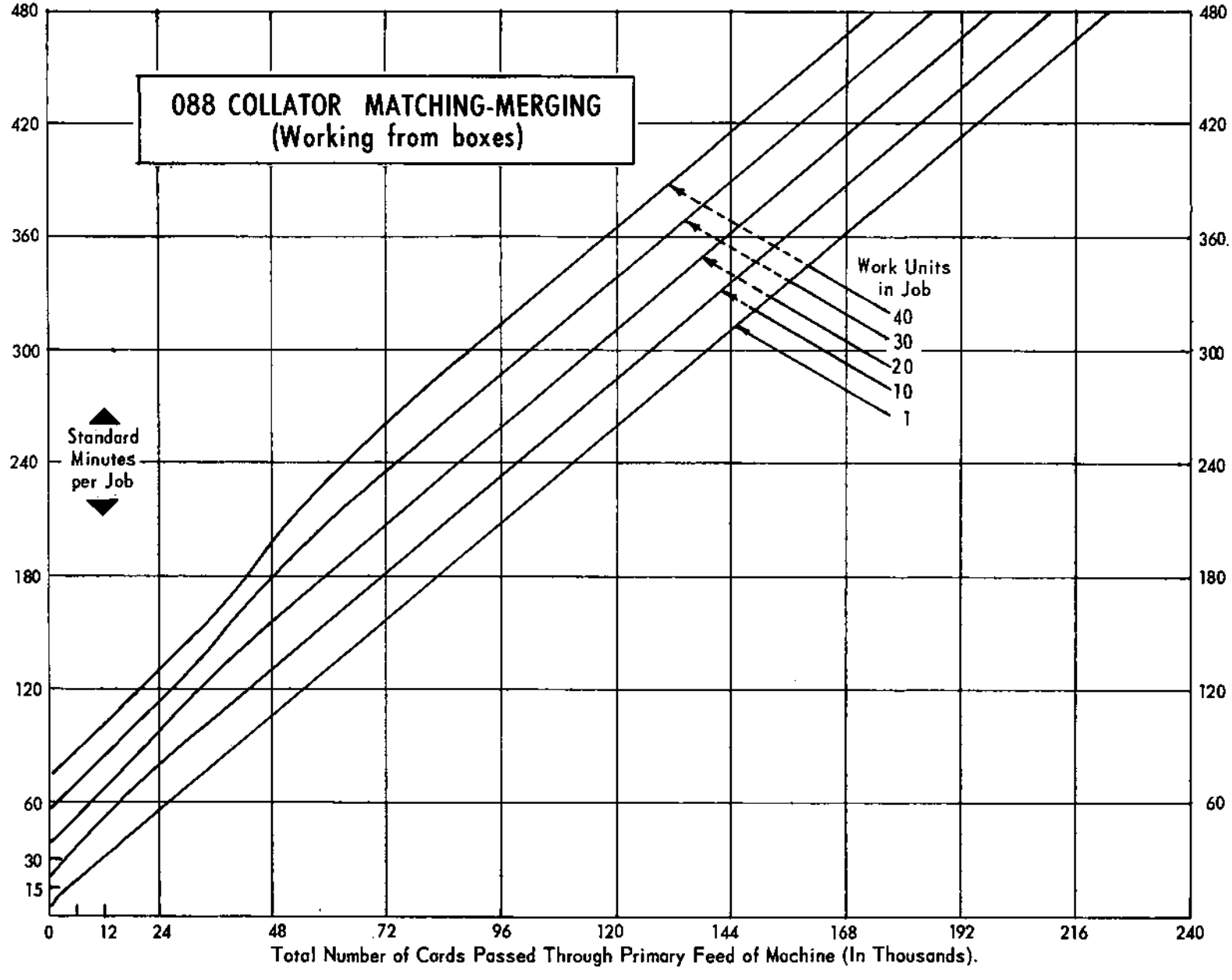


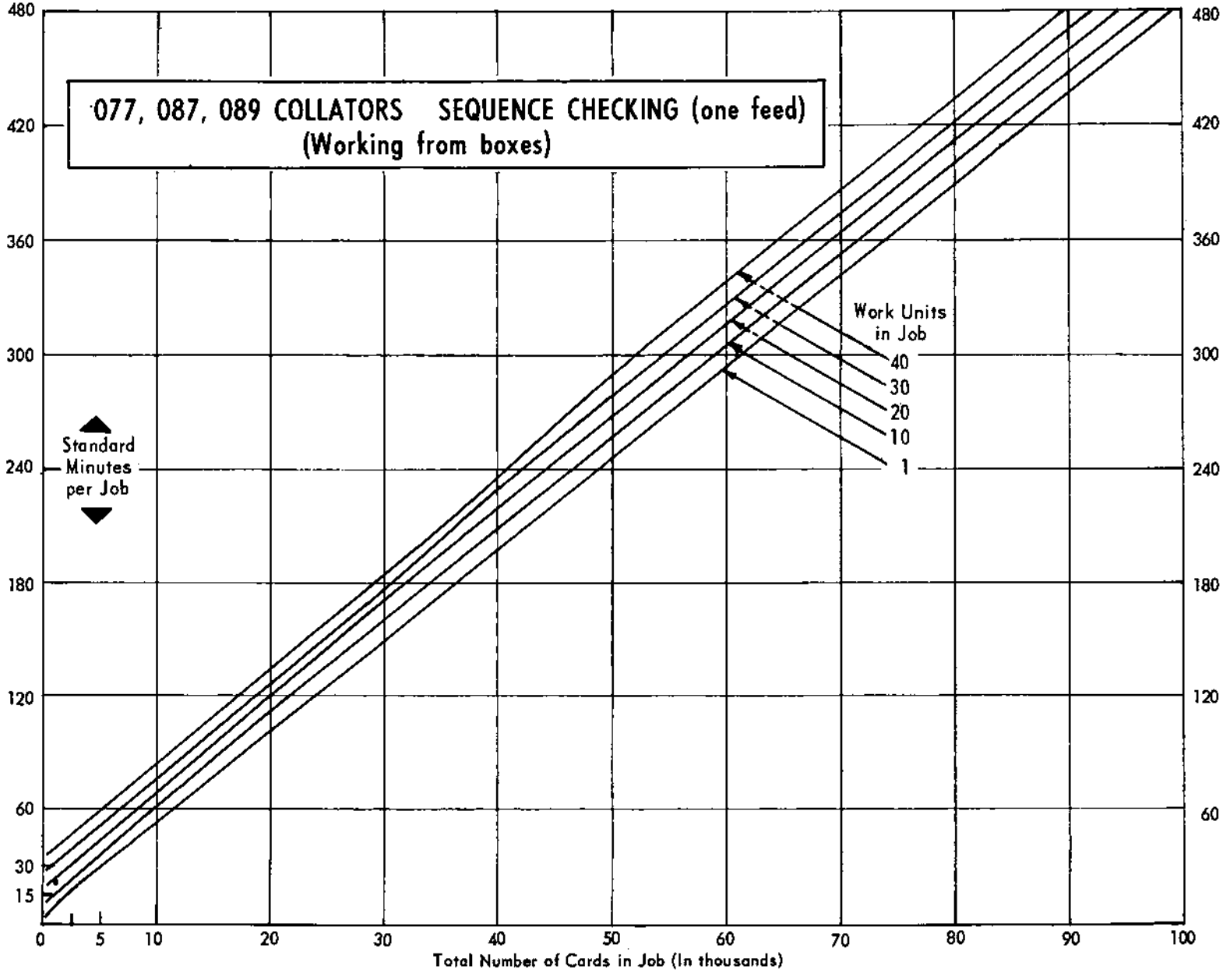


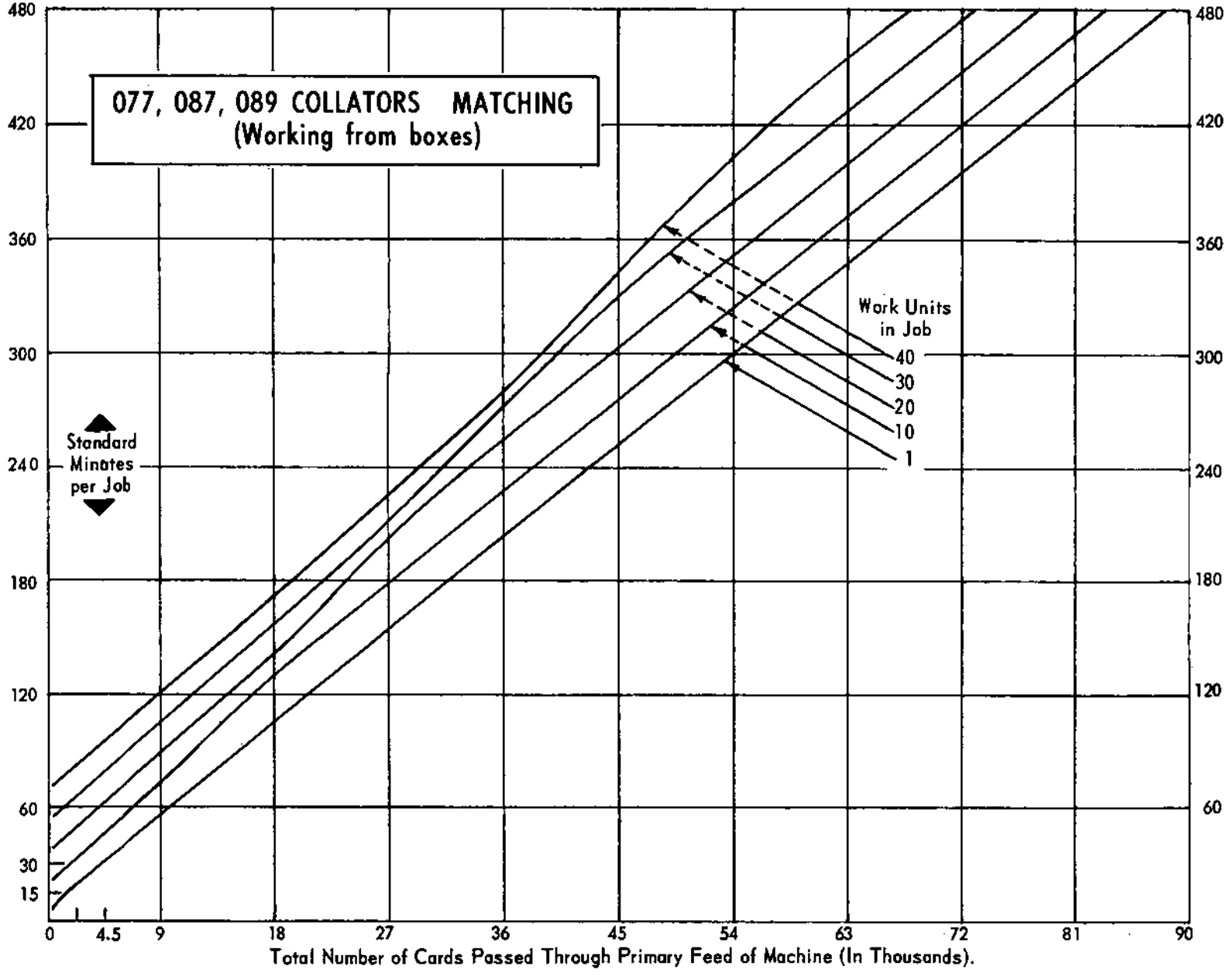


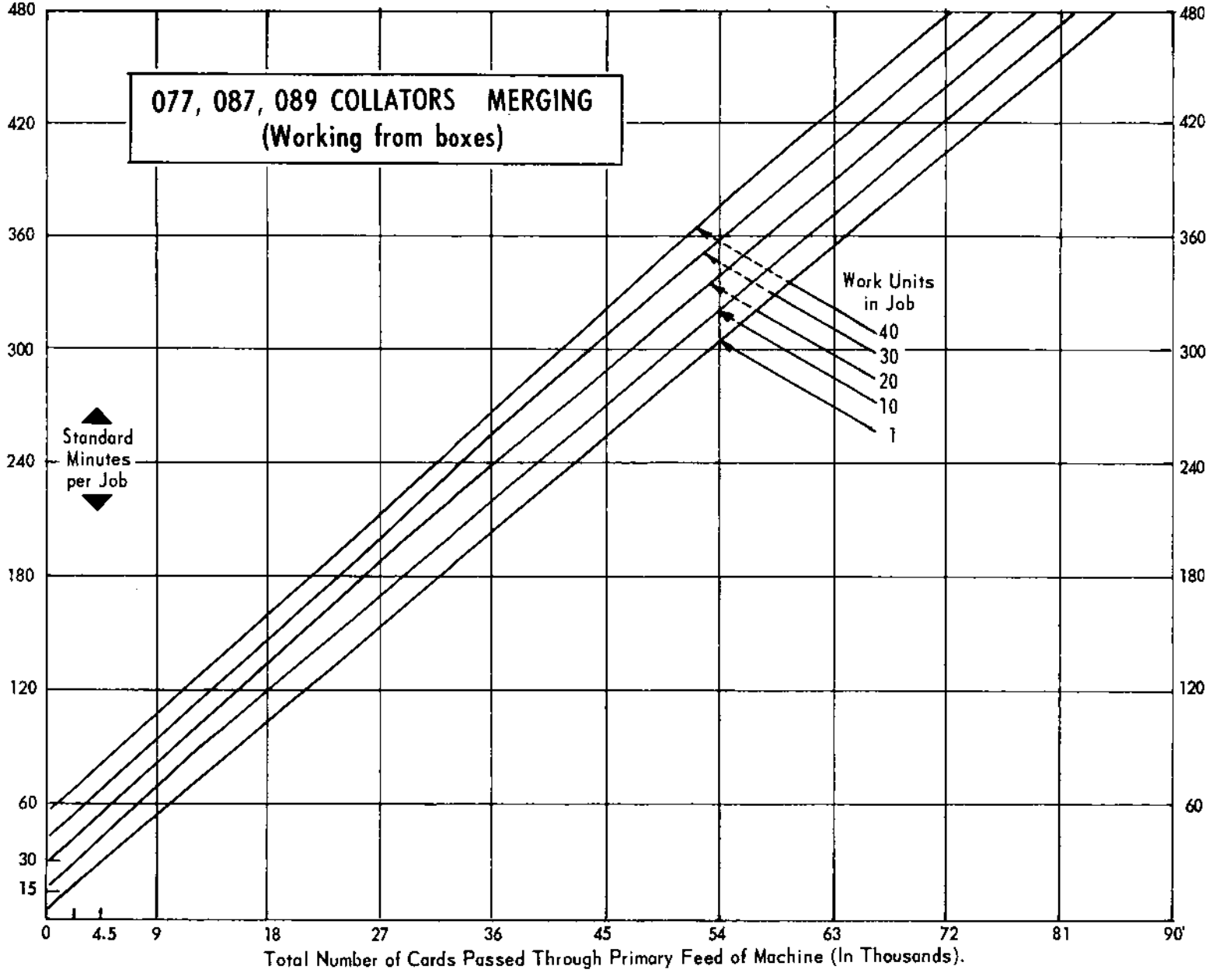


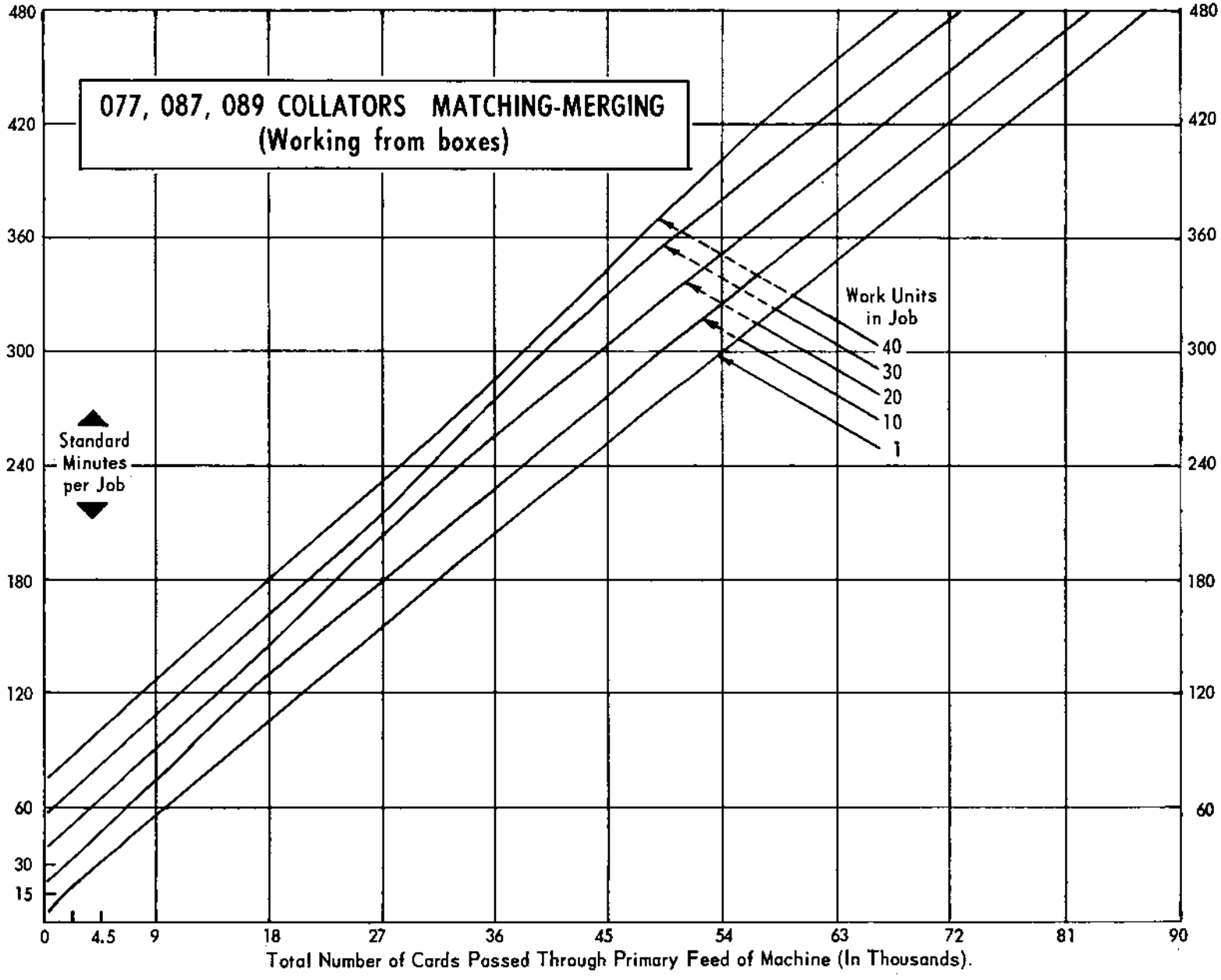


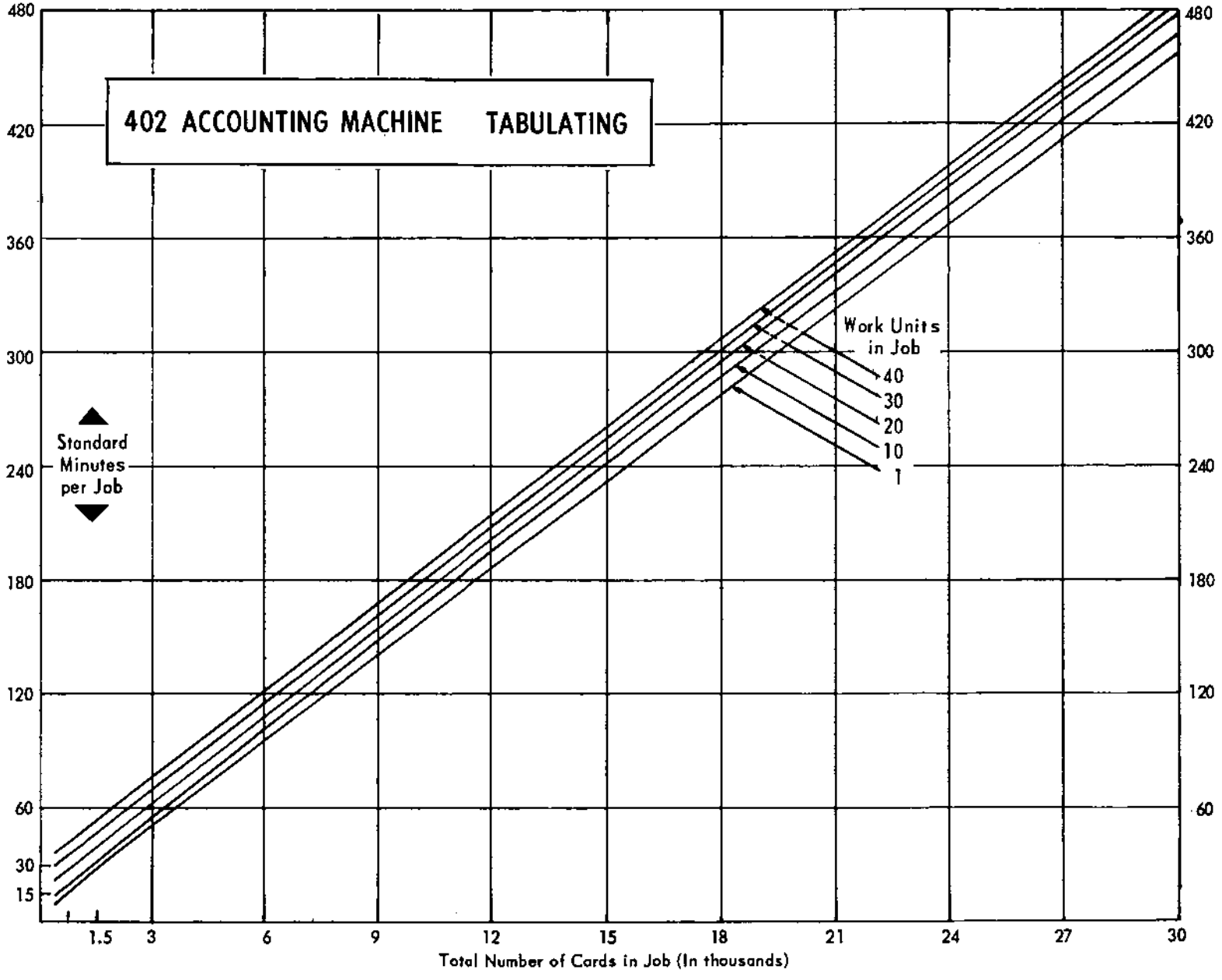


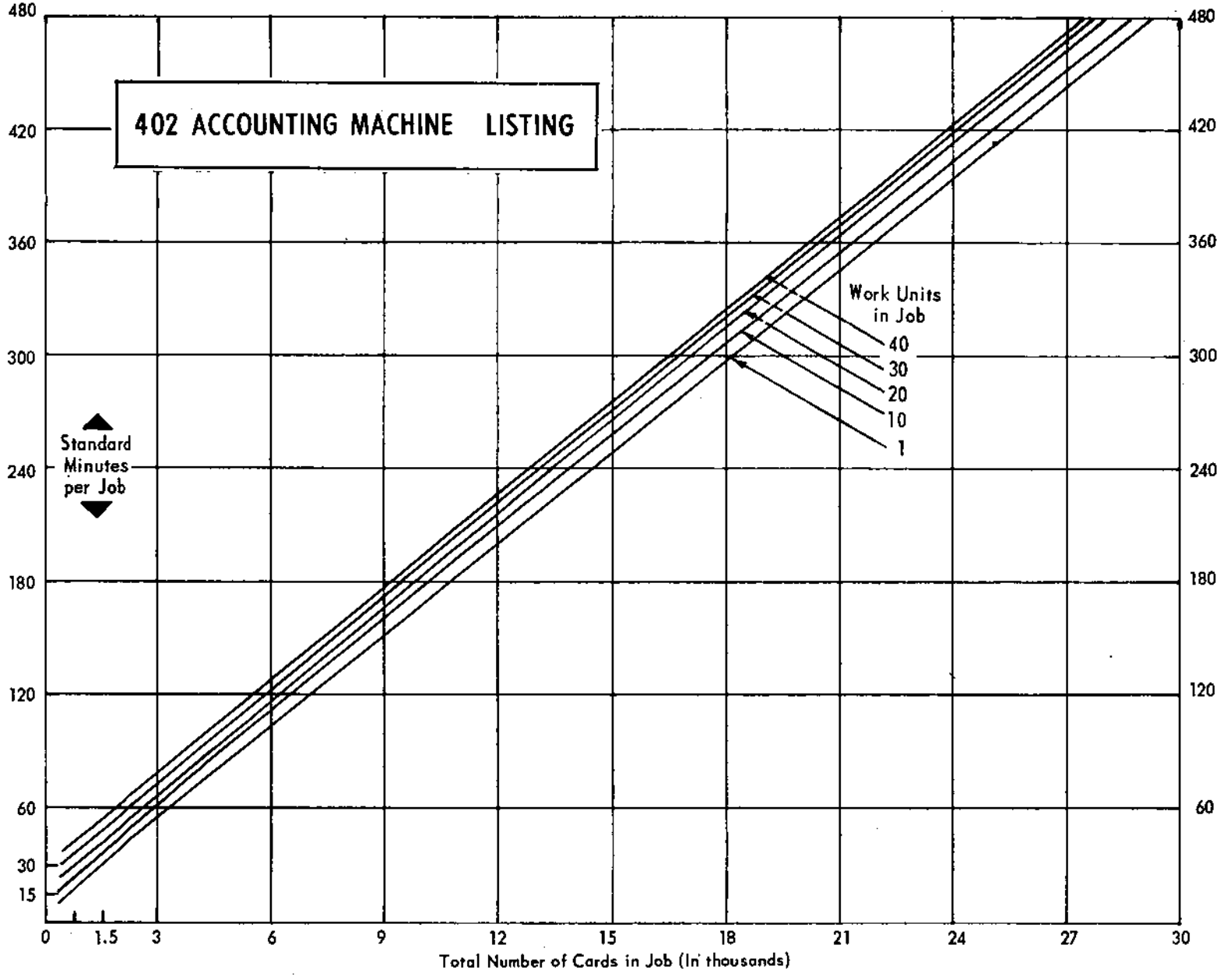


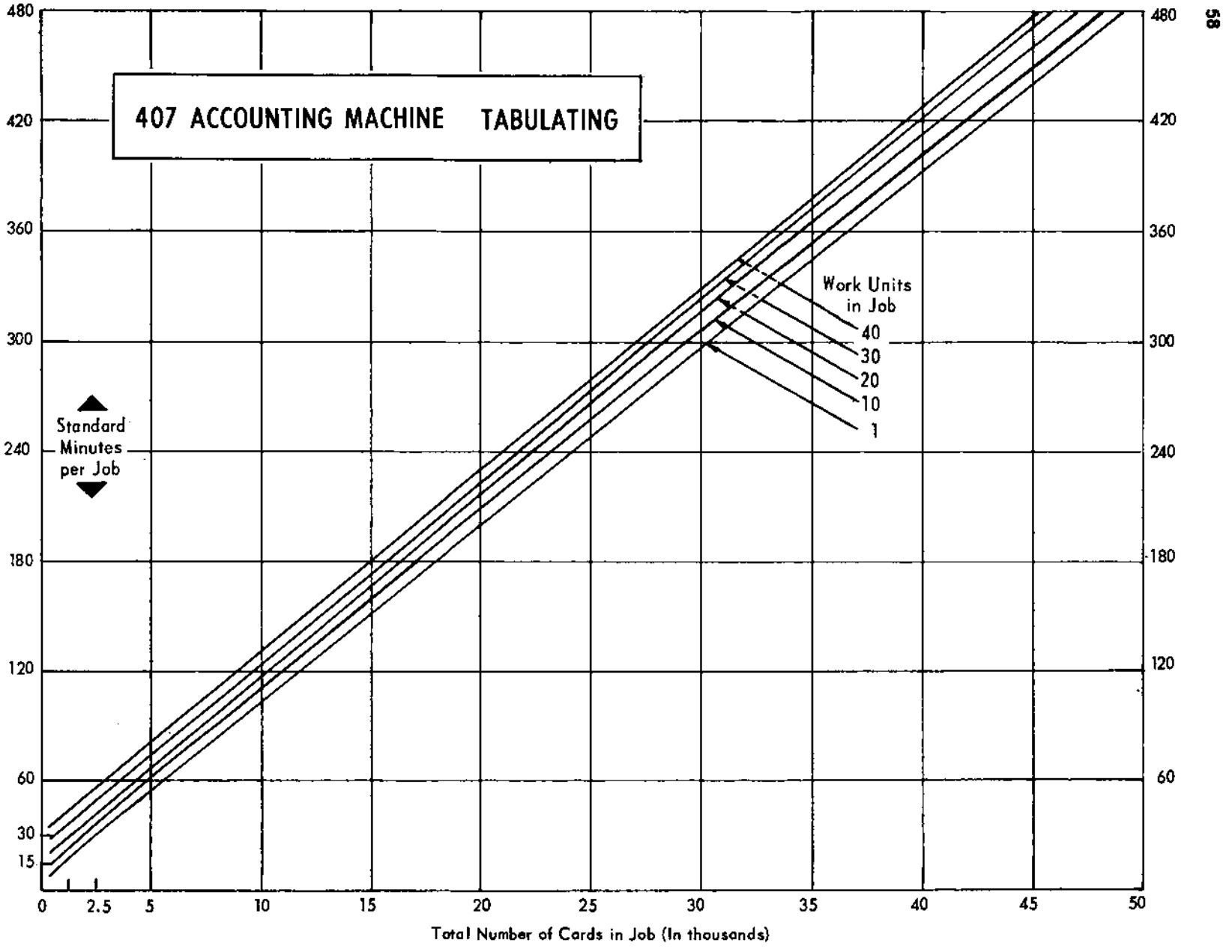


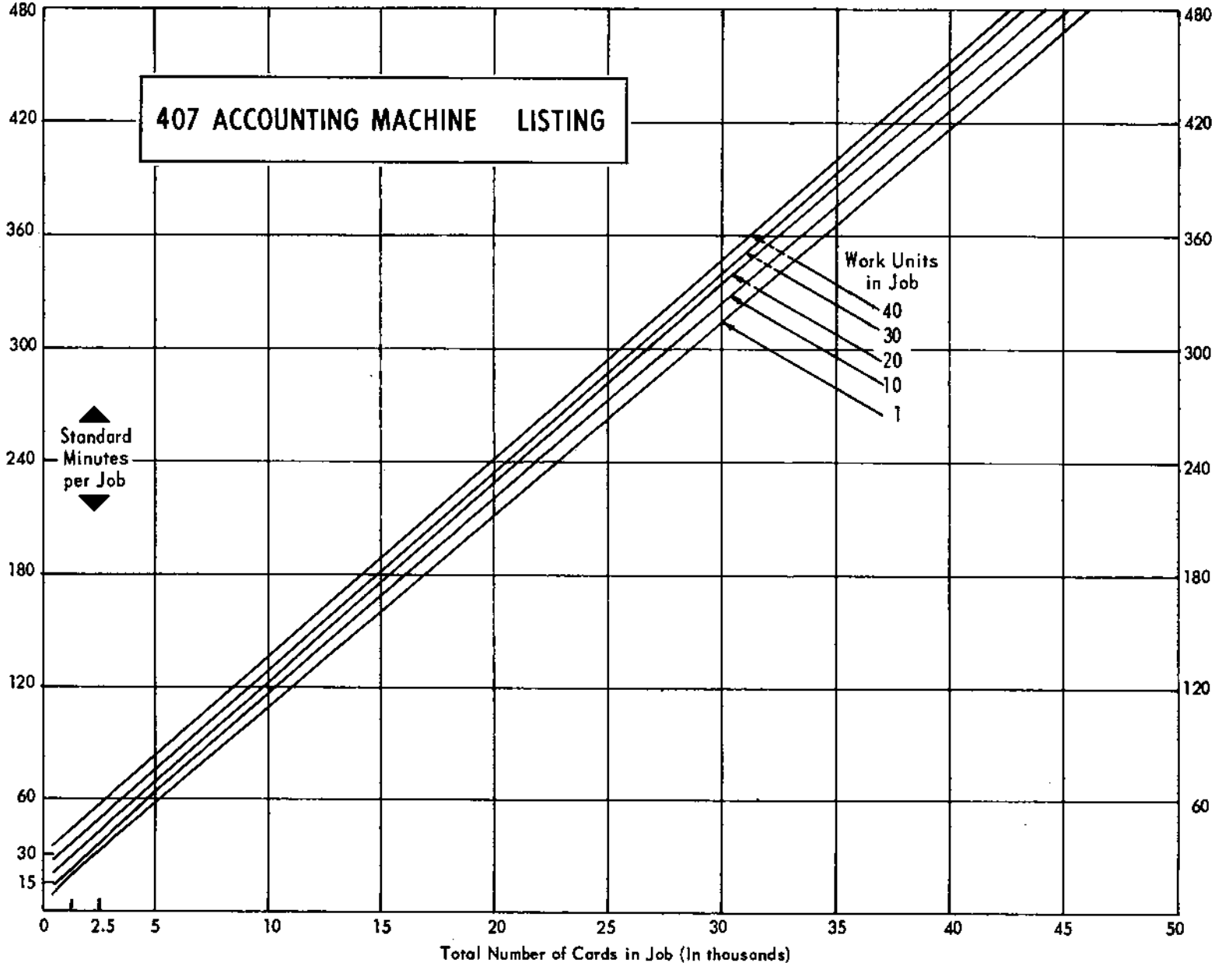


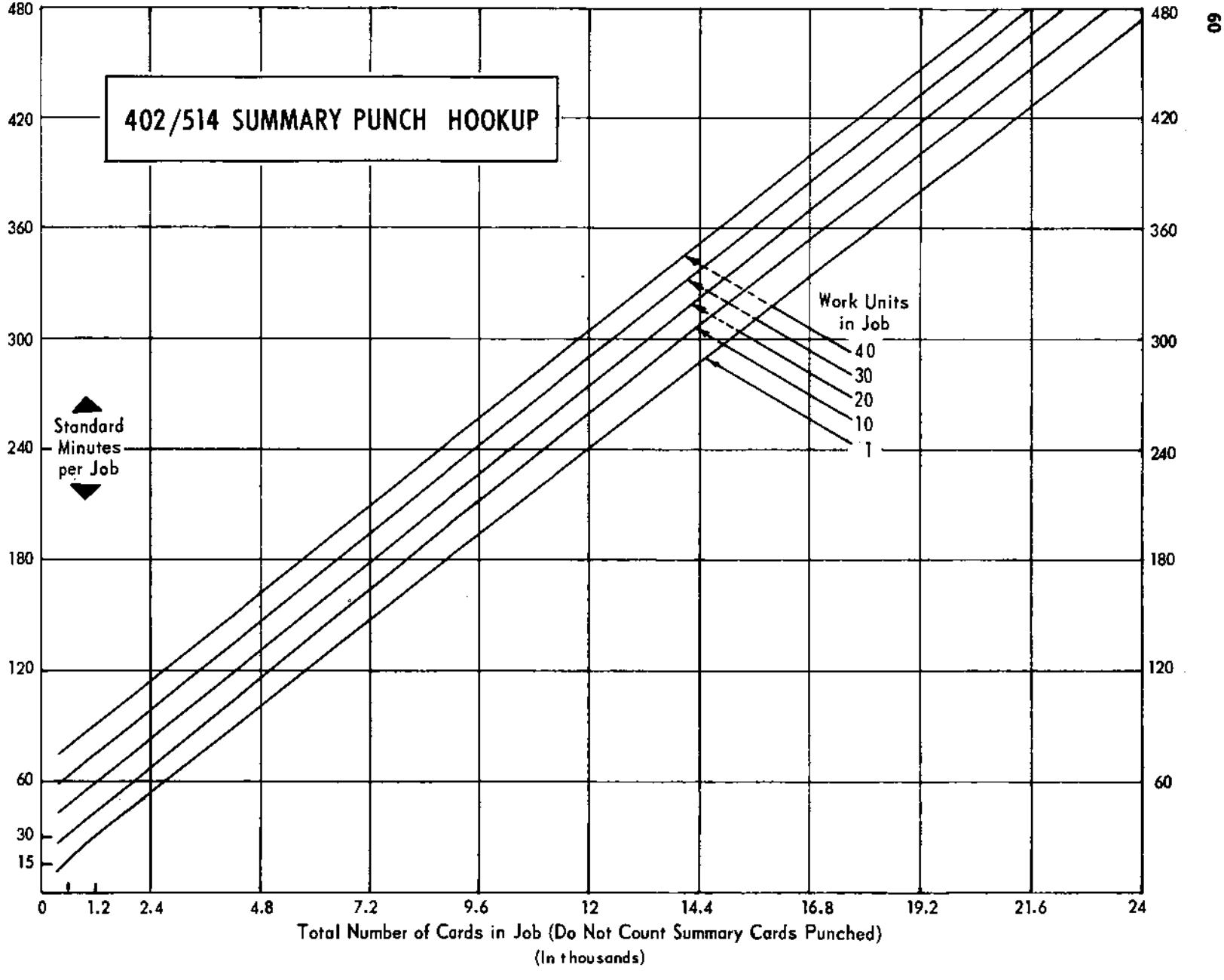


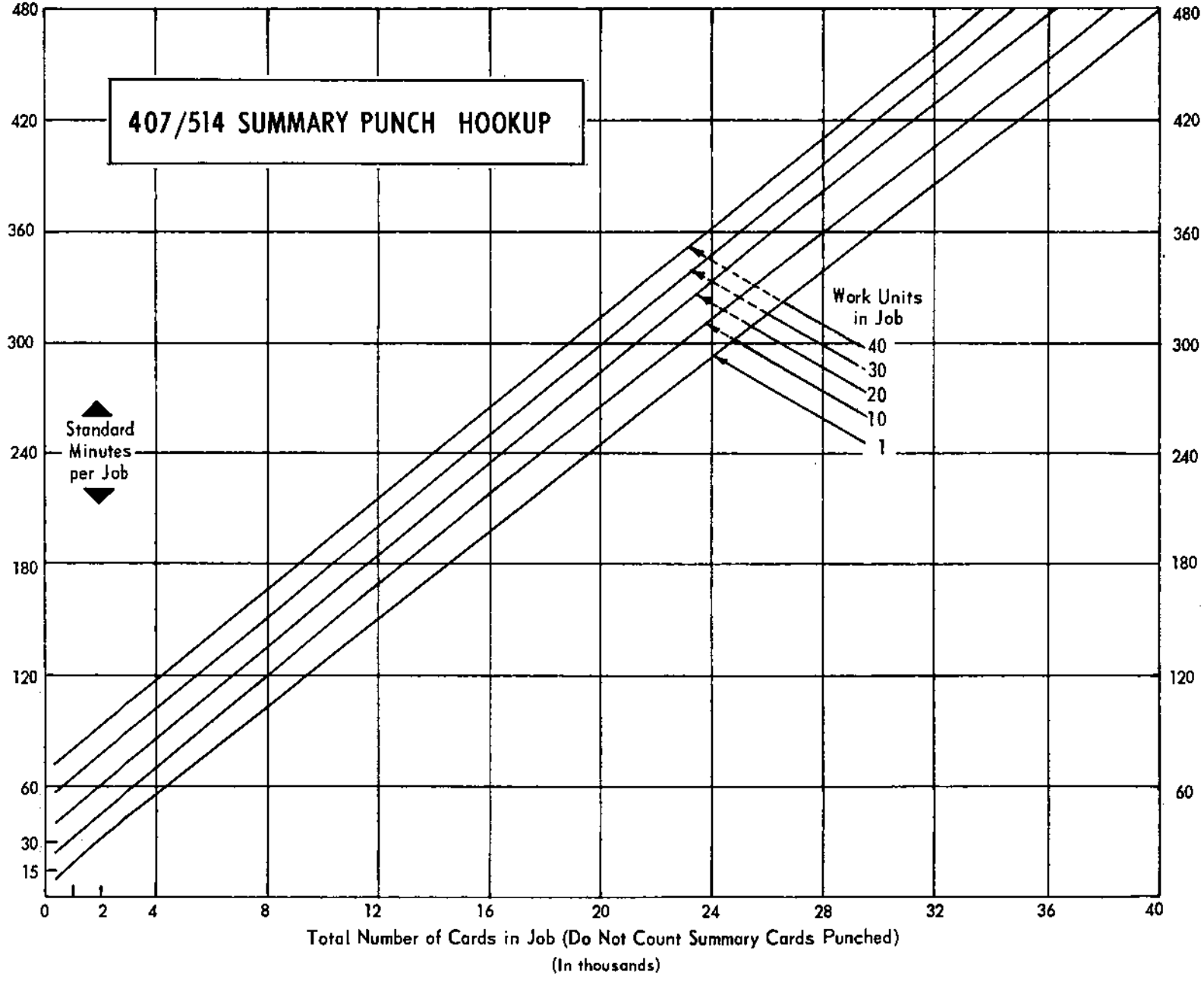


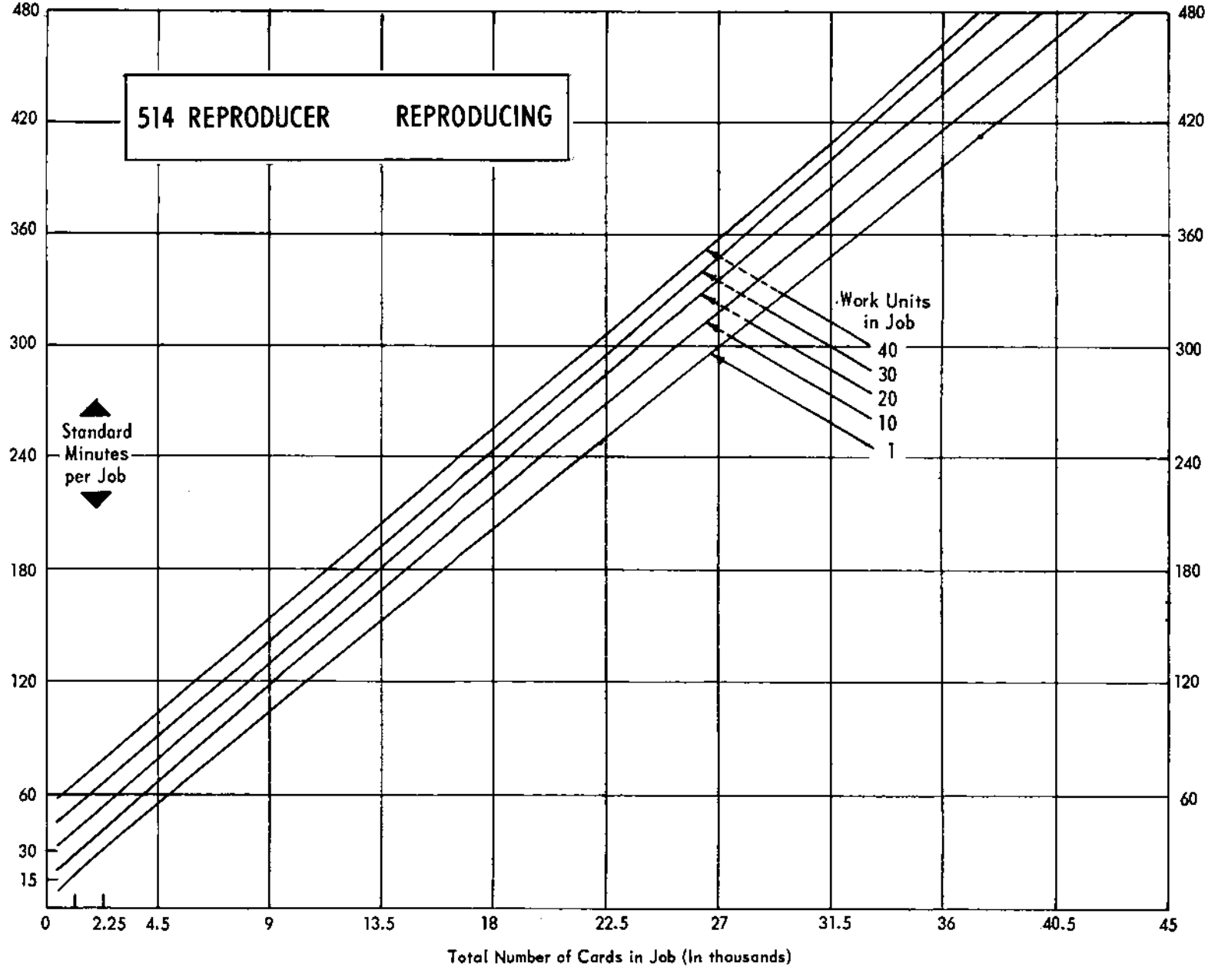


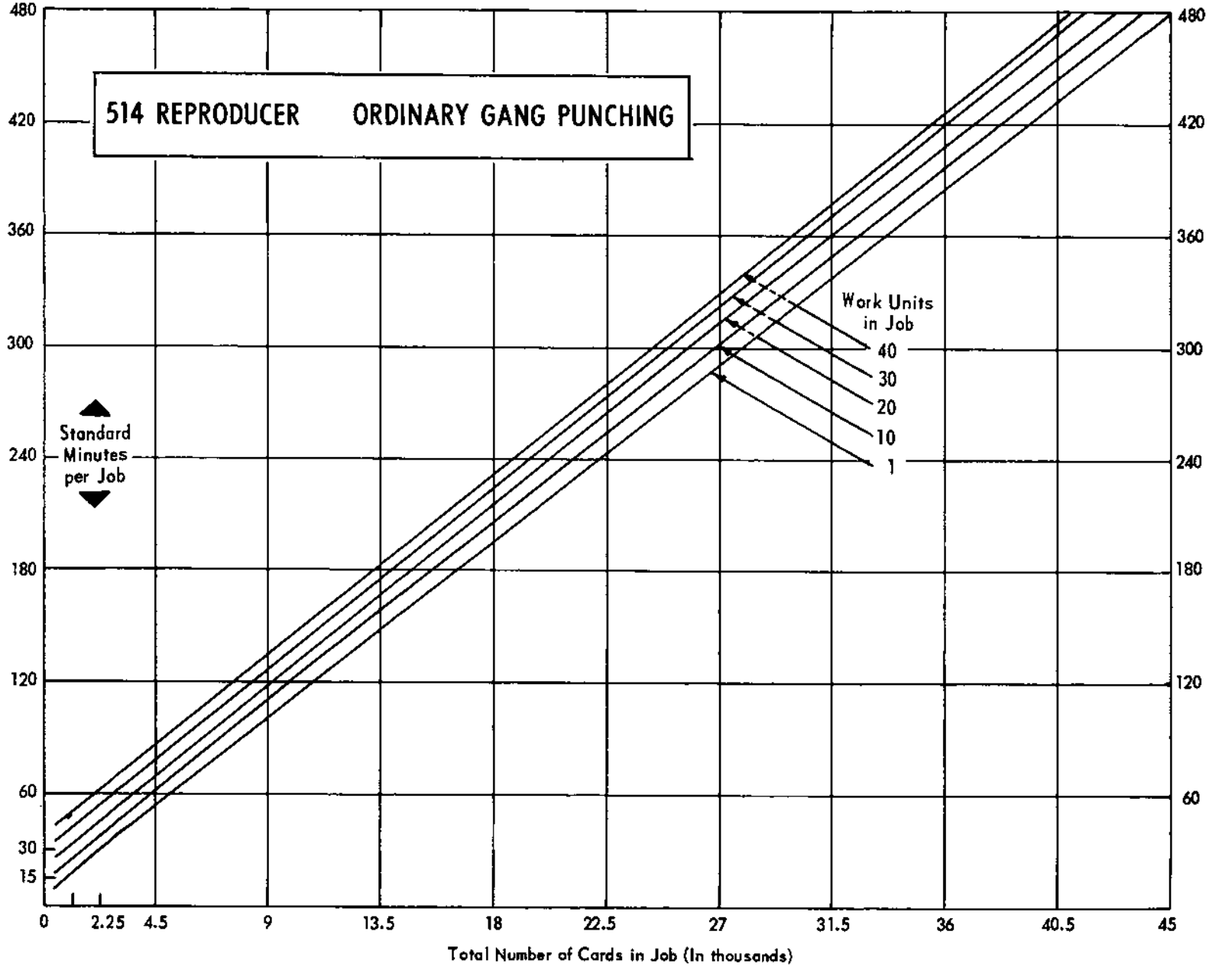


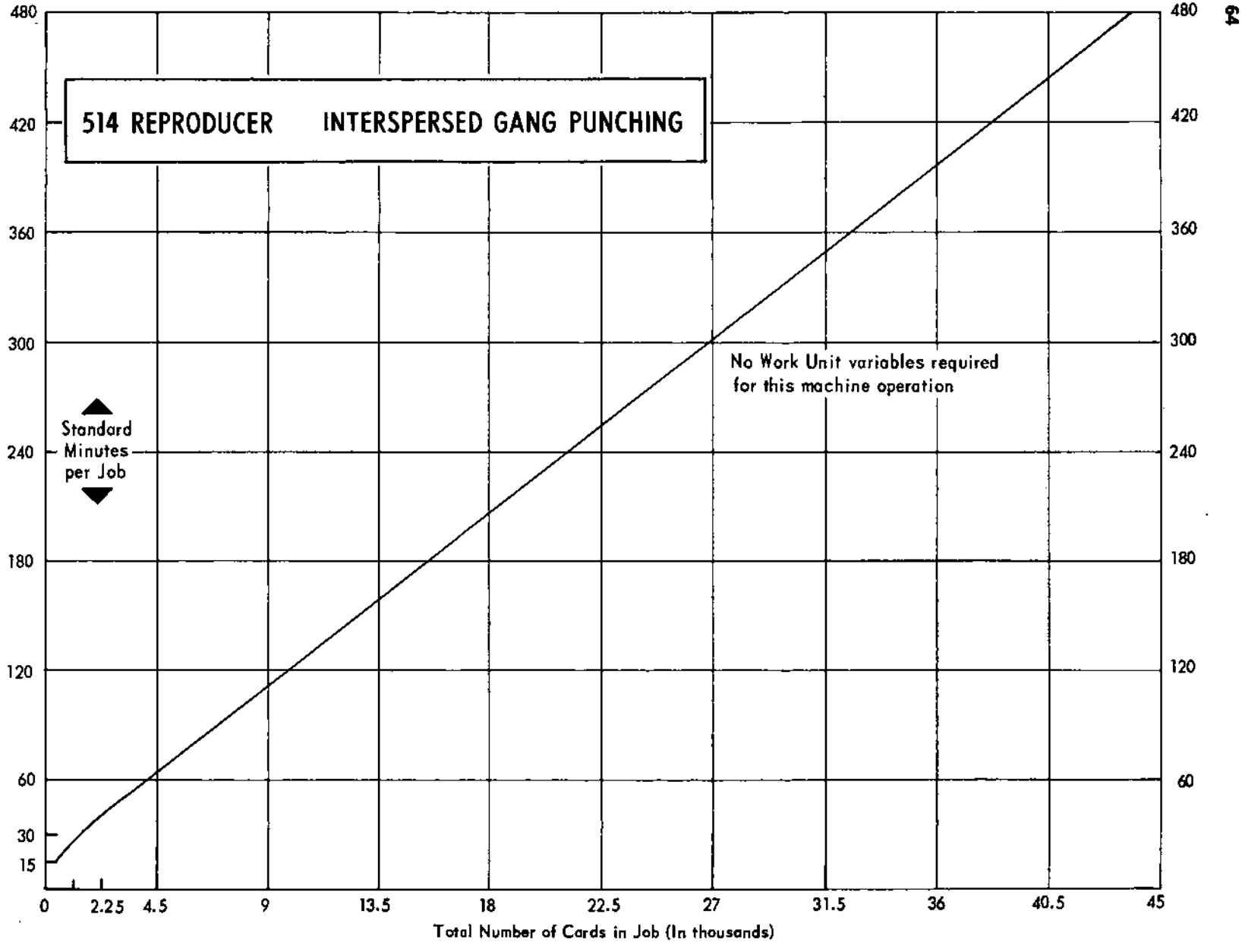


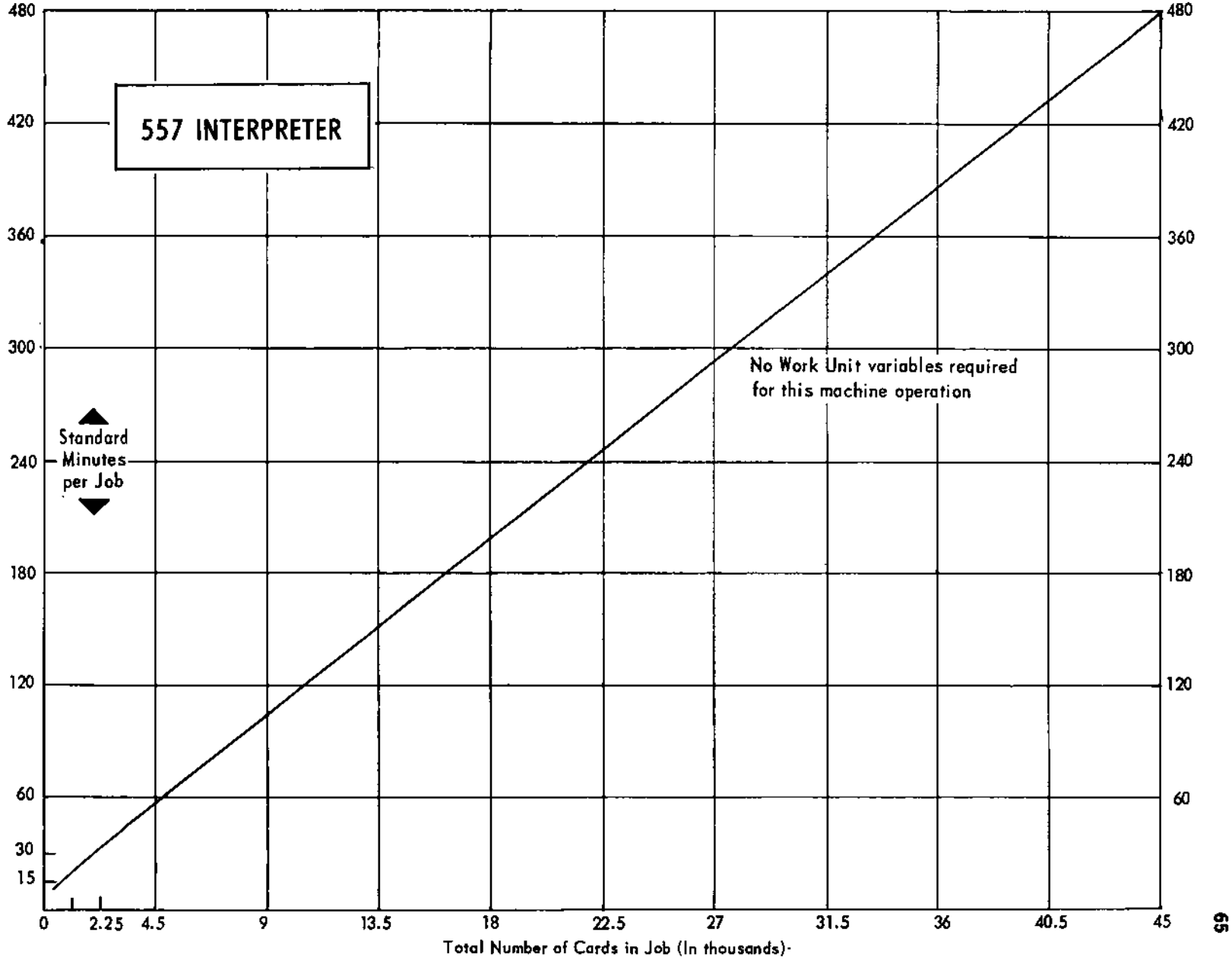


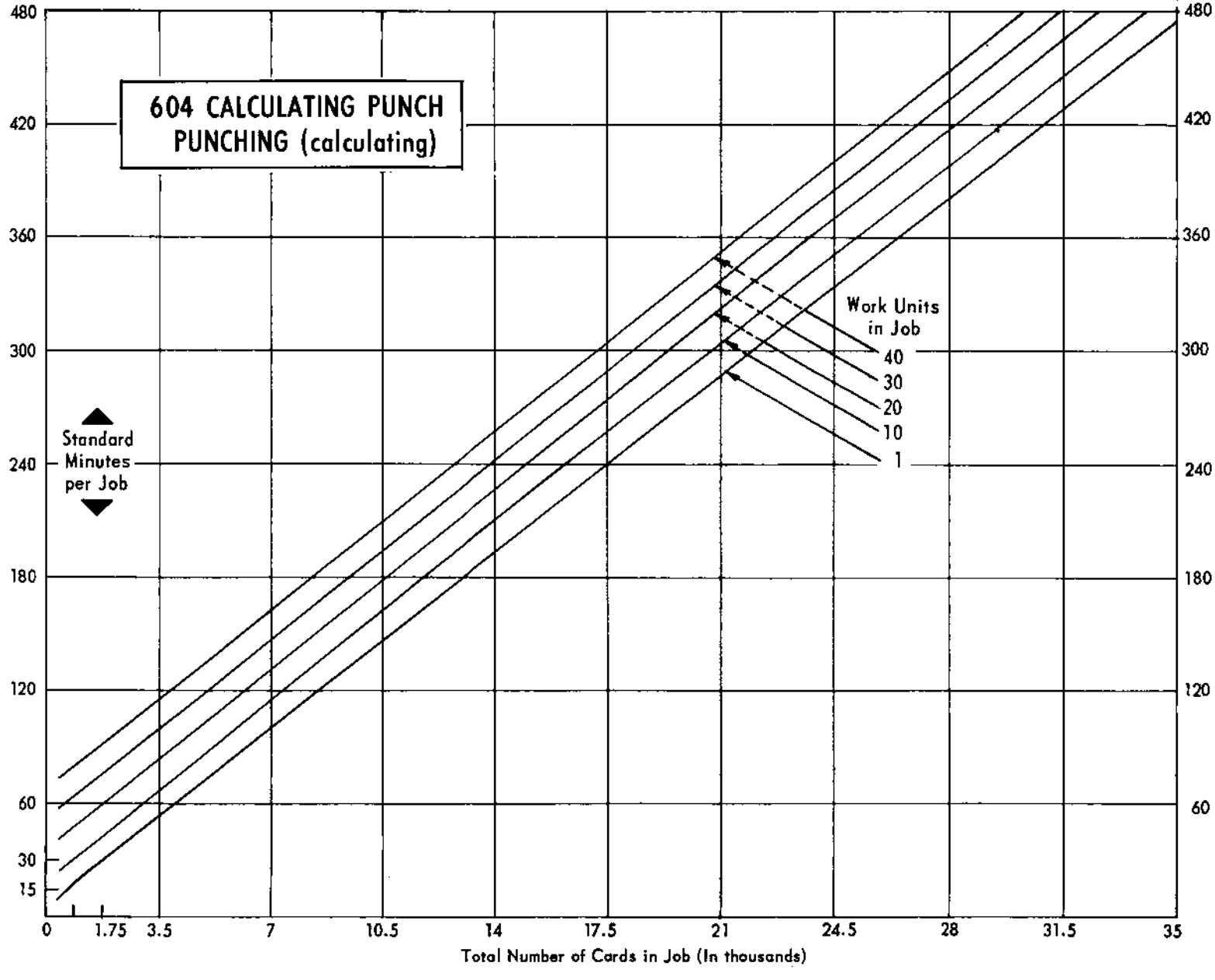


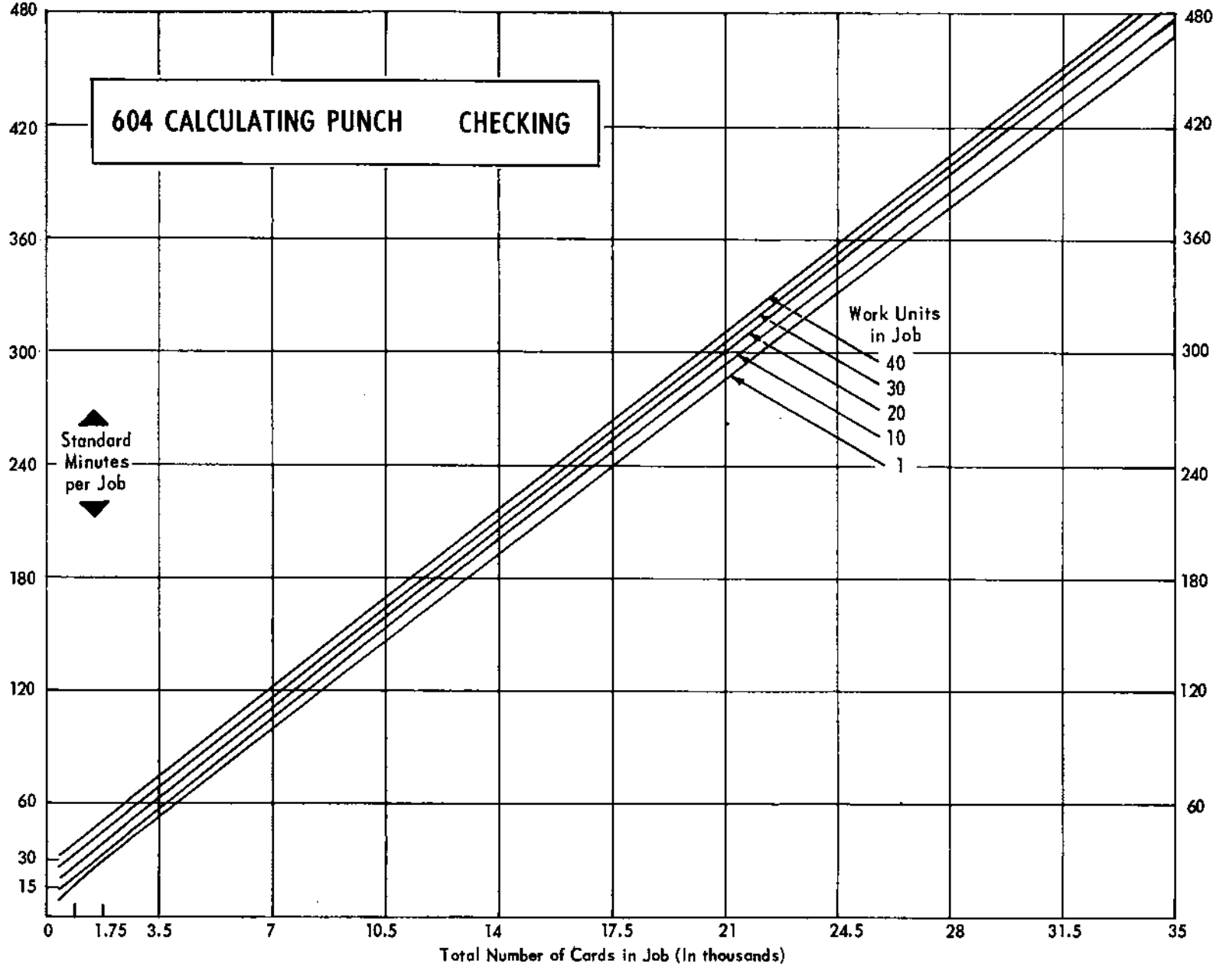


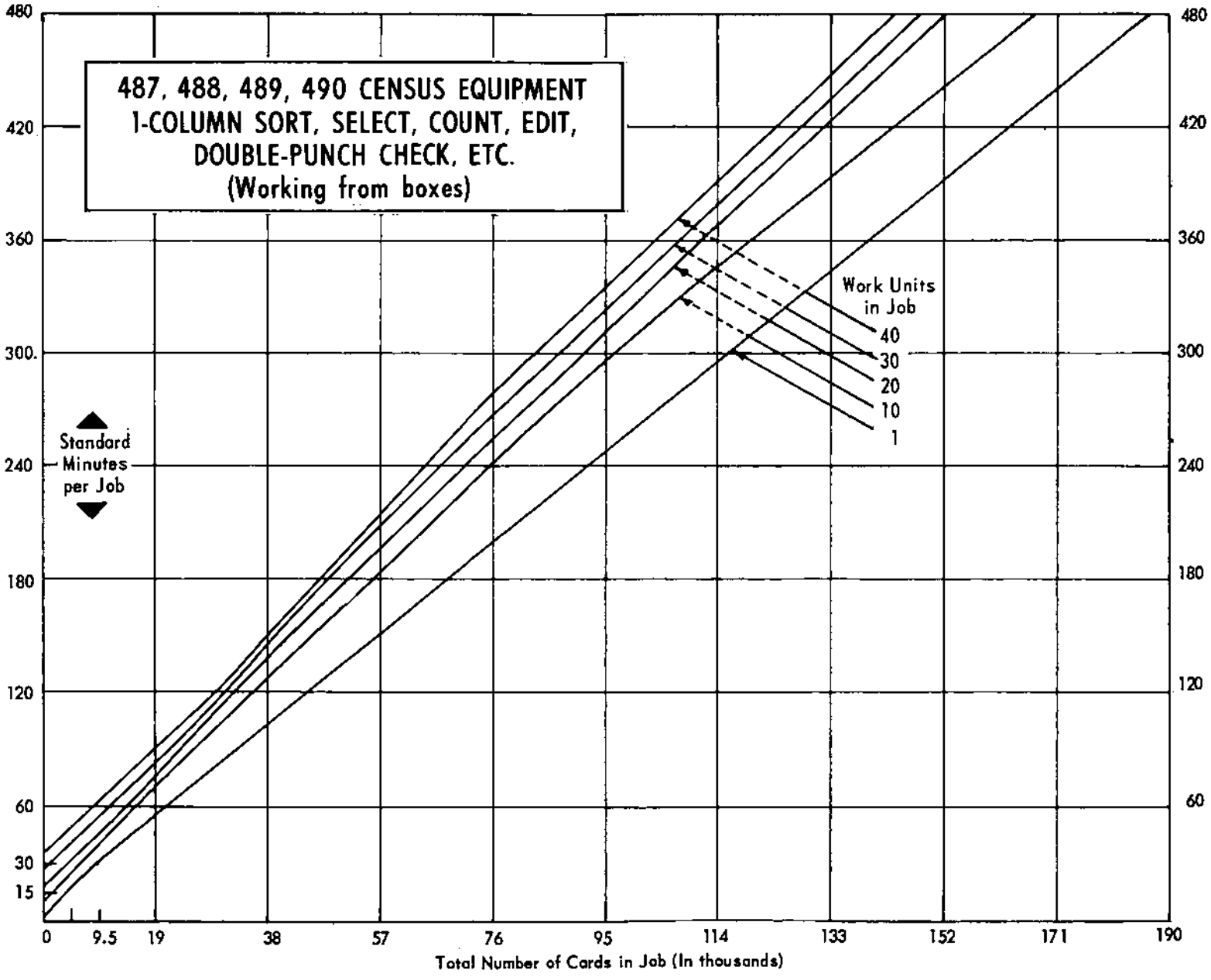












Part III

Detailed Engineered Standards for Tabulating Equipment

INTRODUCTION TO DETAILED STANDARDS

This part of the manual includes detailed engineered standards, used primarily to measure individual operator performance. The standards are appropriate for computing operator performance on each machine job or for determining individual and group performance on a daily, weekly, monthly, and quarterly basis. Performances can also be computed by machine type if more precise budgeting figures are desired.

A power machine operation involves two major functions - the cycling action of the machine, and the necessary physical activities of the operator. The standards provide for the entire running time of a machine and only that part of the operator's activities which must be performed while the machine is idle, such as positioning the sensing brush for the next column sort or emptying the machine stackers at the end of a column sort before starting the next sort.

The manual activities which can be done only when the machine is stopped are identified as "external" elements; the remaining necessary manual activities which are performed while the machine is running (cycling) are called "internal" elements. Careful analysis must be made of a machine operation to determine the amount of physical activity which is required, and to distinguish accurately between "external" and "internal" elements. Most of the elements are performed over and over during the course of a machine operation. The decision as to whether they are external or internal elements, and how many times

they occur in either case, depends usually upon the time of their occurrence in the operation.

The "Work Unit" standard provides for the external physical elements of the operator while handling the cards and operating the machine. A machine job contains more than one work unit when the card deck is separated into groups representing intermediate classifications, and these groups are processed independently of each other during the course of the job.

An example of the development of a "Work Unit" standard is shown immediately following the standards tables. It relates to the operation "Ordinary Gang Punching" on the 514 Reproducing Punch.

A writeup of general operating procedures precedes the standards for each type of machine operation. A few of the physical elements involved in operating tabulating equipment are: position file box from truck top to truck shelf, insert file box wedges, empty machine pocket to box or rack, load machine hopper from box or rack, start machine, empty all pockets to machine top, sight check, cards from machine top to file box or rack, reset counter, etc.

The normal times for manual elements in the standards have been increased by an allowance of 10% to provide for personal time and unavoidable delays. The actual times for machine cycling (card cycles) have been increased by 5% to provide only for personal time.

The units of measure which comprise the series of detailed standards for tabulating equipment are: SET UP, FIRST TEST, ADDITIONAL TEST, PROBLEM CARDS, WORK UNIT, JOB, and CARD CYCLE. A brief but informative explanation of each is provided below.

SET UP

An operator receives the appropriate set up time value for each assignment of work performed on a specific machine. Generally, this standard provides for the time spent by the operator in receiving instructions, getting the work and placing it in a convenient location by the machine, preparing the machine for the job (switches, control panel, tab paper, etc.), securing the work and machine when finished, and recordkeeping. Usually each machine job represents an assignment and requires a set up. Occasionally several different jobs may be performed on the same machine with the same deck of cards. When this occurs, only one set up is allowed.

TESTS

A test deck of cards is run through a machine to be sure that it is operating correctly. Test runs are made only on certain types of machines. These are identified by the test standards listed in the tables of standards. When an operator performs one or more tests as directed, he is entitled to the appropriate test standard (first/additional) for the number of tests made. This standard provides for getting the test material, running the test, checking and recording the results, and returning the test material. The card cycles of the test(s) are counted with the card cycles of the job when recording production counts for standard computation purposes.

PROBLEM CARDS

Problem cards occur while the machine is in operation for reasons such as jamming of card(s) and out-of-sequence card(s). The standard provides for removing the problem card(s) from the machine, correcting it as necessary, replacing it, and starting the machine. Two standards are involved, one for occurrence of problem cards and the other for cards corrected. When problem cards occur in a job, the operator must record the counts on his daily production form.

WORK UNIT

The work unit standard consists of the necessary "external" physical activities which an operator performs on a machine job. The external elements occur immediately before and after the processing of a work unit, between column sorts on the sorters, and occasionally when a high-speed 084 Sorter overtakes the operator on a large-volume job. In most machine jobs the card deck is composed of either one work unit in its entirety or of two or more work units (groups of cards) which represent different categories or sub-groupings in the card deck. These groups may be counties, regions, states, crops, commodities, or any other classification. The groups are counted as separate work units only if they are processed independently of each other in running the job. All cards in a work unit must be passed through the machine and removed from the machine pockets before the next group is started, counted and recorded as a separate total, boxed separately, and identified by their category.

The machine operator records the number of work units in each job processed. The applicable work unit standard for a job is multiplied

by the total number of work units to determine minutes produced for this part of the job.

Occasionally a card deck for a machine job is passed through the machine in one continuous process although it may consist of a series of items or types, or it may contain lead cards which precede and identify different sections. When this occurs, the card deck is counted as one work unit for standards purposes.

Some terms are used in relation to the work unit standards which require clarification. These terms are:

Number of Columns Sorted—In processing a work unit of a sorter job, the external physical activities of an operator increase with each additional column in which the cards are sorted. For this reason, the work unit standards for sorters were constructed to provide standard times per work unit according to the number of columns sorted in a job.

Average Size of Work Unit (cards)—There is no uniformity in the size of work units in a job. They can be very large or very small, and completely different within a job - from handfuls of cards to boxes full. In processing work units in a job, the amount of external physical activity performed by an operator depends on the number of cards in the work unit. The work increases as the volume of cards increases. Therefore, the work unit standards were constructed to furnish a range of time values by size of work unit. Since most of the work unit elements relate to card and box handling it was necessary to use a uniform volume of cards in a handful and box full to maintain consistency in applying the frequency of occurrence of elements in the standard writeups. In

these standards, a handful of cards is 400 and a box full, 2000. These quantities were established through extensive studies of tabulating equipment operations performed at the Census Bureau. The range of work unit sizes in the standard tables conforms to these quantities (1-400, 401-800, 801-1200, 1201-2000, etc.).

Proper use of these standards requires that machine operators record on a daily production form the total cards, as well as the number of work units in a machine job. If a job of 11000 cards has only one work unit, the work unit size is 11000. The standard to use from the tables is the one in the work unit range of "10401 or more" for the 082 and 083 sorters or "1201 or more" for most of the other machines. If a job has 10560 cards and it contains 12 work units, one must first determine the average size of the work units. This is done by dividing total cards by number of work units. In this case the average work unit size is 880, and the standard time value to use is found in the range of "801-1200" on the work unit standard tables. When the time value is selected it is multiplied by the number of work units in the job to determine standard minutes produced.

Working from Boxes or Racks—The sorter and collator work unit standards distinguish between working from boxes and working from racks. With the high-speed machines it takes less external physical activity to work from portable racks than from boxes. This advantage is offset, however, by the fact that boxes are more suitable for handling, identifying, and storing cards. For this reason, boxes are used for most machine jobs at the Census Bureau. The work unit standards for slower machines were constructed with box handling elements only

because most of the jobs are assembled in boxes. The difference in time as compared with racks is insignificant. In the few instances when racks are used for the slower machines the same work unit standards are applied.

JOB

The "Job" standards relate only to the 557 Interpreter and the operation Interspersed Gang Punching on the 514 Reproducer. The necessary external physical activities of the operator occur only at the start and end of a job for these machine operations. Since all other manual elements required to process the cards are internal to the machine cycling, work unit standards are not required. Breaker or separator cards are inserted by the operator to separate work units when the last handful of cards for a work unit is placed in the hopper. The standard time value per job is credited to an operator each time he completes a job of the type mentioned above.

CARD CYCLE

This standard time value provides for the machine cycling time during an operation. Standard minutes produced is determined by multiplying total number of cards passed through a machine by the appropriate card cycle standard.

In a numerical sorting operation the cards pass through the machine as many times as the number of columns sorted. The total number of card cycles (passes) may far exceed the actual number of cards in a job. For standard computation purposes, the machine operator must record the number of columns sorted as well as the total number

of cards in a job. The multiplication of the two results in the actual number of card cycles for computing production performance. A count of card passes for a job may also be obtained by using a counter attachment to accumulate the total, although this involves some arithmetic computations by the operator when actual card counts are required for each work unit and for the total job.

An alphabetic sort involves more card passes to a column with the same number of cards than does a numerical sort. When sorting alphabetically on the 083 for example, all cards are passed through the machine the first time for a column sort, with the sort selection switch set at A-1. This sorts cards with a zone 12 punch by letters A to I and stacks cards with a zone 11 or 0 punch in the identical machine pockets. The A to I cards are removed and filed in order. The sort selection switch is then set to A-2 and the cards which fell in zone 11 and 0 pockets are passed separately through the machine to sort them by J to R and S to Z respectively. These cards are filed in order following the A to I cards. This procedure is repeated for each additional column sorted. Alphabetic, like numerical sorting, starts at a right-hand column of a field in a card and progresses to the left. This type of sort requires approximately 1-2/3 passes per card for each column sorted. The counter attachment on a sorter keeps a cumulative count of the card passes made so that a total for the job is available whether by continuous count or by work unit count and totalization.

On the accounting machines and collators the occurrence of card passes through the machine may vary from the actual machine cycles depending on the type of operation being performed. A card may remain

stationary in the accounting machine while it is being read several times as the machine is cycling. On collating operations using both card feeds, as in matching, merging, and matching-merging, the cards may pass through either feed or they may pass simultaneously through both feeds while the machine is cycling. Because of the variable nature of the card passes in these operations, the machines have clock attachments which show the actual running time. Standard minutes produced is determined by adding a percent personal allowance to the running time of a job. Card cycle standards are available also in case a machine does not have a clock attachment. These standards were developed from the running times and appropriate card counts recorded from jobs on machines with clocks. Standard minutes produced is determined by multiplying the standard time value by the actual number of cards processed in a job. For the accounting machines it is the total of cards passed through the machine; for the collators on matching, merging, and matching-merging operations it is the total of cards passed through the primary feed.

MACHINE SPEEDS

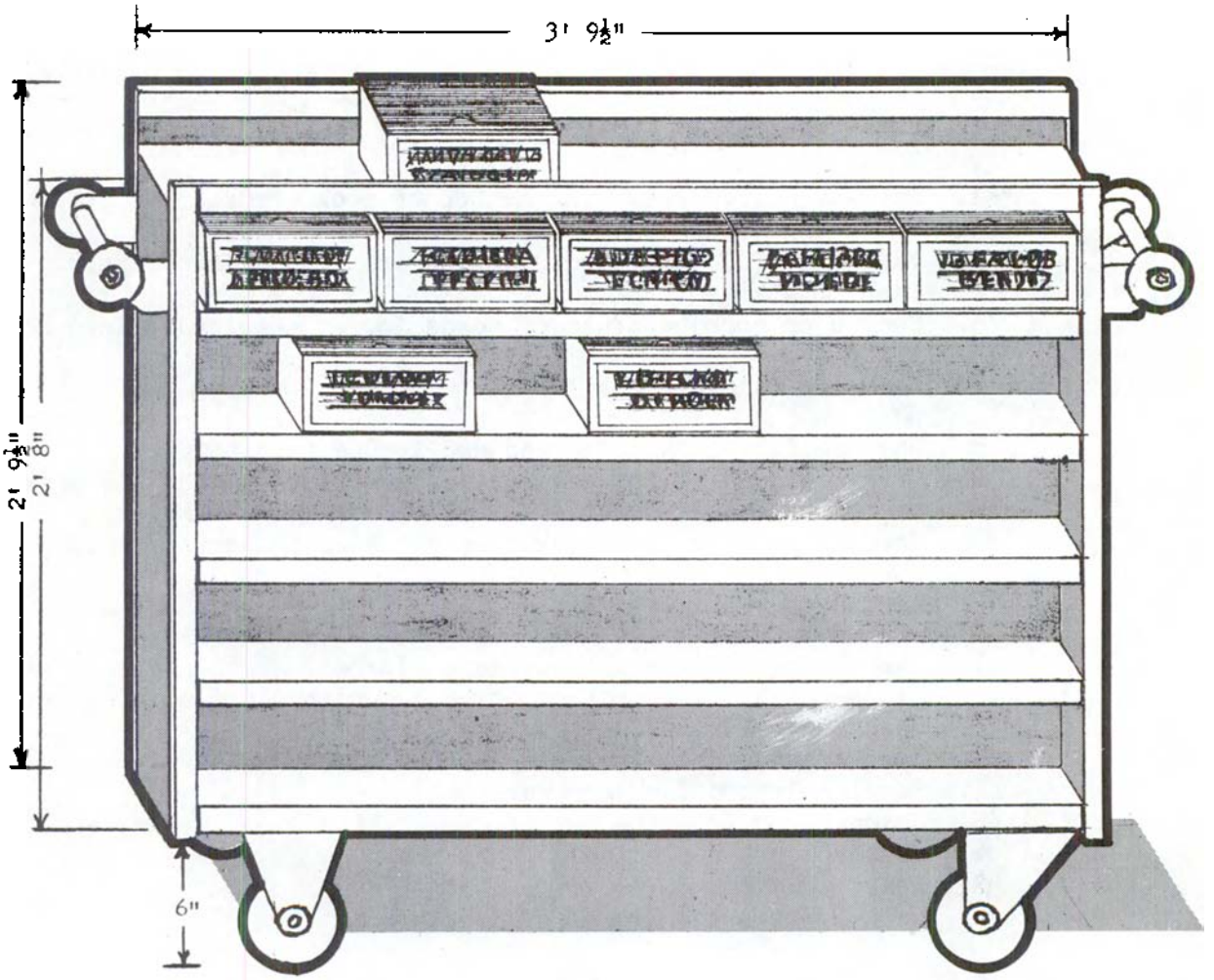
Type	Card Cycles per Minute
082 Sorter	650
083 Sorter	1000
084 Sorter	2000
077 Collator.....one feed	240
087 Collator.....one feed	240
088 Collator.....one feed	650
089 Collator - Alphabetic.....one feed	240
402 Accounting Machine.....variable	80/150
407 Accounting Machine.....maximum	150
487, 488, 489, 490 Census Equipment	435
514 Reproducer	100
557 Interpreter	100
604 Calculator	100

CAPACITY OF CARD RECEPTACLES

Type	No. of Cards
Portable Truck (cookie pusher)	50000
Portable Rack	26000
File Box	2000

PORTABLE TRUCK - "COOKIE PUSHER"

The general operating procedures which follow frequently refer to a "cookie pusher" in the text. This is the rather odd name given by the work force to a type of portable truck. The truck is used to transport and store boxes of punch cards in the work area. A sketch of the truck is shown below.



SORTERS - SORT ONE COLUMN

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup which includes:

A. Turn on power switch.
B. Arrange the working area.
C. Secure work to be processed and the required equipment.
D. Set sorting brush at required column.
E. Set appropriate switches.
F. Reset Veeder counter.
G. Record personnel and machine times.

II. Standards provide for work accomplished in the following sequence:

A. At the beginning of a work unit:

1. Box moved from shelf to the top of cookie pusher.
2. Wedge and blocks removed.
3. First handful (400 cards) jogged and loaded into hopper.
4. Machine started.
5. Second or more handfuls of cards jogged and loaded into hopper.

B. For each 400 card cycles:

1. One handful of cards jogged and loaded into hopper.
2. Cards removed as required from stacker containing the greatest number of cards.
3. Cards jogged, sight-checked, and placed in sorting rack.

C. At the end of each work unit:

1. Cards removed from all stackers, jogged, sight-checked, and placed in sorting rack or boxes according to size of work unit.
2. Cards transferred from sorting rack to boxes.
3. Blocks and wedges inserted.
4. Box labels modified and numbered.
5. Boxes moved from the top to the shelf of cookie pusher.
6. Veeder count posted to control sheet.
7. Reset counter.

III. Other provisions:

A. The standards provide for the complete disposition of each work unit before the following work unit is started.

B. Box handling:

1. The standards provide for handling and opening one box per 2,000 cards or fraction thereof.
2. The standards provide forhandling, labeling, and closing one box per 2,000 cards or fraction thereof.

SORTERS - SORT TWO OR MORE COLUMNS

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup which includes:

A. Turn on power switch.
B. Arrange the work area.
C. Secure work to be processed and the required equipment.
D. Set sorting brush at the first column to be sorted.
E. Set appropriate switches.
F. Reset the Veeder counter.
G. Record personnel and machine times.

II. Standards provide for work accomplished in the following sequence:

A. At the beginning of a work unit:

1. Box moved from shelf to the top of cookie pusher.
2. Wedge and blocks removed.
3. First handful (400 cards) jogged and loaded into hopper.
4. Machine started.
5. Second or more handfuls of cards jogged and loaded into hopper.

B. At the beginning of each column except the first:

1. Jog, sight-check and load one handful of cards into hopper.
2. Start machine.
3. Jog, sight-check and load second or more handfuls of cards into hopper.

C. For each 400 card cycles in first column sorted:

1. One handful of cards jogged and loaded into hopper.
2. Cards removed as required from stacker containing the greatest number of cards.
3. Cards jogged and placed in sorting rack.

D. For each 400 card cycles in all columns other than the first and last columns sorted:

1. Jog, sight-check and load one handful of cards into hopper.
2. Cards removed as required from stacker containing the greatest number of cards.
3. Cards jogged and placed in sorting rack.

E. For each 400 card cycles in the last column sorted:

1. Jog, sight-check and load one handful of cards into hopper.
2. Cards removed as required from stacker containing the greatest number of cards.
3. Cards jogged and sight-checked.
4. Cards placed in sorting rack and transferred to box.

F. At the end of the first column sorted:

1. Post Veeder count to control sheet.

G. At the end of each column except the last:

1. Cards removed from all stackers, jogged and placed in sorting rack or on machine top according to size of work unit.
2. Sensing brush moved to next column.

H. At the end of each work unit:

1. Cards removed from all stackers, jogged, sight-checked and placed in sorting rack or boxes according to size of work unit.
2. Cards transferred from sorting rack to boxes.
3. Blocks and wedges inserted.
4. Box labels modified and numbered.
5. Boxes moved from the top to the shelf of cookie pusher.
6. Reset counter.

III. Other provisions:

A. The standards provide for the complete disposition of each work unit before the following work unit is started.

B. The standards provide for starting from boxes and working into a sorting rack or onto the machine top depending upon the work unit size. On the last column sorted the cards are placed in boxes or in a rack and transferred to boxes at the end of the pass.

C. The standards provide for handling, opening, closing, and labeling one box per 2,000 cards or fraction thereof.

PRODUCTION STANDARDS

082 and 083 Sorters

Working from Boxes or Racks

	Standard Minutes
SET UP for jobs of 1000 cards or less.....	1.50
SET UP for jobs of 1001 cards or more.....	3.00
PROBLEM CARDS:	
Per occurrence.....	.70
Per card.....	.55
Standard Minutes per CARD CYCLE - 082 Sorter.....	.00162
Standard Minutes per CARD CYCLE - 083 Sorter.....	.00105

(WORK UNIT Standards on following pages)

PRODUCTION STANDARDS—Continued

082 and 083 Sorters

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job — Number of Columns Sorted				
	1	2	3	4	5
1 - 400	.783	1.771	2.258	2.745	3.233
401 - 800	.983	2.032	2.581	3.130	3.679
801 - 1200	1.141	2.190	2.739	3.288	3.837
1201 - 2000	1.791	3.456	4.005	4.554	5.103
2001 - 2800	2.313	3.979	4.528	5.077	5.625
2801 - 4000	2.577	4.243	4.792	5.341	5.889
4001 - 5200	3.188	4.853	5.402	5.951	6.500
5201 - 6800	3.886	5.552	6.101	6.650	7.198
6801 - 8400	4.585	6.250	6.799	7.348	7.897
8401 - 10400	5.371	7.037	7.586	8.135	8.683
10401 or more	5.459	7.125	7.674	8.223	8.771
	6	7	8	9	10
1 - 400	3.720	4.207	4.695	5.182	5.669
401 - 800	4.228	4.777	5.325	5.874	6.423
801 - 1200	4.386	4.935	5.484	6.032	6.581
1201 - 2000	5.652	6.201	6.750	7.299	7.847
2001 - 2800	6.174	6.723	7.272	7.821	8.370
2801 - 4000	6.438	6.987	7.536	8.085	8.634
4001 - 5200	7.049	7.598	8.147	8.696	9.244
5201 - 6800	7.747	8.296	8.845	9.394	9.943
6801 - 8400	8.446	8.995	9.544	10.093	10.641
8401 - 10400	9.232	9.781	10.330	10.879	11.428
10401 or more	9.320	9.869	10.418	10.967	11.516
	11	12	13	14	15
1 - 400	6.157	6.644	7.131	7.618	8.106
401 - 800	6.972	7.521	8.070	8.619	9.168
801 - 1200	7.130	7.679	8.228	8.777	9.326
1201 - 2000	8.396	8.945	9.493	10.043	10.592
2001 - 2800	8.919	9.468	10.016	10.566	11.114
2801 - 4000	9.183	9.732	10.280	10.830	11.378
4001 - 5200	9.793	10.342	10.890	11.440	11.989
5201 - 6800	10.492	11.041	11.589	12.139	12.687
6801 - 8400	11.190	11.739	12.287	12.837	13.386
8401 - 10400	11.977	12.526	13.074	13.624	14.172
10401 or more	12.065	12.614	13.162	13.712	14.260

PRODUCTION STANDARDS—Continued

082 and 083 Sorters

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job — Number of Columns Sorted				
	16	17	18	19	20
1 - 400	8.593	9.080	9.568	10.055	10.542
401 - 800	9.717	10.266	10.814	11.363	11.912
801 - 1200	9.875	10.424	10.973	11.521	12.070
1201 - 2000	11.141	11.690	12.239	12.788	13.336
2001 - 2800	11.663	12.212	12.761	13.310	13.949
2801 - 4000	11.927	12.476	13.025	13.574	14.123
4001 - 5200	12.538	13.087	13.636	14.185	14.913
5201 - 6800	13.236	13.785	14.334	14.883	15.432
6801 - 8400	13.935	14.484	15.033	15.582	16.490
8401 - 10400	14.721	15.270	15.819	16.368	16.917
10401 or more	14.809	15.358	15.907	16.456	17.005
	21	22	23	24	25
1 - 400	11.030	11.517	12.004	12.491	12.979
401 - 800	12.461	13.010	13.559	14.108	14.657
801 - 1200	12.619	13.168	13.717	14.266	14.815
1201 - 2000	13.885	14.434	14.983	15.532	16.081
2001 - 2800	14.408	14.957	15.506	16.055	16.603
2801 - 4000	14.672	15.221	15.770	16.319	16.867
4001 - 5200	15.282	15.831	16.380	16.929	17.478
5201 - 6800	15.981	16.530	17.079	17.628	18.176
6801 - 8400	16.679	17.228	17.777	18.326	18.875
8401 - 10400	17.466	18.015	18.564	19.113	19.661
10401 or more	17.554	18.103	18.652	19.201	19.749
	26	27	28	29	30
1 - 400	13.466	13.953	14.440	14.927	15.414
401 - 800	15.206	15.755	16.304	16.853	17.402
801 - 1200	15.364	15.913	16.462	17.011	17.560
1201 - 2000	16.630	17.179	17.728	18.277	18.826
2001 - 2800	17.152	17.701	18.250	18.799	19.348
2801 - 4000	17.416	17.965	18.514	19.063	19.612
4001 - 5200	18.027	18.576	19.125	19.674	20.223
5201 - 6800	18.725	19.274	19.823	20.372	20.921
6801 - 8400	19.424	19.973	20.522	21.071	21.620
8401 - 10400	20.210	20.759	21.308	21.857	22.406
10401 or more	20.298	20.847	21.396	21.945	22.494

PRODUCTION STANDARDS—Continued

082 and 083 Sorters

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	31	32	33	34	35
1 - 400	15.901	16.388	16.875	17.362	17.849
401 - 800	17.951	18.500	19.049	19.598	20.147
801 - 1200	18.109	18.658	19.207	19.756	20.305
1201 - 2000	19.375	19.924	20.473	21.022	21.571
2001 - 2800	19.897	20.446	20.995	21.544	22.093
2801 - 4000	20.161	20.710	21.259	21.808	22.357
4001 - 5200	20.772	21.321	21.870	22.419	22.968
5201 - 6800	21.470	22.019	22.568	23.117	23.666
6801 - 8400	22.169	22.718	23.267	23.816	24.365
8401 - 10400	22.955	23.504	24.053	24.602	25.151
10401 or more	23.043	23.592	24.141	24.690	25.239

PRODUCTION STANDARDS—Continued

082 and 083 Sorters

WORK UNIT Standards - Working from Racks

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	1	2	3	4	5
1 - 400	.728	1.715	2.203	2.690	3.177
401 - 800	.843	1.892	2.441	2.990	3.539
801 - 1200	.931	1.980	2.529	3.078	3.627
1201 or more	.931	2.596	3.145	3.694	4.243
	6	7	8	9	10
1 - 400	3.665	4.152	4.639	5.127	5.614
401 - 800	4.088	4.637	5.185	5.734	6.283
801 - 1200	4.176	4.725	5.273	5.822	6.371
1201 or more	4.792	5.341	5.889	6.438	6.987
	11	12	13	14	15
1 - 400	6.101	6.588	7.076	7.563	8.050
401 - 800	6.832	7.381	7.930	8.479	9.028
801 - 1200	6.920	7.469	8.018	8.567	9.116
1201 or more	7.536	8.085	8.634	9.183	9.732
	16	17	18	19	20
1 - 400	8.538	9.025	9.512	10.000	10.487
401 - 800	9.577	10.126	10.674	11.223	11.772
801 - 1200	9.665	10.214	10.762	11.311	11.860
1201 or more	10.281	10.830	11.378	11.927	12.476
	21	22	23	24	25
1 - 400	10.974	11.461	11.949	12.436	12.923
401 - 800	12.321	12.870	13.419	13.968	14.517
801 - 1200	12.409	12.958	13.507	14.056	14.605
1201 or more	13.024	13.574	14.123	14.672	15.221
	26	27	28	29	30
1 - 400	13.410	13.897	14.384	14.871	15.358
401 - 800	15.066	15.615	16.164	16.713	17.262
801 - 1200	15.154	15.703	16.252	16.801	17.350
1201 or more	15.770	16.319	16.868	17.417	17.966

PRODUCTION STANDARDS—Continued

082 and 083 Sorters

WORK UNIT Standards - Working from Racks

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	31	32	33	34	35
1 - 400	15.845	16.332	16.819	17.306	17.793
401 - 800	17.811	18.360	18.909	19.458	20.007
801 - 1200	17.899	18.448	18.997	19.546	20.095
1201 or more	18.515	19.064	19.613	20.162	20.711

PRODUCTION STANDARDS

084 Sorter

Working from Boxes or Racks

	Standard Minutes
SET UP for jobs of 1000 cards or less.....	1.50
SET UP for jobs of 1001 cards or more.....	3.00
PROBLEM CARDS:	
Per occurrence.....	.70
Per card.....	.55
Standard Minutes per CARD CYCLE.....	.000525

(WORK UNIT Standards on following pages)

PRODUCTION STANDARDS--Continued

084 Sorter

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	1	2	3	4	5
1 - 400	.783	1.771	2.258	2.745	3.233
401 - 800	.983	2.032	2.581	3.130	3.679
801 - 1200	1.141	2.190	2.739	3.288	3.837
1201 - 2000	1.791	3.456	4.005	4.554	5.103
2001 - 2800	2.313	3.979	4.528	5.077	5.625
2801 - 4000	2.577	4.243	4.792	5.341	5.889
4001 - 5200	3.518	5.513	6.392	7.271	8.150
5201 - 6800	4.381	6.542	7.586	8.630	9.674
6801 - 8400	5.410	7.900	9.274	10.648	12.022
8401 - 10400	6.526	9.347	11.051	12.755	14.459
10401 - 12400	7.643	10.793	12.827	14.861	16.895
12401 - 14800	8.847	12.328	14.692	17.056	19.420
14801 - 17200	10.217	14.192	17.051	19.910	22.769
17201 - 20000	11.509	15.815	19.004	22.193	25.382
20001 - 22800	13.313	18.114	21.798	25.482	29.166
22801 - 26000	14.859	20.154	24.333	28.512	32.691
26001 - 29200	16.916	22.871	27.710	32.549	37.388
29201 - 32800	18.896	25.346	30.680	36.014	41.348
32801 - 36400	21.041	28.151	34.145	40.139	46.133
36401 - 40400	23.274	31.044	37.698	44.352	51.006
40401 - 44400	25.507	33.937	41.251	48.565	55.879
44401 - 48800	27.828	36.918	44.892	52.866	60.840
48801 - 53200	30.314	40.229	49.028	57,827	66.626
53201 - 58000	32.723	43.298	52.757	62.216	71.675
58001 - 62800	35.643	47.044	57.328	67.612	77.896
62801 - 67600	38.217	50.443	61.552	72.661	83.770
67601 - 72400	41.138	54.188	66.122	78.056	89.990
72401 - 77200	43.712	57.587	70.346	83.105	95.864
77201 - 82000	46.121	60.656	74.075	87.494	100.913
82001 - 86800	49.041	64.402	78.646	92.890	107.134
86801 - 91600	51.615	67.801	82.870	97.939	113.008
91601 - 96400	54.536	71.546	87.440	103.334	119.228
96401 - 101200	57.110	74.945	91.664	108.383	125.102
101201 - 106000	59.519	78.014	95.393	112.772	130.151
106001 - 110800	62.439	81.760	99.964	118.168	136.372
110801 - 115600	65.013	85.159	104.188	123.217	142.246
115601 - 120400	67.934	88.904	108.758	128.612	148.466
120401 125200	70.508	92.303	112.982	133.661	154.340
125201 - 130000	72.917	95.372	116.711	138.050	158.389
130001 - 134800	75,837	99.118	121.282	143.446	
134801 - 139600	78.411	102.517	125.506	148.495	
139601 - 144400	81.332	106.262	130.076	153.890	
144401 - 149200	83.906	109.661	134.300	158.939	
149201 - 154000	86.315	112.730	138.029	163.328	

PRODUCTION STANDARDS—Continued

084 Sorter

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job — Number of Columns Sorted				
	1	2	3	4	5
154001 - 158800	89.235	116.476	142.600	168.724	
158801 - 163600	91.809	119.875	146.824	173.773	
163601 - 168400	94.730	123.620	151.394	179.168	
168401 - 173200	97.304	127.019	155.618	184.217	
173201 - 178000	99.713	130.088	159.347		
178001 - 182800	102.633	133.834	163.918		
182801 - 187600	105.207	137.233	168.142		
187601 - 192400	108.128	140.978	172.712		
192401 - 197200	110.702	144.377	176.936		
197201 - 202000	113.111	147.446			
202001 - 206800	116.031	151.192			
206801 - 211600	118.605	154.591			
211601 - 216400	121.526	158.336			
216401 - 221200	124.100	161.735			
221201 - 226000	126.509	164.804			
226001 - 230800	129.429	168.550			
230801 - 235600	132.003	171.949			
235601 - 240400	134.924	175.694			
240401 - 245200	137.498	179.093			
245201 - 250000	139.907	182.162			
250001 - 254800	142.827	185.908			
254801 - 259600	145.401	189.307			
259601 - 264400	148.322	193.052			
264401 - 269200	150.896	196.451			
269201 - 274000	153.305				
274001 - 278800	156.225				
278801 - 283600	158.799				
283601 - 288400	161.720				
288401 - 293200	164.294				
293201 - 298000	166.703				
298001 - 302800	169.623				
302801 - 307600	172.197				
307601 - 312400	175.118				
312401 - 317200	177.692				
317201 - 322000	180.101				
322001 - 326800	183.021				
326801 - 331600	185.595				
331601 - 336400	188.516				
336401 - 341200	191.090				
341201 - 346000	193.499				
346001 - 350800	196.419				
350801 - 355600	198.993				

084 Sorter

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job — Number of Columns Sorted				
	1	2	3	4	5
355601 - 360400	201.914				
360401 - 365200	204.488				
365201 - 370000	206.897				
370001 - 374800	209.817				
374801 - 379600	212.391				
379601 - 384400	215.312				
384401 - 389200	217.886				
389201 - 394000	220.295				
394001 - 398800	223.215				
398801 - 403600	225.789				
403601 - 408400	228.710				
408401 - 413200	231.284				
413201 - 418000	233.693				
418001 - 422800	236.613				
422801 - 427600	239.187				
427601 - 432400	242.108				
432401 - 437200	244.682				
437201 - 442000	247.091				
442001 - 446800	250.011				
446801 - 451600	252.585				
451601 - 456400	255.506				
456401 - 461200	258.080				
461201 - 466000	260.489				
466001 - 470800	263.409				
470801 - 475600	265.983				
475601 - 480400	268.904				
480401 - 485200	271.478				
485201 - 490000	273.887				
490001 - 494800	276.807				
494801 - 499600	279.381				
499601 - 504400	282.302				
504401 - 509200	284.876				
509201 - 514000	287.285				
514001 - 518800	290.205				
518801 - 523600	292.779				
523601 - 528400	295.700				
528401 - 533200	298.274				
533201 - 538000	300.683				

PRODUCTION STANDARDS—Continued

084 Sorter

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	6	7	8	9	10
1 - 400	3.720	4.207	4.695	5.182	5.669
401 - 800	4.228	4.777	5.325	5.874	6.423
801 - 1200	4.386	4.935	5.484	6.032	6.581
1201 - 2000	5.652	6.201	6.750	7.299	7.847
2001 - 2800	6.174	6.723	7.272	7.821	8.370
2801 - 4000	6.438	6.987	7.536	8.085	8.634
4001 - 5200	9.029	9.908	10.787	11.666	12.545
5201 - 6800	10.718	11.762	12.806	13.850	14.893
6801 - 8400	13.396	14.770	16.144	17.518	18.891
8401 - 10400	16.163	17.867	19.571	21.275	22.978
10401 - 12400	18.929	20.963	22.997	25.031	27.064
12401 - 14800	21.784	24.148	26.512	28.876	31.239
14801 - 17200	25.628	28.487	31.346	34.205	37.063
17201 - 20000	28.571	31.760	34.949	38.138	41.326
20001 - 22800	32.850	36.534	40.218	43.902	47.585
22801 - 26000	36.870	41.049	45.228	49.407	53.585
26001 - 29200	42.227	47.066	51.905	56.744	61.582
29201 - 32800	46.682	52.016	57.350	62.684	68.017
32801 - 36400	52.127	58.121	64.115	70.109	76.102
36401 - 40400	57.660	64.314	70.968	77.622	84.275
40401 - 44400	63.193	70.507	77.821	85.135	92.448
44401 - 48800	68.814	76.788	84.762	92.736	100.709
48801 - 53200	75.425	84.224	93.023	101.822	110.620
53201 - 58000	81.134	90.593	100.052	109.511	118.969
58001 - 62800	88.180	98.464	108.748	119.032	129.315
62801 - 67600	94.879	105.988	117.097	128.206	139.314
67601 - 72400	101.924	113.858	125.792	137.726	149.659
72401 - 77200	108.623	121.382	134.141	146.900	159.658
77201 - 82000	114.332	127.751	141.170	154.589	
82001 - 86800	121.378	135.622	149.866	164.110	
86801 - 91600	128.077	143.146	158.215	173.284	
91601 - 96400	135.122	151.016	166.910		
96401 - 101200	141.821	158.540	175.259		
101201 - 106000	147.530	164.909	182.288		
106001 - 110800	154.576	172.780			
110801 - 115600	161.275	180.304			
115601 - 120400	168.320	188.174			
120401 - 125200	175.019	195.698			
125201 - 130000	180.728	202.067			

PRODUCTION STANDARDS—Continued

084 Sorter

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job — Number of Columns Sorted				
	11	12	13	14	15
1 - 400	6.157	6.644	7.131	7.618	8.106
401 - 800	6.972	7.521	8.070	8.619	9.168
801 - 1200	7.130	7.679	8.228	8.777	9.326
1201 - 2000	8.396	8.945	9.493	10.043	10.592
2001 - 2800	8.919	9.468	10.016	10.566	11.114
2801 - 4000	9.183	9.732	10.280	10.830	11.378
4001 - 5200	13.424	14.303	15.182	16.061	16.940
5201 - 6800	15.937	16.981	18.025	19.069	20.113
6801 - 8400	20.265	21.639	23.013	24.387	25.761
8401 - 10400	24.682	26.386	28.090	29.794	31.497
10401 - 12400	29.098	31.132	33.166	35.200	37.234
12401 - 14800	33.603	35.967	38.331	40.695	43.058
14801 - 17200	39.922	42.781	45.640	48.499	51.358
17201 - 20000	44.515	47.704	50.893	54.082	57.270
20001 - 22800	51.269	54.953	58.637	62.321	66.004
22801 - 26000	57.764	61.943	66.122	70.301	74.480
26001 - 29200	66.421	71.260	76.099	80.938	85.777
29201 32800	73.351	78.685	84.019	89.353	94.687
32801 - 36400	82.096	88.090	94.084	100.078	106.072
36401 - 40400	90.929	97.583	104.237	110.891	117.545
40401 - 44400	99.762	107.076	114.391	121.704	129.018
44401 - 48800	108.683	116.657	124.631	132.605	140.579
48801 - 53200	119.419	128.218	137.017	145.816	154.615
53201 - 58000	128.428	137.887	147.346	156.805	166.264
58001 - 62800	139.599	149.883	160.167	170.451	180.735
	16	17	18	19	20
1 - 400	8.593	9.080	9.568	10.055	10.542
401 - 800	9.717	10.266	10.814	11.363	11.912
801 - 1200	9.875	10.424	10.973	11.521	12.070
1201 - 2000	11.141	11.690	12.239	12.788	13.336
2001 - 2800	11.663	12.212	12.761	13.310	13.949
2801 - 4000	11.927	12.476	13.025	13.574	14.123
4001 - 5200	17.819	18.698	19.577	20.456	21.335
5201 - 6800	21.157	22.201	23.245	24.289	25.333
6801 - 8400	27.135	28.509	29.883	31.257	32.631
8401 - 10400	33.201	34.905	36.609	38.313	40.017
10401 - 12400	39.268	41.302	43.336	45.370	47.403
12401 - 14800	45.422	47.786	50.150	52.514	54.878
14801 - 17200	54.217	57.076	59.935	62.794	65.652
17201 - 20000	60.459	63.648	66.837	70.026	73.215
20001 - 22800	69.688	73.372	77.056	80.740	84.424
22801 - 26000	78.659	82.838	87.017	91.195	95.374
26001 - 29200	90.616	95.455	100.294	105.133	109.971
29201 - 32800	100.021	105.355	110.689	116.023	121.357
32801 - 36400	112.066	118.060	124.054	130.048	136.041
36401 - 40400	124.199	130.853	137.507	144.161	150.815

PRODUCTION STANDARDS—Continued

084 Sorter

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	21	22	23	24	25
1 - 400	11.030	11.517	12.004	12.491	12.979
401 - 800	12.461	13.010	13.559	14.108	14.657
801 - 1200	12.619	13.168	13.717	14.266	14.815
1201 - 2000	13.885	14.434	14.983	15.532	16.081
2001 - 2800	14.408	14.957	15.506	16.055	16.603
2801 - 4000	14.672	15.221	15.770	16.319	16.867
4001 - 5200	22.214	23.093	23.972	24.851	25.730
5201 - 6800	26.377	27.421	28.465	29.509	30.553
6801 - 8400	34.005	35.378	36.752	38.126	39.500
8401 - 10400	41.721	43.425	45.129	46.833	48.536
10401 - 12400	49.437	51.471	53.505	55.539	57.573
12401 - 14800	57.242	59.606	61.970	64.334	66.697
14801 - 17200	68.511	71.370	74.229	77.088	79.947
17201 - 20000	76.404	79.593	82.782	85.971	89.159
20001 - 22800	88.108	91.792	95.476	99.159	102.843
22801 - 26000	99.553	103.732	107.911	112.090	116.269
26001 - 29200	114.810	119.649	124.488	129.327	134.166
29201 - 32800	126.691	132.025	137.359	142.692	148.026
32801 - 36400	142.035	148.029	154.023	160.017	166.011
36401 - 40400	157.469	164.122	170.776	177.430	184.084
	26	27	28	29	30
1 - 400	13.466	13.953	14.440	14.927	15.414
401 - 800	15.206	15.755	16.304	16.853	17.402
801 - 1200	15.364	15.913	16.462	17.011	17.560
1201 - 2000	16.630	17.179	17.728	18.277	18.826
2001 - 2800	17.152	17.701	18.250	18.799	19.348
2801 - 4000	17.416	17.965	18.514	19.063	19.612
4001 - 5200	26.609	27.488	28.367	29.246	30.125
5201 - 6800	31.597	32.641	33.685	34.729	35.773
6801 - 8400	40.874	42.248	43.622	44.996	46.370
8401 - 10400	50.240	51.944	53.648	55.352	57.056
10401 - 12400	59.607	61.641	63.675	65.709	67.743
12401 - 14800	69.061	71.425	73.789	76.153	78.517
14801 - 17200	82.806	85.665	88.524	91.383	94.242
17201 - 20000	92.348	95.537	98.726	101.915	105.104
20001 - 22800	106.527	110.211	113.895	117.579	121.263

PRODUCTION STANDARDS—Continued

084 Sorter

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	31	32	33	34	35
1 - 400	15.901	16.388	16.875	17.362	17.849
401 - 800	17.951	18.500	19.049	19.598	20.147
801 - 1200	18.109	18.658	19.207	19.756	20.305
1201 - 2000	19.375	19.924	20.473	21.022	21.571
2001 - 2800	19.897	20.446	20.995	21.544	22.093
2801 - 4000	20.161	20.710	21.259	21.808	22.357
4001 - 5200	31.004	31.883	32.762	33.641	34.520
5201 - 6800	36.817	37.861	38.905	39.949	40.993
6801 - 8400	47.744	49.118	50.492	51.866	53.240
8401 - 10400	58.760	60.464	62.168	63.872	65.576
10401 - 12400	69.777	71.811	73.845	75.879	77.913
12401 - 14800	80.881	83.245	85.609	87.973	90.337
14801 - 17200	97.101	99.960	102.819	105.678	108.537
17201 - 20000	108.293	111.482	114.671	117.860	121.049
20001 - 22800	124.947	128.631	132.315	135.999	139.683

PRODUCTION STANDARDS—Continued

084 Sorter

WORK UNIT Standards - Working from Racks

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	1	2	3	4	5
1 - 400	.728	1.715	2.203	2.690	3.177
401 - 800	.843	1.892	2.441	2.990	3.539
801 - 1200	.931	1.980	2.529	3.078	3.627
1201 - 2000	.931	2.596	3.145	3.694	4.243
2001 - 2800	.931	2.596	3.145	3.694	4.243
2801 - 4000	.931	2.596	3.145	3.694	4.243
4001 - 5200	1.261	3.256	4.135	5.014	5.893
5201 - 6800	1.426	3.586	4.630	5.674	6.718
6801 - 8400	1.756	4.246	5.620	6.994	8.368
8401 - 10400	2.086	4.906	6.610	8.314	10.018
10401 - 12400	2.416	5.566	7.600	9.634	11.668
12401 - 14800	2.746	6.226	8.590	10.954	13.318
14801 - 17200	3.241	7.216	10.075	12.934	15.793
17201 - 20000	3.571	7.876	11.065	14.254	17.443
20001 - 22800	4.066	8.866	12.550	16.234	19.918
22801 - 26000	4.561	9.856	14.035	18.214	22.393
26001 - 29200	5.221	11.176	16.015	20.854	25.693
29201 - 32800	5.716	12.166	17.500	22.834	28.168
32801 - 36400	6.376	13.486	19.480	25.474	31.468
36401 - 40400	7.036	14.806	21.460	28.114	34.768
40401 - 44400	7.696	16.126	23.440	30.754	38.068
44401 - 48800	8.356	17.446	25.420	33.394	41.368
48801 - 53200	9.181	19.096	27.895	36.694	45.493
53201 - 58000	9.841	20.416	29.875	39.334	48.793
58001 - 62800	10.666	22.066	32.350	42.634	52.918
62801 - 67600	11.491	23.716	34.825	45.934	57.043
67601 - 72400	12.316	25.366	37.300	49.234	61.168
72401 - 77200	13.141	27.016	39.775	52.534	65.293
77201 - 82000	13.801	28.336	41.755	55.174	68.593
82001 - 86800	14.626	29.986	44.230	58.474	72.718
86801 - 91600	15.451	31.636	46.705	61.774	76.843
91601 - 96400	16.276	33.286	49.180	65.074	80.968
96401 - 101200	17.101	34.936	51.655	68.374	85.093
101201 - 106000	17.761	36.256	53.635	71.014	88.393
106001 - 110800	18.586	37.906	56.110	74.314	92.518
110801 - 115600	19.411	39.556	58.585	77.614	96.643
115601 - 120400	20.236	41.206	61.060	80.914	100.768
120401 - 125200	21.061	42.856	63.535	84.214	104.893
125201 - 130000	21.721	44.176	65.515	86.854	108.193
130001 - 134800	22.546	45.826			
134801 - 139600	23.371	47.476			
139601 - 144400	24.196	49.126			
144401 - 149200	25.021	50.776			

PRODUCTION STANDARDS—Continued

084 Sorter

WORK UNIT Standards - Working from Racks

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	1	2	3	4	5
149201 - 154000	25.681	52.096			
154001 - 158800	26.506	53.746			
158801 - 163600	27.331	55.396			
163601 - 168400	28.156				
168401 - 173200	28.981				
173201 - 178000	29.641				
178001 - 182800	30.466				
182801 - 187600	31.291				
187601 - 192400	32.116				
192401 - 197200	32.941				
197201 - 202000	33.601				

PRODUCTION STANDARDS—Continued

084 Sorter

WORK UNIT Standards - Working from Racks

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	6	7	8	9	10
1 - 400	3.665	4.152	4.639	5.127	5.614
401 - 800	4.088	4.637	5.185	5.734	6.283
801 - 1200	4.176	4.725	5.273	5.822	6.371
1201 - 2000	4.792	5.341	5.889	6.438	6.987
2001 - 2800	4.792	5.341	5.889	6.438	6.987
2801 - 4000	4.792	5.341	5.889	6.438	6.987
4001 - 5200	6.772	7.651	8.530	9.409	10.287
5201 - 6800	7.762	8.806	9.850	10.894	11.937
6801 - 8400	9.742	11.116	12.490	13.864	15.237
8401 - 10400	11.722	13.426	15.130	16.834	18.537
10401 - 12400	13.702	15.736	17.770	19.804	21.837
12401 - 14800	15.682	18.046	20.410	22.774	25.137
14801 - 17200	18.652	21.511	24.370	27.229	30.087
17201 - 20000	20.632	23.821	27.010	30.199	33.387
20001 - 22800	23.602	27.286	30.970	34.654	38.337
22801 - 26000	26.572	30.751	34.930	39.109	43.287
26001 - 29200	30.532	35.371	40.210	45.049	49.887
29201 - 32800	33.502	38.836	44.170	49.504	54.837
32801 - 36400	37.462	43.456	49.450	55.444	61.437
36401 - 40400	41.422	48.076	54.730	61.384	68.037
40401 - 44400	45.382	52.696	60.010	67.324	74.637
44401 - 48800	49.342	57.316	65.290	73.264	81.237
48801 - 53200	54.292	63.091	71.890	80.689	89.487
53201 - 58000	58.252	67.711	77.170	86.629	96.087
58001 - 62800	63.202	73.486	83.770	94.054	104.337
62801 - 67600	68.152	79.261	90.370	101.479	112.587
67601 - 72400	73.102	85.036	96.970	108.904	120.837
72401 - 77200	78.052	90.811	103.570	116.329	129.087
77201 - 82000	82.012	95.431	108.850	122.269	
82001 - 86800	86.962	101.206	115.450	129.694	
86801 - 91600	91.912	106.981	122.050	137.119	
91601 - 96400	96.862	112.756	128.650		
96401 - 101200	101.812	118.531	135.250		
101201 - 106000	105.772	123.151	140.530		
106001 - 110800	110.722	128.926			
110801 - 115600	115.672	134.701			
115601 - 120400	120.622	140.476			
120401 - 125200	125.572	146.251			
125201 - 130000	129.532	150.871			

084 Sorter

WORK UNIT Standards - Working from Racks

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	11	12	13	14	15
1 - 400	6.101	6.589	7.076	7.563	8.050
401 - 800	6.832	7.381	7.930	8.479	9.028
801 - 1200	6.920	7.469	8.018	8.567	9.116
1200 - 2000	7.536	8.085	8.634	9.183	9.732
2001 - 2800	7.536	8.085	8.634	9.183	9.732
2801 - 4000	7.536	8.085	8.634	9.183	9.732
4001 - 5200	11.166	12.045	12.924	13.803	14.682
5201 - 6800	12.981	14.025	15.069	16.113	17.157
6801 - 8400	16.611	17.985	19.359	20.733	22.107
8401 - 10400	20.241	21.945	23.649	25.353	27.057
10401 - 12400	23.871	25.905	27.939	29.973	32.007
12401 - 14800	27.501	29.865	32.229	34.593	36.957
14801 - 17200	32.946	35.805	38.664	41.523	44.382
17201 - 20000	36.576	39.765	42.954	46.143	49.332
20001 - 22800	42.021	45.705	49.389	53.073	56.757
22801 - 26000	47.466	51.645	55.824	60.003	64.182
26001 - 29200	54.726	59.565	64.404	69.243	74.082
29201 - 32800	60.171	65.505	70.839	76.173	81.507
32801 - 36400	67.431	73.425	79.419	85.413	91.407
36401 - 40400	74.691	81.345	87.999	94.653	101.307
40401 - 44400	81.951	89.265	96.579	103.893	111.207
44401 - 48800	89.211	97.185	105.159	113.133	121.107
48801 - 53200	98.286	107.085	115.884	124.683	133.482
53201 - 58000	105.546	115.005	124.464	133.923	143.382
58001 - 62800	114.621	124.905	135.189	145.473	155.757
	16	17	18	19	20
1 - 400	8.538	9.025	9.512	10.000	10.487
401 - 800	9.577	10.126	10.674	11.223	11.772
801 - 1200	9.665	10.214	10.762	11.311	11.860
1201 - 2000	10.281	10.830	11.378	11.927	12.476
2001 - 2800	10.281	10.830	11.378	11.927	12.476
2801 - 4000	10.281	10.830	11.378	11.927	12.476
4001 - 5200	15.561	16.440	17.319	18.198	19.076
5201 - 6800	18.201	19.245	20.289	21.332	22.376
6801 - 8400	23.481	24.855	26.230	27.602	28.976
8401 - 10400	28.761	30.465	32.169	33.872	35.576
10401 - 12400	34.041	36.075	38.109	40.142	42.176
12401 - 14800	39.321	41.685	44.049	46.412	48.776
14801 - 17200	47.241	50.100	52.959	55.817	58.676
17201 - 20000	52.521	55.710	58.899	62.087	65.276
20001 - 22800	60.441	64.125	67.809	71.492	75.176
22801 - 26000	68.361	72.540	76.719	80.897	85.076
26001 - 29200	78.921	83.760	88.599	93.437	98.276
29201 - 32800	86.841	92.175	97.509	102.842	108.176
32801 - 36400	97.401	103.395	109.389	115.382	121.376
36401 - 40400	107.961	114.615	121.269	127.922	134.576

PRODUCTION STANDARDS—Continued

084 Sorter

WORK UNIT Standards - Working from Racks

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	21	22	23	24	25
1 - 400	10.974	11.462	11.949	12.436	12.923
401 - 800	12.321	12.870	13.419	13.968	14.517
801 - 1200	12.409	12.958	13.507	14.056	14.605
1201 - 2000	13.025	13.574	14.123	14.672	15.221
2001 - 2800	13.025	13.574	14.123	14.672	15.221
2801 - 4000	13.025	13.574	14.123	14.672	15.221
4001 - 5200	19.955	20.834	21.713	22.592	23.471
5201 - 6800	23.420	24.464	25.508	26.552	27.596
6801 - 8400	30.350	31.724	33.098	34.472	35.846
8401 - 10400	37.280	38.984	40.688	42.392	44.096
10401 - 12400	44.210	46.244	48.278	50.312	52.346
12401 - 14800	51.140	53.504	55.868	58.232	60.596
14801 - 17200	61.535	64.394	67.253	70.112	72.971
17201 - 20000	68.465	71.654	74.843	78.032	81.221
20001 - 22800	78.860	82.544	86.228	89.912	93.596
22801 - 26000	89.255	93.434	97.613	101.792	105.971
26001 - 29200	103.115	107.954	112.793	117.632	122.471
29201 - 32800	113.510	118.844	124.178	129.512	134.846
32801 - 36400	127.370	133.364	139.358	145.352	151.346
36401 - 40400	141.230	147.884	154.538	161.192	167.846
	26	27	28	29	30
1 - 400	13.410	13.897	14.384	14.871	15.358
401 - 800	15.066	15.615	16.164	16.713	17.262
801 - 1200	15.154	15.703	16.252	16.801	17.350
1201 - 2000	15.770	16.319	16.868	17.417	17.966
2001 - 2800	15.770	16.319	16.868	17.417	17.966
2801 - 4000	15.770	16.319	16.868	17.417	17.966
4001 - 5200	24.350	25.229	26.108	26.987	27.866
5201 - 6800	28.640	29.684	30.728	31.772	32.816
6801 - 8400	37.220	38.594	39.968	41.342	42.716
8401 - 10400	45.800	47.504	49.208	50.912	52.616
10401 - 12400	54.380	56.414	58.448	60.482	62.516
12401 - 14800	62.960	65.324	67.688	70.052	72.416
14801 - 17200	75.830	78.689	81.548	84.407	87.266
17201 - 20000	84.410	87.599	90.788	93.977	97.166
20001 - 22800	97.280	100.964	104.648	108.332	112.016

PRODUCTION STANDARDS--Continued

084 Sorter

WORK UNIT Standards - Working from Racks

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	31	32	33	34	35
1 - 400	15.845	16.332	16.819	17.306	17.793
401 - 800	17.811	18.360	18.909	19.458	20.007
801 - 1200	17.899	18.448	18.997	19.546	20.095
1201 - 2000	18.515	19.064	19.613	20.162	20.711
2001 - 2800	18.515	19.064	19.613	20.162	20.711
2801 - 4000	18.515	19.064	19.613	20.162	20.711
4001 - 5200	28.745	29.624	30.503	31.382	32.261
5201 - 6800	33.860	34.904	35.948	36.992	38.036
6801 - 8400	44.090	45.464	46.838	48.212	49.586
8401 - 10400	54.320	56.024	57.728	59.432	61.136
10401 - 12400	64.550	66.584	68.618	70.652	72.686
12401 - 14800	74.780	77.144	79.508	81.872	84.236
14801 - 17200	90.125	92.984	95.843	98.702	101.561
17201 - 20000	100.355	103.544	106.733	109.922	113.111
20001 - 22800	115.700	119.384	123.068	126.752	130.436

COLLATORS - SEQUENCE CHECKING (One Feed)

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup and test which includes:

- A. Secure the work to be processed.
- B. Arrange the working area.
- C. Secure and insert one control panel.
- D. Secure a test deck.
- E. Test the machine.
- F. Return the test deck.
- G. Reset counters.
- H. Record personnel and machine times.

II. The standards provide for work accomplished in the following sequence:

A. At the beginning of each work unit:

1. Box moved from the shelf to the top of cookie pusher.
2. Wedge and blocks removed.
3. For the first work unit only:

    a. First 15 (approximate) cards loaded into hopper with one card marked and deliberately mis-filed.
    b. Machine started.
    c. Cards removed from stackers at error stop.
    d. Error light reset and cards run out.
    e. Cards removed from stacker and marked card refiled.
    f. First 15 cards restored to proper place in box.

4. First handful (400 cards) jogged and loaded into hopper.
5. Machine started.
6. Second handful loaded into hopper.

B. At the end of each 400 card cycles:

1. Handful loaded to hopper.
2. Cards removed from stacker.
3. Cards jogged and placed in box.

C. At the end of each work unit:

1. Cards run out into stacker.
2. Cards removed from stacker.
3. Cards jogged and placed in box.
4. Blocks and wedge inserted.
5. Box moved from top to shelf of cookie pusher.
6. Veeder counter total posted to control sheet.
7. Reset counter.

III. Other provisions:

A. The standards provide for the complete disposition of each work unit before the following work unit is started.

B. When work units consist of more than 2,000 cards, the standards provide for the insertion and removal of blocks and wedges for one box per 2,000 cards or fraction thereof.

PRODUCTION STANDARDS

088 Collator
077, 087, 089 Collators

SEQUENCE CHECKING (One Feed)

	Standard Minutes
SET UP for jobs of 1000 cards or less	1.50
SET UP for jobs of 1001 cards or more	3.00
FIRST TEST for operation	5.00
Each ADDITIONAL TEST for operation	3.50
PROBLEM CARDS: Per occurrence - out of sequence	1.00
Per occurrence - other	.70
Per card	.55

Standard Minutes per WORK UNIT, by average size of work unit (cards):

Working from boxes:	
1-400	.792
401-800	.877
801-1200	.947
1201 or more	1.157
Working from racks:	
Any size work unit	.737

Standard Minutes per CARD CYCLE - 088 Collator	.00162
Standard Minutes per CARD CYCLE - 077, 087, 089 Collators	.00437

COLLATORS - MATCHING

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup and test which includes:

A. Secure the work to be processed.
B. Arrange the working area.
C. Secure and insert the control panel.
D. Secure a test deck.
E. Test the machine.
F. Return the test deck.
G. Reset counters and clock.
H. Record personnel and machine times.

II. The standards provide for work accomplished in the following sequence:

A. At the beginning of each work unit:

1. Box for primary feed moved from the shelf to the top of cookie pusher.
2. Wedge and blocks removed.
3. First handful (400 cards) jogged and loaded into primary hopper.
4. Box for secondary feed moved from the shelf to the top of cookie pusher.
5. Wedge and blocks removed.
6. First handful jogged and loaded into secondary hopper.
7. Machine started.
8. Second handful loaded into primary hopper.
9. Second handful loaded into secondary hopper.
10. First new box for each of two select stackers moved to top of cookie pusher.
11. Each new box label marked with required identification.
12. For the first work unit only:

a. Cards removed from matched stackers.
b. First matched pair compared for accuracy of match.
c. All cards placed in boxes.
d. First unmatched primary card (when available) checked against both matched and unmatched secondaries to verify accuracy of selection.
e. First unmatched secondary card (when available) checked against both matched and unmatched primaries to verify accuracy of selection.

B. At the completion of each 400 stacked cards in any of the four stackers:

1. Cards removed from stacker.
2. Cards jogged and placed in box.
3. Hoppers checked and loaded by handfuls of 400 cards as required.

C. At the end of each work unit:

1. Cards run out into stackers.
2. Cards removed from stackers. (4)
3. Cards jogged and placed in boxes. (4)
4. Blocks and wedges inserted. (4 boxes)
5. Boxes (4) moved from the top to the shelves of cookie pusher.
6. Post Veeder counter total to control sheet.
7. Reset counter.

III. Other provisions:

A. The standards provide for the complete disposition of each work unit before the following work unit is started.

B. Box handling:

1. The standards provide for handling and opening two boxes per 4,000 total cards or fraction thereof.

2. The standards provide for handling, closing and labeling two boxes per work unit plus two boxes per 4,000 total cards or fraction thereof.

PRODUCTION STANDARDS

088 Collator
077, 087, 089 Collators

MATCHING

	Standard Minutes
SET UP for jobs of 1000 cards or less	1.50
SET UP for jobs of 1001 cards or more	3.00
FIRST TEST for operation	5.00
Each ADDITIONAL TEST for operation	3.50
PROBLEM CARDS: Per occurrence - out of sequence	1.30
Per occurrence - other	.70
Per card	.55

Standard Minutes per WORK UNIT, by average size of work unit (cards):

Working from boxes:	
1-400	1.689
401-800	1.834
801-1200	2.016
1201 or more	2.784
Working from racks:	
Any size work unit	1.526

(CARD CYCLE Standards on following page)

PRODUCTION STANDARDS—Continued

088 Collator
077, 087, 089 Collators

MATCHING

Standard Minutes

If the machine has a clock attachment, use the recorded running time for a job to compute standard minutes produced. This is performed simply by increasing the running time with a percent personal allowance (5% is used at Census Bureau).

If the machine does not have a clock attachment, use the card cycle standard time values listed below to compute standard production. Merely multiply the card cycle standard by the actual number of cards processed through the primary feed of the machine. (See explanation on page 79)

Standard Minutes per CARD CYCLE (based on work experience at Census Bureau):

088 Collator.....	.00185
077, 087, 089 Collators.....	.00501

COLLATORS - MERGING

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup and test which includes:

A. Secure the work to be processed.
B. Arrange the working area.
C. Secure and insert the control panel.
D. Secure a test deck.
E. Test the machine.
F. Return the test deck.
G. Reset counters and clock.
H. Record personnel and machine times.

II. The standards provide for work accomplished in the following sequence:

A. At the beginning of each work unit:

1. Box for primary feed moved from the shelf to the top of cookie pusher.
2. Wedge and blocks removed.
3. For the first work unit only:

    a. Control number of the first card recorded.
    b. First card marked.

4. Sequence of first six cards checked manually.
5. First handful (400 cards) jogged and loaded into primary hopper.
6. Box for secondary feed moved from the shelf to the top of cookie pusher.
7. Wedge and blocks removed.
8. For the first work unit only:

    a. Control number of the first card recorded.
    b. First card marked.

9. Sequence of first six cards checked manually.
10. First handful jogged and loaded into secondary hopper.
11. Machine started.
12. Second handful loaded into primary hopper.
13. Second handful loaded into secondary hopper.
14. First new box for merged cards moved to top of cookie pusher and labeled.

B. At the completion of each 400 merged cards:

1. Cards removed from stacker.
2. Cards jogged.

3. For the first 400 merged cards only:

   a. Check made to verify that the first card is the marked card with the lower recorded control number.
   b. Check made to verify that the marked card with the higher recorded control number has been correctly merged.

4. Cards placed in box.
5. Hoppers checked and loaded by handfuls of 400 cards as required.

C. At the end of each work unit:

1. Cards run out into stacker.
2. Cards removed from stacker.
3. Cards jogged and placed in box.
4. Blocks and wedge inserted.
5. Box moved from the top to the shelf of cookie pusher.
6. Post Veeder counter total to control sheet.
7. Reset counter.

III. Other provisions:

A. The standards provide for the complete disposition of each work unit before the following work unit is started.

B. Box handling:

1. The standards provide for handling, opening, and voiding labels on two boxes per 4,000 merged cards or fraction thereof.

2. The standards provide for handling, labeling and closing one box per 2,000 merged cards or fraction thereof.

PRODUCTION STANDARDS

088 Collator
077, 087, 089 Collators

MERGING

	Standard Minutes
SET UP for jobs of 1000 cards or less	1.50
SET UP for jobs of 1001 cards or more	3.00
FIRST TEST for operation	5.00
Each ADDITIONAL TEST for operation	3.50
PROBLEM CARDS: Per occurrence - out of sequence	1.30
Per occurrence - other	.70
Per card	.55

Standard Minutes per WORK UNIT, by average size of work unit (cards):

Working from boxes:	
1-400	1.339
401-800	1.499
801-1200	1.674
1201 or more	1.885
Working from racks:	
Any size work unit	1.254

(CARD CYCLE Standards on following page)

PRODUCTION STANDARDS—Continued

088 Collator
077, 087, 089 Collators

MERGING

Standard Minutes

If the machine has a clock attachment, use the recorded running time for a job to compute standard minutes produced. This is performed simply by increasing the running time with a percent personal allowance (5% is used at Census Bureau).

If the machine does not have a clock attachment, use the card cycle standard time values listed below to compute standard production. Merely multiply the card cycle standard by the actual number of cards processed through the primary feed of the machine. (See explanation on page 79)

Standard Minutes per CARD CYCLE (based on work experience at Census Bureau):

088 Collator.....	.00189
077, 087, 089 Collators.....	.00513

COLLATORS - MATCHING-MERGING

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup and test which includes:

A. Secure the work to be processed.
B. Arrange the working area.
C. Secure and insert the control panel.
D. Secure a test deck.
E. Test the machine.
F. Return the test deck.
G. Reset counters and clock.
H. Record personnel and machine times.

II. The standards provide for work accomplished in the following sequence:

A. At the beginning of each work unit:

1. Box for primary feed moved from the shelf to the top of cookie pusher.
2. Wedge and blocks removed.
3. For the first work unit only:

    a. Control number of the first card recorded.
    b. First card marked.

4. Sequence of first six cards checked manually.
5. First handful (400 cards) jogged and loaded into primary hopper.
6. Box for secondary feed moved from the shelf to the top of cookie pusher.
7. Wedge and blocks removed.
8. For the first work unit only:

    a. Control number of the first card recorded.
    b. First card marked.

9. Sequence of first six cards checked manually.
10. First handful jogged and loaded into secondary hopper.
11. Machine started.
12. Second handful loaded into primary hopper,
13. Second handful loaded into secondary hopper.
14. First new box for each of three stackers moved to top of cookie pusher.
15. Each new box label marked with required identification.
16. For the first work unit only:

    a. When recorded control numbers are equal:

        (1) Cards removed from merged stacker.
        (2) Check made to verify that both marked cards are in first control number group.
        (3) Merged cards placed in box.

(4) First unmatched primary card (when available) checked against both the merged cards and unmatched secondaries to verify accuracy of selection.
(5) First unmatched secondary card (when available) checked against both the merged cards and unmatched primaries to verify accuracy of selection.

b. When recorded control numbers are not equal:

(1) Cards removed from merged stacker.
(2) Check made to verify that the marked card for the higher recorded control number has been correctly merged, or correctly selected as unmatched.
(3) Merged cards placed in box.
(4) Check made to verify that the marked card for the lower recorded control number is the first selected card in its selected stacker.
(5) Check made to verify that the first selected card in the other selected stacker is unmatched in either merged or the other selected stacker.

B. At the completion of each 400 stacked cards in any of the three stackers:

1. Cards removed from stacker.
2. Cards jogged and placed in box.
3. Hoppers checked and loaded by groups of 400 cards as required.

C. At the end of each work unit:

1. Cards run out into stackers.
2. Cards removed from stackers. (3)
3. Cards jogged and placed in boxes. (3)
4. Blocks and wedges inserted. (3 boxes)
5. Boxes (3) moved from the top to the shelves of cookie pusher.
6. Post Veeder counter total to control sheet.
7. Reset counter.

III. Other provisions:

A. The standards provide for the complete disposition of each work unit before the following unit is started.

B. Box handling:

1. The standards provide for handling, opening, and voiding labels on two boxes per 4,000 total cards or fraction thereof.

2. The standards provide for handling and closing two boxes per work unit plus one box per 2,000 total cards or fraction thereof.

PRODUCTION STANDARDS

088 Collator
077, 087, 089 Collators

MATCHING-MERGING

	Standard Minutes
SET UP for jobs of 1000 cards or less	1.50
SET UP for jobs of 1001 cards or more	3.00
FIRST TEST for operation	5.00
Each ADDITIONAL TEST for operation	3.50
PROBLEM CARDS: Per occurrence - out of sequence	1.30
Per occurrence - other	.70
Per card	.55

Standard Minutes per WORK UNIT, by average size of work unit (cards):

Working from boxes:	
1-400	1.807
401-800	1.967
801-1200	2.090
1201 or more	2.719
Working from racks:	
Any size work unit	1.670

(CARD CYCLE Standards on following page)

PRODUCTION STANDARDS—Continued

088 Collator
077, 087, 089 Collators

MATCHING-MERGING

Standard Minutes

If the machine has a clock attachment, use the recorded running time for a job to compute standard minutes produced. This is performed simply by increasing the running time with a percent personal allowance (5% is used at Census Bureau).

If the machine does not have a clock attachment, use the card cycle standard time values listed below to compute standard production. Merely multiply the card cycle standard by the actual number of cards processed through the primary feed of the machine. (See explanation on page 79)

Standard Minutes per CARD CYCLE (based on work experience at Census Bureau):

088 Collator.....	.00184
077, 087, 089 Collators.....	.00499

ACCOUNTING MACHINES

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup and test which includes:

A. Secure the work to be processed.
B. Arrange the working area.
C. Secure and insert a control panel.
D. Secure test deck and master test sheet.
E. Secure and insert paper as required.
F. Test the machine.

1. Set machine (switches, hammerlocks, clock, etc.)
2. Run test cards.
3. Proofread test sheet.
4. Identify test sheet (by operator, machine, board, date, job, etc.)

G. Deliver test sheet, master test sheet, and test deck to supervisor.
H. Reset clock cycle counter to zero following test.
I. Record personnel and machine times.

II. Standards provide for work accomplished in the following sequence:

A. At the beginning of a work unit:

1. First box moved from the shelf to the top of cookie pusher.
2. Wedge and blocks removed.
3. First handful (400 cards) jogged and sight-checked.
4. First handful loaded into hopper.
5. Machine started.
6. Second handful jogged, sight-checked, and loaded into hopper.

B. At the completion of each 400 stacked cards:

1. Handful loaded into hopper.
2. Cards removed from stacker.
3. Cards placed in box.
4. Last visible sheets scanned for gross errors, sequence of control numbers, and accuracy of control breaks.
5. Stacking of paper checked and corrected.

C. At the end of each work unit:

1. Cards run out into stacker.
2. Control totals checked.
3. Last visible sheets scanned for gross errors, sequence of control numbers, and accuracy of control breaks.
4. Paper advanced for next work unit.

5. Cards removed from stacker.
6. Cards placed in box.
7. Blocks and wedge inserted.
8. Box moved from the top to the shelf of cookie pusher.

D. At the end of the job:

1. Cards run out into stacker.
2. Control totals checked.
3. Last visible sheets scanned for gross errors, sequence of control numbers, and accuracy of control breaks.
4. Paper advanced for tearing.
5. Cards removed from stacker.
6. Cards placed in box.
7. Blocks and wedge inserted.
8. Box moved from the top to the shelf of cookie pusher.
9. Paper torn and stacked.
10. Tabulation sheets from last work unit identified.

III. Other provisions:

A. The standards provide for the complete disposition of the cards for each work unit before the following work unit is started.

B. The standards provide for box handling on the basis of one box moved, opened, closed, and moved for each 2,000 cards or fraction thereof.

C. The standards provide for tearing paper and identifying the tabulation sheets. One tearing and identification per work unit is provided.

PRODUCTION STANDARDS

402 and 407 Accounting Machines

	Standard Minutes
SET UP for jobs of 1000 cards or less	3.0
SET UP for jobs of 1001 cards or more	5.0
FIRST TEST for operation without Summary Punch	7.5
Each ADDITIONAL TEST for operation without Summary Punch	5.0
PROBLEM CARDS: Per occurrence	.70
Per card	.55

Standard Minutes per WORK UNIT, by average size of work unit (cards):

1-400	.683
401-800	.798
801-1200	.873
1201 or more	1.097

If the machine has a clock attachment, use the recorded running time for a job to compute standard minutes produced. This is performed simply by increasing the running time with a percent personal allowance (5% is used at Census Bureau).

If the machine does not have a clock attachment, use the card cycle standard time values listed below to compute standard production. Merely multiply the card cycle standard by the actual number of cards processed through the machine. (See explanation on page 79)

Standard Minutes per CARD CYCLE (based on work experience at Census Bureau):

402 Accounting Machine:	Listing	.0149
	Tabulating	.0140
407 Accounting Machine:	Listing	.00909
	Tabulating	.00849

SUMMARY PUNCH HOOKUPS

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup and test which includes:

A. Secure the work to be processed.
B. Secure the summary card stock.
C. Arrange the working area.
D. Connect the summary punch to the tabulator.
E. Secure and insert two control panels.
F. Secure test deck, master test sheet, and master summary cards.
G. Secure and insert paper as required.
H. Test the machine.

1. Set machines (switches, hammerlock, clock, etc.)
2. Run test cards.
3. Proofread test sheet.
4. Proofread (by sight-checking) ten summary cards.
5. Identify test sheet and summary cards (by operator, machine, board, date, job, etc.)

I. Deliver test materials and results to supervisor.
J. Reset clock cycle counter to zero following test.
K. Record personnel and machine times.

II. Standards provide for work accomplished in the following sequence:

A. At the beginning of a work unit:

1. Gang-punch master card prepared.
2. Box of card stock moved from carton to the top of cookie pusher.
3. First handful (400 cards) jogged and loaded into punch hopper with master card.
4. Punch started and two cards run into stacker.
5. Cards removed from punch stacker.
6. Gang-punching checked for accuracy.
7. Punched cards destroyed.
8. Empty box for summary cards moved to the top of cookie pusher.
9. Box of detail cards moved from the shelf to the top of cookie pusher.
10. Wedge and blocks removed.
11. First handful jogged, sight-checked and loaded into tabulator hopper.
12. Paper advanced to first print line.
13. Tabulator started.
14. Second handful loaded into tabulator hopper.
15. Second handful loaded to punch hopper.

B. At the third control break.

1. Cards removed from punch stacker.
2. First summary card checked with tabulation sheet for accuracy of group indication and summary data.
3. Tabulation sheet checked for accuracy of control break and control number sequence.
4. First summaries placed in box.

C. At the end of each 400 summary cycles:

1. Handful loaded to punch hopper.
2. Cards removed from punch stacker.
3. Cards jogged and sight checked.
4. Cards placed in box, except last card.
5. Last card checked for:
   a. Accuracy of gang punching
   b. Accuracy of group indication.
   c. Accuracy of summary data.
6. Last card placed in box.

D. At the completion of 400 stacked cards in the tabulator:

1. Handful loaded to tabulator hopper.
2. Cards removed from stacker.
3. Cards placed in box.
4. Last visible sheets scanned for gross errors, sequence of control numbers, and accuracy of control breaks.
5. Stacking of paper folds checked and corrected if required.

E. At the end of each work unit:

1. Cards run out into tabulator stacker.
2. Control totals checked.
3. Last visible sheets scanned for gross errors, sequence of control numbers, and accuracy of control breaks.
4. Paper advanced for next work unit.
5. Cards removed from tabulator stacker.
6. Cards placed in box.
7. Blocks and wedge inserted.
8. Box moved from the top to the shelf of cookie pusher.
9. Cards run out into punch stacker.
10. Cards removed from punch stacker.
11. Cards jogged and sight checked.
12. Cards placed in box, except last card.
13. Last card checked for:
    a. Accuracy of gang-punching.
    b. Accuracy of group indication.
    c. Accuracy of summary data.

14. Last card placed in box.
15. Blocks and wedge inserted.
16. Box moved from the top to the shelf of cookie pusher.

F. At the end of the job:

1. Cards run out into tabulator stacker.
2. Control totals checked.
3. Last visible sheets scanned for gross errors, sequence of control numbers, and accuracy of control breaks.
4. Paper advanced for tearing.
5. Cards removed from tabulator stacker.
6. Cards placed in box.
7. Blocks and wedge inserted.
8. Box moved from the top to the shelf of cookie pusher.
9. Cards run out into punch stacker.
10. Cards removed from punch stacker.
11. Cards jogged and sight-checked.
12. Cards placed in box, except last card.
13. Last card checked for:

    a. Accuracy of gang-punching.
    b. Accuracy of group indication.
    c. Accuracy of summary data.

14. Last card placed in box.
15. Blocks and wedge inserted.
16. Box moved from the top to the shelf of cookie pusher.
17. Paper torn and stacked.
18. Tabulation sheets from last work unit identified.

III. Other provisions:

A. The standards provide for the complete disposition of the cards for each work unit before the following work unit is started.

B. When work units consist of more than 2,000 detail cards, the standards provide for the insertion and removal of blocks and wedges for one box per 2,000 cards or fraction thereof.

C. When the number of summaries exceeds 2,000 cards per work unit, the standards provide for moving and opening one cardboard box; and for inserting blocks and wedges, labeling and moving one box for each 2,000 summary cards or fraction thereof.

D. The standards provide for tearing paper and identifying the tabulation sheets. One tearing and identification per work unit is provided.

PRODUCTION STANDARDS

402/514 Summary Punch Hookup
407/514 Summary Punch Hookup

	Standard Minutes
SET UP for jobs of 1000 cards or less	3.00
SET UP for jobs of 1001 cards or more	5.00
FIRST TEST for operation with Summary Punch	10.00
Each ADDITIONAL TEST for operation with Summary Punch	8.50
PROBLEM CARDS: Per occurrence	.70
Per card	.55

Standard Minutes per WORK UNIT, by average size of work unit (cards):

1-400	1.592
401-800	1.794
801-1200	1.926
1201 or more	2.320

If the accounting machine has a clock attachment, use the recorded running time for a job to compute standard minutes produced. This is performed simply by increasing the running time with a percent personal allowance (5% is used at Census Bureau).

If the accounting machine does not have a clock attachment, use the card cycle standard time values listed below to compute standard production. Merely multiply the card cycle standard by the actual number of cards processed through the accounting machine. (See explanation on page 79)

Standard Minutes per CARD CYCLE (based on work experience at Census Bureau):

402/514 Summary Punch Hookup	.0180
407/514 Summary Punch Hookup	.0102

514 REPRODUCER - REPRODUCING

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup and test which includes:

A. Secure work to be processed, cards to be punched, boxes for new file, cookie pushers as required.

B. Arrange the working area.

C. Secure and insert a control panel.

D. Test the machine for:

1. Punching all the holes required.
2. Punching only the holes required.
3. Proper functioning of all the comparing unit positions being used.

E. Reset Veeder counters to zero.

F. Record personnel and machine times.

II. The standard provides for work accomplished in the following sequence:

A. At the beginning of each work unit:

1. Empty box moved to the top of cookie pusher for new file.
2. Box of cards (to feed the punch hopper) moved to the top of cookie pusher.
3. Box opened.
4. First handful (400 cards) jogged and loaded into punch hopper.
5. Box of cards (to feed the read hopper) moved from the shelf to the top of cookie pusher.
6. Wedge and blocks removed.
7. First handful loaded into read hopper.
8. Machine started.
9. For the first work unit of a job:

a. Machine stopped with one or two cards in each stacker.
b. Cards removed from stackers and a pair compared to verify that the machine is:

(I) Punching all the holes required.
(II) Punching only the holes required.

c. Machine started.
d. First pairs placed in output boxes.

10. Second handful loaded into punch hopper.
11. Second handful loaded into read hopper.

B. At the end of each 400 cycles:

1. Machine stopped.
2. Cards removed from both stackers.
3. Machine started.
4. Last pair of cards compared to verify that the machine is:

   a. Punching all the holes required.
   b. Punching only the holes required.

5. Cards from punch stacker jogged and placed in box.
6. Cards from read stacker jogged and placed in box.
7. Handful loaded into punch hopper.
8. Handful loaded into read hopper.

C. At the end of each work unit:

1. Last cards run out into stackers.
2. Last handful removed from stackers.
3. Last pair of cards compared to verify that the machine is:

   a. Punching all the holes required.
   b. Punching only the holes required.

4. Cards from punch stacker jogged and placed in box.
5. Cards from read stacker jogged and placed in box.
6. Blocks and wedges inserted in two boxes.
7. Two boxes moved from the top to the shelf of cookie pusher.
8. Veeder counters checked for agreement and one reading posted to control sheet.
9. Two veeder counters reset to zero.

III. Other provisions:

A. The standard provides for the complete disposition of each work unit before the following work unit is started.

B. When the average size of work units within a job (defined by cards for read feed) exceeds 2,000 cards, the standard provides for handling boxes removing blocks and wedges, and inserting blocks and wedges on the basis of two boxes per 2,000 cards or fraction thereof. The standard provides for labeling new boxes on the basis of one box per 2,000 cards or fraction thereof.

PRODUCTION STANDARDS

514 Reproducer

REPRODUCING

		Standard Minutes
SET UP for jobs of 1000 cards or less		3.0
SET UP for jobs of 1001 cards or more		5.0
PROBLEM CARDS:	Per occurrence	.70
	Per card	.55

Standard Minutes per WORK UNIT, by average size of work unit (cards):

1-400	1.270
401-800	1.715
801-1200	1.951
1201-2000	2.559
2001-2800	2.763
2801-4000	3.070
4001-5200	3.377
5201-6800	3.786
6801-8400	4.195
8401-10400	4.707
10401-12400	5.218
12401-14800	5.832
14801-17200	6.446
17201-20000	7.162
20001-22800	7.878
22801-26000	8.697
26001-29200	9.515
29201-32800	10.436
32801-36400	11.356
36401-40400	12.379
40401-44400	13.402
44401-48800	14.528
48801-53200	15.653

Standard Minutes per CARD CYCLE..... .0105

514 REPRODUCER - ORDINARY GANG PUNCHING

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

(Master cards not previously inserted and punching not under X-punch control)

I. An allowance is provided for setup which includes:

- A. Secure the work to be processed and cookie pushers as required.
- B. Arrange the working area.
- C. Secure and insert the control panel.
- D. Prepare master cards.
- E. Reset Veeder counters.
- F. Record personnel and machine times.

II. The standard provides for work accomplished in the following sequence:

A. At the beginning of each work unit:

1. Box moved from the shelf to the top of cookie pusher.
2. Wedge and blocks removed.
3. Master card and first handful (400 cards) loaded into punch hopper.
4. Machine started.
5. First two or three cards removed from punch stacker and gang-punching verified as follows:

   a. The correct master card is in use.
   b. The detail card(s) has all the required holes.
   c. The detail card(s) has only the required holes.

6. Master card filed and detail card(s) placed in box.
7. Second handful loaded into punch hopper.

B. At the end of each 400 cycles:

1. Cards removed from punch stacker.
2. Cards jogged and sight-checked for presence of all the required holes.
3. Last card of handful examined to verify that it has only the required holes.
4. Handful of punched cards placed in box.
5. Next handful loaded into punch hopper.

C. At the end of each work unit:

1. Cards run out into punch stacker.
2. Cards removed from punch stacker.
3. Cards jogged and sight-checked for presence of all the required holes.
4. Last card examined to verify that it has only the required holes.
5. Last handful placed in box.
6. Blocks and wedge inserted.
7. Box moved from the top to the shelf of cookie pusher.
8. Veeder counter total posted to control sheet.
9. Veeder counter reset to zeros.

III. Other provisions:

A. The standard provides for the complete disposition of each work unit before the following work unit is started.

B. When the average size of work units within a job exceeds 2,000 cards, the standard provides for handling boxes, removing blocks and wedge, and inserting blocks and wedge on the basis of one box per 2,000 cards or fraction thereof.

PRODUCTION STANDARDS

514 Reproducer

ORDINARY GANG PUNCHING

	Standard Minutes
SET UP for jobs of 1000 cards or less	3.0
SET UP for jobs of 1001 cards or more	5.0
PROBLEM CARDS:	
Per occurrence	.70
Per card	.55
Standard Minutes per WORK UNIT, by average size of work unit (cards):	
1-400	.877
401-800	.962
801-1200	1.032
1201 or more	1.242
Standard Minutes per CARD CYCLE	.0105

514 REPRODUCER - INTERSPERSED GANG PUNCHING

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

(Master cards inserted in a prior operation and punching under X-punch control)

I. An allowance is provided for setup and test which includes:

- A. Secure the work to be processed and cookie pushers as required.
- B. Arrange the working area.
- C. Secure and insert the control panel.
- D. Set X-brushes.
- E. Test the machine for:
  1. Punching all the holes required.
  2. Punching only the holes required.
  3. Proper functioning of all the comparing unit positions being used.
  4. Proper functioning of all X-brushes being used.
- F. Reset Veeder counters to zero.
- G. Record personnel and machine times.

II. The standard provides for work accomplished in the following sequence:

- A. At the beginning of each job (not work unit):
  1. Box moved from the shelf to the top of cookie pusher.
  2. Wedge and blocks removed.
  3. First handful (400 cards) loaded into punch hopper.
  4. Machine started.
  5. First two or three cards removed from punch stacker and check made to see that the machine is:
     a. Punching all the holes required.
     b. Punching only the holes required.
  6. Cards from punch stacker weighted as a backlog for the read hopper.
  7. Second handful loaded into punch hopper.
- B. At the end of the first 400 cycles:
  1. Cards removed from punch stacker.
  2. Cards jogged and scanned by fanning to catch blank and/or double-punched columns in gang-punched fields.
  3. Cards added to weighted backlog for read hopper.
  4. Handful loaded into punch hopper.

C. At the end of second 400 cycles:

1. Machine stopped.
2. Backlog loaded into read hopper.
3. Cards removed from punch stacker.
4. Machine started.
5. Cards jogged and scanned by fanning to catch blank and/or double punched columns in gang-punched fields.
6. Cards loaded into read hopper.
7. Handful loaded into punch hopper.

D. At the end of third and subsequent 400 cycles:

1. Cards removed from both stackers.
2. Cards from read stacker jogged and placed in box.
3. Cards from punch stacker jogged and scanned by fanning to catch blank and/or double punched columns in gang-punched fields
4. Cards loaded into read hopper.
5. Handful loaded into punch hopper.

E. As the last of each work unit is loaded into the punch hopper, two breaker cards of distinctive color and corner cut are inserted.

F. When the last card feeds from punch hopper:

1. Cards run out into punch stacker (three cycles).
2. Machine stopped.
3. Cards removed from both stackers.
4. Machine started.
5. Cards from read stacker jogged and placed in box.
6. Cards from punch stacker jogged and scanned by fanning to catch blank and/or double-punched columns in gang-punched fields.
7. Cards loaded into read hopper.

G. At the end of the next to last 400 cycles:

1. Cards removed from read stacker.
2. Cards jogged and placed in box.

H. When the last card of the job feeds from read hopper:

1. Cards run out into read stacker.
2. Cards removed from read stacker.
3. Cards jogged and placed in box.
4. Blocks and wedge inserted.
5. Box moved from the top to the shelf of cookie pusher.
6. Veeder counter totals checked for agreement.
7. One Veeder Counter total posted to control sheet. (Job total.)

III. Other provisions:

A. Work units within a job are to be run consecutively with breaker cards as separators.

B. When the average size of work units exceeds 2,000 cards, the standard provides for handling boxes, removing blocks and wedges, and inserting blocks and wedges on the basis of one box per 2,000 cards or fraction thereof.

PRODUCTION STANDARDS

514 Reproducer

INTERSPERSED GANG PUNCHING

	Standard Minutes
SET UP for jobs of 1000 cards or less	9.00
SET UP for jobs of 1001 cards or more	15.00
PROBLEM CARDS:	
Per occurrence - card(s) jammed	1.35
Per occurrence - other	.70
Per card	.55
Standard Minutes per JOB (Note: Work unit elements internal)	1.979
Standard Minutes per CARD CYCLE	.0105

557 INTERPRETER

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup and test which includes:

A. Secure the work to be processed.
B. Arrange the work area.
C. Secure and insert the control panel.
D. Secure the test deck.
E. Test the machine with three cards and check for proper line and accuracy of interpretation.
F. Identify and return test deck to supervisor.
G. Reset Veeder counter to zero.
H. Record personnel and machine times.

II. The standards provide for work accomplished in the following sequence:

A. At the beginning of a job:

1. Box moved from shelf to top of cookie pusher.
2. Wedge and blocks removed.
3. First handful (400 cards) taken from front of box, jogged, and loaded into hopper.
4. Machine started.
5. First one or two cards removed from stacker and the accuracy of the interpretation proven in one card.
6. First card(s) placed in box.
7. Second handful loaded into hopper.

B. At the end of each 400 card cycles:

1. Handful loaded to hopper.
2. Cards removed from stacker.
3. Cards jogged and inspected for gross interpretation failures by fanning.
4. Handful to box, except last card.
5. Last card examined in detail for accurate interpretation.
6. Last card placed in box.

C. At the end of each job:

1. Cards removed from stacker.
2. Cards jogged and inspected for gross interpretation failures by fanning.
3. Cards to box, except last card.
4. Last card examined in detail for accurate interpretation.
5. Last card placed in box.
6. Blocks and wedge inserted.
7. Box from top to shelf of cookie pusher.

III. Other provisions:

A. The standards provide for the continuous operation of the interpreter from box to box and work unit to work unit through the use of separator cards of contrasting color and/or corner cut inserted by the operator as the last handful from each box is loaded into the hopper.

B. When the average size of work units exceed 2,000 cards, the standards provide for handling boxes, removing blocks and wedges, and inserting blocks and wedges on the basis of one box per 2,000 cards or fraction thereof.

PRODUCTION STANDARDS

557 Interpreter

	Standard Minutes
SET UP for jobs of 1000 cards or less	4.50
SET UP for jobs of 1001 cards or more	6.50
PROBLEM CARDS:	
Per occurrence	.70
Per card	.55
Standard Minutes per JOB (Note: Work Unit elements internal)	1.695
Standard Minutes per CARD CYCLE	.0105

604 CALCULATING PUNCH - PUNCHING (Calculating)

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup and test which includes:

- A. Secure the work to be processed.
- B. Arrange the working area.
- C. Secure and insert the control panels.
- D. Secure a test deck and a master test deck.
- E. Test the machine with 20 cards.
- F. Compare decks card for card.
- G. Identify and return test decks to supervisor.
- H. Reset Veeder counter to zero.
- I. Record personnel and machine times.

II. The standards provide for work accomplished in the following sequence:

A. At the beginning of a work unit:

1. Box moved from the shelf to the top of cookie pusher.
2. Wedge and blocks removed.
3. First handful (400 cards) jogged and loaded into hopper.
4. Machine started.
5. For the first work unit only:

   a. First one or two cards removed from stacker and the accuracy of the calculation proven in the first card.
   b. First card(s) placed in box.

6. Second handful loaded into hopper.

B. At the end of each 400 card cycles:

1. Handful loaded into hopper.
2. Cards removed from stacker.
3. Cards jogged and result fields examined by fanning to verify the results are being punched.
4. Handful to box, except last card.
5. Last card examined for accuracy of computation.
6. Last card placed in box.

C. At the end of each work unit:

1. Cards run out into stacker.
2. Cards removed from stacker.
3. Cards jogged and result fields examined by fanning to verify that results are being punched.
4. Handful to box, except last card.

5. Last card examined for accuracy of computation.
6. Last card placed in box.
7. Blocks and wedge inserted.
8. Box moved from the top to the shelf of cookie pusher.
9. Post Veeder counter total to control sheet.
10. Reset counter.

III. Other provisions:

A. The standards provide for the complete disposition of each work unit before the following work unit is started.

B. When work units consist of more than 2,000 cards, the standards provide for the insertion and removal of blocks and wedges for one box per 2,000 cards or fraction thereof.

PRODUCTION STANDARDS

604 Calculating Punch

PUNCHING (Calculating)

	Standard Minutes
SET UP for jobs of 1000 cards or less	3.0
SET UP for jobs of 1001 cards or more	5.0
FIRST TEST for operation	10.0
Each ADDITIONAL TEST for operation	8.5
PROBLEM CARDS:	
Per occurrence	.70
Per card	.55
Standard Minutes per WORK UNIT, by average size of work unit (cards):	
1-400	1.628
401-800	1.713
801-1200	1.783
1201 or more	1.993
Standard Minutes per CARD CYCLE	.0105

604 CALCULATING PUNCH - CHECKING

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup and test which includes:

A. Secure the work to be processed.
B. Arrange the working area.
C. Secure and insert the control panels.
D. Secure a test deck.
E. Test the machine with 20 cards.
F. Return test deck to supervisor.
G. Reset Veeder counter to zero.
H. Record personnel and machine times.

II. The standards for work accomplished in the following sequence:

A. At the beginning of a work unit.

1. Box moved from the shelf to the top of cookie pusher.
2. Wedge and blocks removed.
3. First handful (400 cards) jogged and loaded into hopper.
4. Machine started.
5. Second handful loaded into hopper.

B. At the end of each 400 card cycles:

1. Handful loaded into hopper.
2. Cards removed from stacker.
3. Cards jogged and placed in box.

C. At the end of each work unit:

1. Cards run out into stacker.
2. Cards removed from stacker.
3. Cards jogged and placed in box.
4. Blocks and wedge inserted.
5. Box moved from the top to the shelf of cookie pusher.
6. Post Veeder counter total to control sheet.
7. Reset counter.

III. Other provisions:

A. The standards provide for the complete disposition of each work unit before the following work unit is started.

B. When work units consist of more than 2,000 cards, the standards provide for the insertion and removal of blocks and wedges for one box per 2,000 cards or fraction thereof.

PRODUCTION STANDARDS

604 Calculating Punch

CHECKING

	Standard Minutes
SET UP for jobs of 1000 cards or less	3.0
SET UP for jobs of 1001 cards or more	5.0
FIRST TEST for operation	10.0
Each ADDITIONAL TEST for operation	8.5
PROBLEM CARDS:	
Per occurrence	.70
Per card	.55
Standard Minutes per WORK UNIT, by average size of work unit (cards):	
1-400	.593
401-800	.678
801-1200	.748
1201 or more	.958
Standard Minutes per CARD CYCLE	.0105

487, 488, 489, 490 CENSUS EQUIPMENT - 1-COLUMN SORT, SELECT, COUNT, EDIT, DOUBLE-PUNCH CHECK, etc.

GENERAL OPERATING PROCEDURE COVERED BY STANDARDS

I. An allowance is provided for setup and test which includes:

A. Turn on power switch.
B. Arrange the work area.
C. Secure work to be processed and the required equipment.
D. Install wire plug board.
E. Run test deck of cards.
F. Reset Veeder counter.
G. Record personnel and machine time.

II. Standards provide for work accomplished in the following sequence:

A. At the beginning of a work unit:

1. Box moved from shelf to top of cookie pusher.
2. Wedge and blocks removed.
3. First handful (400 cards) jogged and loaded into hopper.
4. Change plugboard wire as necessary.
5. Machine started.
6. Second handful of cards jogged and loaded into hopper.

B. For each 400 card cycles:

1. One handful of cards jogged and loaded into hopper.
2. Cards removed as required from stacker containing the greatest number of cards.
3. Cards jogged, sight-checked, and placed in sorting rack or boxes as required.

C. At the end of each work unit:

1. Cards removed from all stackers, jogged, sight-checked and placed in sorting rack or boxes according to size of work unit.
2. Cards transferred from sorting rack to boxes.
3. Blocks and wedges inserted.
4. Box labels modified and numbered.
5. Boxes moved from the top to the shelf of cookie pusher.
6. Veeder counter total posted to control sheet.
7. Reset counter.

III. Other provisions:

A. The standards provide for the complete disposition of each work unit before the following work unit is started.

B. The standards provide for handling, opening, closing, and labeling one box per 2,000 cards or fraction thereof.

PRODUCTION STANDARDS

487, 488, 489, 490 Census Equipment

1-COLUMN SORT OR SELECT, COUNT, EDIT, DOUBLE-PUNCH CHECK, etc.
SORT 2 OR MORE COLUMNS (Separate card pass for each column)

Working from Boxes or Racks

	Standard Minutes
SET UP for jobs of 1000 cards or less.....	1.50
SET UP for jobs of 1001 cards or more.....	3.00
PROBLEM CARDS:	
Per occurrence.....	.70
Per card.....	.55
Standard Minutes per CARD CYCLE.....	.00241

(WORK UNIT Standards on following pages)

PRODUCTION STANDARDS—Continued

487, 488, 489, 490 Census Equipment

1-COLUMN SORT OR SELECT, COUNT, EDIT, DOUBLE-PUNCH CHECK, etc.
SORT 2 OR MORE COLUMNS (Separate card pass for each column)

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job — Number of Columns Sorted				
	1	2	3	4	5
1 - 400	.849	1.882	2.414	2.946	3.479
401 - 800	1.049	2.143	2.737	3.331	3.925
801 - 1200	1.207	2.301	2.895	3.489	4.083
1201 - 2000	1.857	3.567	4.161	4.755	5.349
2001 - 2800	2.379	4.090	4.684	5.278	5.871
2801 - 4000	2.643	4.354	4.948	5.542	6.135
4001 - 5200	3.254	4.964	5.558	6.152	6.746
5201 - 6800	3.952	5.663	6.257	6.851	7.444
6801 - 8400	4.651	6.360	6.955	7.549	8.143
8401 - 10400	5.437	7.148	7.742	8.336	8.929
10401 or more	5.525	7.236	7.830	8.424	9.017
	6	7	8	9	10
1 - 400	4.011	4.543	5.076	5.608	6.140
401 - 800	4.519	5.113	5.706	6.300	6.894
801 - 1200	4.677	5.271	5.865	6.458	7.052
1201 - 2000	5.943	6.537	7.131	7.725	8.318
2001 - 2800	6.465	7.059	7.653	8.247	8.841
2801 - 4000	6.729	7.323	7.917	8.511	9.105
4001 - 5200	7.340	7.934	8.528	9.122	9.715
5201 - 6800	8.038	8.632	9.226	9.820	10.414
6801 - 8400	8.737	9.331	9.925	10.519	11.112
8401 - 10400	9.523	10.117	10.711	11.305	11.899
10401 or more	9.611	10.205	10.799	11.393	11.987
	11	12	13	14	15
1 - 400	6.673	7.205	7.737	8.269	8.802
401 - 800	7.488	8.082	8.676	9.270	9.864
801 - 1200	7.646	8.240	8.834	9.428	10.022
1201 - 2000	8.912	9.506	10.099	10.694	11.288
2001 - 2800	9.435	10.029	10.622	11.217	11.810
2801 - 4000	9.699	10.293	10.886	11.481	12.074
4001 - 5200	10.309	10.903	11.496	12.091	12.685
5201 - 6800	11.008	11.602	12.195	12.790	13.383
6801 - 8400	11.706	12.300	12.893	13.488	14.082
8401 - 10400	12.493	13.087	13.680	14.275	14.868
10401 or more	12.581	13.175	13.768	14.363	14.956

PRODUCTION STANDARDS—Continued

487, 488, 489, 490 Census Equipment

1-COLUMN SORT OR SELECT, COUNT, EDIT, DOUBLE-PUNCH CHECK, etc.
SORT 2 OR MORE COLUMNS (Separate card pass for each column)

WORK UNIT Standards - Working from Boxes

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	16	17	18	19	20
1 - 400	9.334	9.866	10.399	10.931	11.463
401 - 800	10.458	11.052	11.645	12.239	12.833
801 - 1200	10.616	11.210	11.804	12.397	12.991
1201 - 2000	11.882	12.476	13.070	13.664	14.257
2001 - 2800	12.404	12.998	13.592	14.186	14.870
2801 - 4000	12.668	13.262	13.856	14.450	15.044
4001 - 5200	13.279	13.873	14.467	15.061	15.834
5201 - 6800	13.977	14.571	15.165	15.759	16.353
6801 - 8400	14.676	15.270	15.864	16.458	17.411
8401 - 10400	15.462	16.056	16.650	17.244	17.838
10401 or more	15.550	16.144	16.738	17.332	17.926
	21	22	23	24	25
1 - 400	11.996	12.528	13.060	13.592	14.125
401 - 800	13.427	14.021	14.615	15.209	15.803
801 - 1200	13.585	14.179	14.773	15,367	15.961
1201 - 2000	14.851	15.445	16.039	16.633	17.227
2001 - 2800	15,374	15.968	16,562	17.156	17.749
2801 - 4000	15.638	16.232	16.826	17.420	18.013
4001 - 5200	16.248	16.842	17.436	18.030	18.624
5201 - 6800	16.947	17.541	18.135	18.729	19.322
6801 - 8400	17.645	18.239	18.833	19.427	20.021
8401 - 10400	18.432	19.026	19.620	20.214	20.807
10401 or more	18.520	19.114	19.708	20.302	20.895

487, 488, 489, 490 Census Equipment

1-COLUMN SORT OR SELECT, COUNT, EDIT, DOUBLE-PUNCH CHECK, etc.
SORT 2 OR MORE COLUMNS (Separate card pass for each column)

WORK UNIT Standards - Working from Racks

Average Size of Work Unit (Cards)	Standard Minutes for each WORK UNIT in a job				
	Number of Columns Sorted				
	1	2	3	4	5
1 - 400	.794	1.826	2.359	2.891	3.423
401 - 800	.909	2.003	2.597	3.191	3.785
801 - 1200	.997	2.091	2.685	3.279	3.873
1201 or more	.997	2.707	3.301	3.895	4.489
	6	7	8	9	10
1 - 400	3.956	4.488	5.020	5.553	6.085
401 - 800	4.379	4.973	5.566	6.160	6.754
801 - 1200	4.467	5.061	5.654	6.248	6.842
1201 or more	5.083	5.677	6.270	6.864	7.458
	11	12	13	14	15
1 - 400	6.617	7.149	7.682	8.214	8.746
401 - 800	7.348	7.942	8.536	9.130	9.724
801 - 1200	7.436	8.030	8.624	9.218	9.812
1201 or more	8.052	8.646	9.240	9.834	10.428
	16	17	18	19	20
1 - 400	9.279	9.811	10.343	10.876	11.408
401 - 800	10.318	10.912	11.505	12.099	12.693
801 - 1200	10.406	11.000	11.593	12.187	12.781
1201 or more	11.022	11.616	12.209	12.803	13.397
	21	22	23	24	25
1 - 400	11.940	12.472	13.005	13.537	14.069
401 - 800	13.287	13.881	14.475	15.069	15.663
801 - 1200	13.375	13.969	14.563	15.157	15.751
1201 or more	13.990	14.585	15.179	15.773	16.367

DEVELOPMENT OF WORK UNIT STANDARDS

Descriptions of the detailed standards have been furnished at the beginning of this section, but it is felt that the work unit standards need further clarification to enable the reader to understand their composition and purpose.

The work unit standards provide for the necessary external physical activities of an operator during a machine job. These external physical activities together with the cycling of the machine compose the total time for processing cards in a machine job. The card cycle standards as mentioned earlier compensate the operator for the machine cycling time.

The work unit standards selected for illustration pertain to the operation "Ordinary Gang Punching" on the 514 Reproducing Punch. This operation was selected because it is not complex, and there are only four work unit standard writeups involved. In comparison, the 083 Sorter standards are composed of 11 work unit sizes with each size having 35 time values representing the number of columns sorted (1 to 35).

The writeups for Ordinary Gang Punching consist of work unit sizes 1 to 400 cards, 401 to 800, 801 to 1200, and 1201 cards or more. There is no need to go any higher because the external elements remain constant for work unit sizes over 1200 cards. The writeups are shown on the following pages. Both external and internal elements are listed in the writeups so that a complete analysis of operator activity is present.

The first writeup is for work units averaging between 1 to 400 cards. All card handling elements are external because of the small volume of cards (one handful) in each work unit. Before any cards are passed through the machine the card counter is reset to zero, wedges are removed from the file box, and cards for the work unit are loaded into the machine hopper. Then the machine is started and cycling proceeds until all cards have cleared the hopper. The operator presses the start button to run out the cards remaining in the machine. The cards are removed from the stacker to the top of the machine, joggled into alignment, picked up and sight checked for correct punching, and replaced in the box. Wedges are inserted in the box when it is full. Card count of the work unit is posted to a control or job sheet. These are the external elements performed by the operator. Since the work units are so small, about five should fit into a box. Therefore, the frequency used for the elements of removing and replacing wedges is one occurrence for every five work units (1/5). Labeling the box(es) is done while the machine is cycling. It involves approximately 10 digits and letters per box so the element which is on a per-digit basis occurs 10 times for each box of five work units (10/5).

The second writeup involves work units in sizes ranging from 401 to 800 cards. Assuming that the shelves of a portable truck are used to store boxes for work units larger than 400 cards, the elements "Box to top of truck" and "Box to shelf" have been added as externals. The remaining elements are the same as in the preceding writeup. Based on an estimate of three work units to a box, the frequency for box

handling elements is 1/3. Labeling which is internal occurs once for every three work units or at a frequency of 10/3. When the work unit size exceeds one handful of cards, the occurrence of additional card handling and sight checking elements is internal to the machine cycling as shown in the writeup.

The third writeup is for work units of 801 to 1200 cards. The external and internal elements are similar to the previous writeups except that the frequencies are different. The box handling elements occur once for every two work units (1/2), and the labeling frequency is 10/2. Labeling is internal, and card handling and sight checking elements are internal after the first 400 cards of a work unit.

The fourth writeup is for work unit sizes of 1201 cards or more. The elements are the same as in the other writeups. This size work unit will fill at least one box so the box handling elements occur once in a work unit as do the other external elements. Labeling which is on a per-digit basis occurs internally with every work unit. Since an estimate of 10 digits and letters are marked on a box, the frequency for labeling is 10/1. The box handling elements for one box occur externally, and for any additional boxes in a work unit, internally. Card handling and sight checking elements are external for 400 cards, and internal for the balance of the cards in a work unit. Once a machine is started, cards are removed, checked, and placed in boxes; the boxes are blocked, labeled, and placed aside when filled; and the machine hopper is loaded intermittently -- all internal to the machine cycling except for the last handful of cards and the last box in a work unit.

Each writeup shows the total external normal minutes per work unit, the application of 10% personal and delay allowance, and the standard minutes for the size of work unit mentioned. A description of the elements in the work unit writeups is shown on pages 161 and 162.

514 REPRODUCING PUNCH - ORDINARY GANG PUNCHING

WORK UNIT STANDARD

Average size of work unit: 1 - 400 cards

Element	Normal Mins	Freq. of occur. per Work Unit	External	Internal		
			Mins per Work Unit	Mins per Work Unit	Mins per 400 cards (except first 400)	Mins per 2000 cards (except first 2000)
Reset Veeder counter.....	.1300	1/1	.1300			
Box to top of truck.....	.0600		--			
Remove wedges.....	.1320	1/5	.0264			
Load hopper.....	.1500	1/1	.1500			
Start machine.....	.0600	1/1	.0600			
Runout.....	.0900	1/1	.0900			
Pocket to machine top.....	.0540	1/1	.0540			
Sight check.....	.0380	1/1	.0380			
Machine top to box.....	.1350	1/1	.1350			
Insert wedges.....	.1200	1/5	.0240			
Label boxes.....per digit	.0250	10/5	--	.0500		
Box to shelf.....	.0700		--			
Post Veeder count.....	.0900	1/1	.0900			
Total normal minutes.....			.7974			
Personal & delay allowance.....			X 1.10			
Standard minutes per work unit.....			.8771			

514 REPRODUCING PUNCH - ORDINARY GANG PUNCHING

WORK UNIT STANDARD

Average size of work unit: 401 - 800 cards

Element	Normal Mins	Freq. of occur. per Work Unit	External	Internal		
			Mins per Work Unit	Mins per Work Unit	Mins per 400 cards (except first 400)	Mins per 2000 cards (except first 2000)
Reset Veeder counter.....	.1300	1/1	.1300			
Box to top of truck.....	.0600	1/3	.0200			
Remove wedges.....	.1320	1/3	.0440			
Load hopper.....	.1500	1/1	.1500		.1500	
Start machine.....	.0600	1/1	.0600			
Runout.....	.0900	1/1	.0900			
Pocket to machine top.....	.0540	1/1	.0540		.0540	
Sight check.....	.0380	1/1	.0380		.0380	
Machine top to box.....	.1350	1/1	.1350		.1350	
Insert wedges.....	.1200	1/3	.0400			
Label boxes.....per digit	.0250	10/3	---	.0833		
Box to shelf.....	.0700	1/3	.0233			
Post Veeder count.....	.0900	1/1	.0900			
Total normal minutes.....			.8743			
Personal & delay allowance.....			X 1.10			
Standard minutes per work unit..			.9617			

514 REPRODUCING PUNCH - ORDINARY GANG PUNCHING

WORK UNIT STANDARD

Average size of work unit: 801 - 1200 cards

Element	Normal Mins	Freq. of occur. per Work Unit	External	Internal		
			Mins per Work Unit	Mins per Work Unit	Mins per 400 cards (except first 400)	Mins per 2000 cards (except first 2000)
Reset Veeder counter.....	.1300	1/1	.1300			
Box to top of truck.....	.0600	1/2	.0300			
Remove wedges.....	.1320	1/2	.0660			
Load hopper.....	.1500	1/1	.1500		.1500	
Start machine.....	.0600	1/1	.0600			
Runout.....	.0900	1/1	.0900			
Focket to machine top.....	.0540	1/1	.0540		.0540	
Sight check.....	.0380	1/1	.0380		.0380	
Machine top to box.....	.1350	1/1	.1350		.1350	
Insert wedges.....	.1200	1/2	.0600			
Label boxes.....per digit	.0250	10/2	---	.1250		
Box to shelf.....	.0700	1/2	.0350			
Post Veeder count.....	.0900	1/1	.0900			
Total normal minutes.....			.9380			
Personal & delay allowance.....			X 1.10			
Standard minutes per work unit...			1.0318			

514 REPRODUCING PUNCH - ORDINARY GANG PUNCHING

WORK UNIT STANDARD

Average size of work unit: 1201 cards or more

Element	Normal Mins	Freq. of occur. per Work Unit	External	Internal		
			Mins per Work Unit	Mins per Work Unit	Mins per 400 cards (except first 400)	Mins per 2000 cards (except first 2000)
Reset Veeder counter.....	.1300	1/1	.1300			
Box to top of truck.....	.0600	1/1	.0600			.0600
Remove wedges.....	.1320	1/1	.1320			.1320
Load hopper.....	.1500	1/1	.1500		.1500	
Start machine.....	.0600	1/1	.0600			
Runout.....	.0900	1/1	.0900			
Pocket to machine top.....	.0540	1/1	.0540		.0540	
Sight check.....	.0380	1/1	.0380		.0380	
Machine top to box.....	.1350	1/1	.1350		.1350	
Insert wedges.....	.1200	1/1	.1200			.1200
Label boxes.....per digit	.0250	10/1	--	.2500		.2500
Box to shelf.....	.0700	1/1	.0700			.0700
Post Veeder count.....	.0900	1/1	.0900			
Total normal minutes.....			1.1290			
Personal & delay allowance.....			X 1.10			
Standard minutes per work unit...			1.2419			

Description of Work Elements

Reset Veeder Counter

Operator reaches to Veeder counter (either in front or back of machine); places thumb or forefinger on wheel of counter; presses forward, rotating wheel until counter is reset to zero.

Box to Top of Truck

Operator reaches for file box on shelf of truck; grasps front of file box with one hand; pulls it out of shelf sufficiently to grasp with other hand; lifts file box from shelf and raises it to height of truck; places box in selected location on top of truck and releases it.

Remove Wedges

(wood wedges) Operator picks up wedge hammer and inserts claw end along side of wood wedge in file box; presses hammer head away from side of box to force claw end against side of wedge and raise it; grasps edge of wedge with fingers; pulls it out together with any additional wedges or blocks in box and places them aside; places aside wedge hammer.

(cardboard or cardboard and wood wedges) Operator grasps file box firmly with one hand; grasps flap of cardboard wedge with fingers of other hand; pulls out wedge and places aside together with any additional wedges or blocks in box.

Load Hopper

Operator picks up handful of cards from file box on top of truck or from pocket of rack; fans both ends of handful of cards while turning to machine, places cards along raised edge of machine top and joggles them until cards are evenly positioned; lifts out weight in machine hopper; places cards in hopper and replaces weight.

Start Machine

Operator presses button, clicks switch, moves lever, or performs similar movement to start machine in operation.

Runout

Operator reaches to control button at front of machine; depresses button and keeps it depressed until cards held internally in the machine are cleared into card pocket(s) or stacker(s).

Pocket to Machine Top

Operator grasps card(s) in machine pocket; withdraws card(s) clear of pocket; places card(s) on top of machine.

Sight Check

Operator raises handful of cards to light; sights through predetermined location of punch hole(s) in cards.

Machine Top to Box

Operator picks up stack of cards from top of machine; joggles cards into a neat, even stack on joggle plate at top of machine; turns about and places cards in box or rack.

Insert Wedges

(wood wedges) Operator picks up unbeveled wood wedge with one hand; firmly presses cards in file box against front end of box with other hand; inserts unbeveled wedge in space at rear of file box; picks up beveled wood wedge and inserts it alongside first wedge, narrow edge down; picks up wedge hammer and pounds top of beveled wedge until it is flush with top of file box; places aside wedge hammer. When necessary several cards are removed from or added to file box to permit wedges to fit firmly.

(cardboard or cardboard and wood wedges) Operator picks up cardboard or unbeveled wood wedge with one hand; firmly presses cards in file box against front end of box with other hand; inserts unbeveled wood wedge or cardboard wedge in space at rear of file box; as necessary picks up additional cardboard wedges and inserts them in space at rear of file box, pressing them firmly in place with thumb of both hands. If necessary, removes or adds a few cards to file box to permit wedges to fit firmly.

Label Boxes

Operator picks up marking pencil and turns to file box; marks identifying numbers or letters or combination of both on face of file box (positions file box if necessary); places marking pencil aside.

Box to Shelf

Operator grasps file box on top of truck with both hands; picks it up or slides it off top of truck; lowers it to appropriate shelf of truck; places rear end of file box on shelf; slides box onto shelf and releases it.

Post Veeder Count

Operator picks up pencil; observes total card cycle count on Veeder counter attached to machine; posts count to job sheet or other recordkeeping document; places pencil aside.

Part IV

Measuring Individual Productivity with Detailed Standards

Introductory Comments

This final section of the manual illustrates how to measure productive effort of individual tabulating equipment operators with the detailed engineered standards described previously. A basic requirement for computing performances is a daily reporting form which is prepared by each operator showing the jobs on which she worked. The form should provide space for posting details of each machine job such as card counts, number of work units, type of machine, operation, etc. When a non-machine activity occurs, a written entry is made describing it.

In addition to providing data for computing operator performance, a reporting form also furnishes written accountability of total work time by activity, by operator. This information when summarized is extremely useful to operating officials for budgeting, staffing, machine utilization, work distribution, etc.

An example of a reporting form which meets the requirements and is called "Daily Time and Production Record" is described in the following pages.

The Reporting Form

The "Daily Time and Production Record" form contains twenty-six columns. Eighteen are used by the operator to report details of machine jobs, one is used by the supervisor to initial entries, and seven are used by the standards computation clerk in calculating performances. The heading of the form contains spaces for operator name and number, section, date, and lunch period. These are self-explanatory. Since the column titles require some clarification, a list of them is furnished below in numerical order together with an explanation of each.

Column Number	Column Title	Explanation of Entry
1	Start	Operator records the actual beginning and ending times of each machine job or other activity, using time clocks conveniently located in the work area. The time is stamped on the form in hours and tenths of an hour; each tenth is equivalent to six minutes. The entries can also be handwritten.
2	End	
3	Elapsed Minutes	This column shows the minutes spent on each activity recorded by the operator. The entry is made usually by the person who computes the performance of the operators. It is determined by subtracting starting time from ending time and converting to minutes.
4	Machine Type	Operator records the type number of the machine used for each job (083, 088, 407, etc.).
5	Operation	Operator writes the type of operation performed on the machine (sort, tab, seq., repr., etc.).
6	Job, Chart and Step. No.	Operator writes identifying code number(s) and/or letter(s) for each machine job.

Column Number	Column Title	Explanation of Entry
7	No. of Tests	Operator records number of necessary machine tests actually performed for the job.
	Work from:	
8	Box	Operator places checkmark in appropriate column
9	Rack	to show whether cards were assembled in boxes or racks.
10	No. Columns Sorted	For each sorter job, operator posts the total number of columns in which the cards were sorted.
	Problem Cards:	
11	No. of occur.	Operator posts the number of times problem cards occurred during any machine job.
	No. of cards	
12	Rej.	Operator writes in the appropriate column the
13	Jam	total number of problem cards which had to be
14	Seq.	corrected and replaced during the occurrences reported in column 11. A "reject" card is not usually considered as a problem card for standards purposes. Column 12 merely provides a location for recording the count of cards which were rejected during a machine job if a count is required for control purposes.
15	No. of Work Units	Operator records total number of work units in each machine job.
16	Card Cycles or Clock Time	Operator transcribes the total number of card cycles counted for each job on the Veeder counter, or total minutes of cycling time recorded for each job on the machine clock.
17	Total cards in file	Operator posts the actual number of cards in the job as shown by Veeder counters, printouts, job tickets, etc.

Column Number	Column Title	Explanation of Entry
18	Prints	This column applies to machine jobs in which certain types of printouts are made. The operator makes an entry when a record is required of the total sheets or items printed in a job.
19	Specified card count	This space is available for special card counts or other type counts not usually recorded. Operator makes an entry as instructed.
20	Remarks	This column is used primarily for supervisor's initials to validate entries.

(The remaining columns on the form are filled in by the person who computes the performance of the operators.)

21	Average Cards per Work Unit	Clerk computes and records the average size in cards of the work units in each machine job. (column 17 divided by column 15)
	Standard Minutes Produced:	
22	Card Cycles or Clock Time	Clerk computes and records standard minutes produced for machine running time from card cycles or clock time shown in column 16, using detailed standards.
23	Work Units	Clerk computes and records standard minutes produced for the work units in each machine job (column 15), using detailed standards.
24	Set Up, Tests, Problem Cards	Clerk computes and records standard minutes produced for set up, tests, and problem cards reported for each machine job, using detailed standards.

Column Number	Column Title	Explanation of Entry
25	Total Standard Minutes Produced	Clerk summarizes entries in column 22, 23, and 24 and transcribes total to this column.
26	Total Minutes Charged	Clerk transcribes to this column the elapsed minutes posted in column 3 for each machine job.

The reporting form on the next page contains job entries for one day's work on tabulating equipment. The entries are actual jobs which were selected from different reporting forms and grouped on one form to show as many as possible of the different machine types with standards. The jobs are identified by capital letters on the left margin. Production performance for the day's work has been computed and recorded. Detailed explanations of the computations follow the reporting form.

U. S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

DAILY TIME AND PRODUCTION RECORD

Name and number: Dorothy Dynes 19504
Section: Tabulating
Date: June 6, 1966
Lunch period: 11:10 to 11:40

	Start	End	Elapsed Minutes	Machine Type	Operation	Job, Chart and Step No.	No. of tests	Work from: Box	Work from: Rack	No. columns sorted	Problem Cards: No.	No. of cards: Rej.	No. of cards: Jam	No. of cards: Seq.	No. of Work Units	Card Cycles or Clock Time	Total cards in file	Prints	Specified card count	Remarks
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	08.0	09.0	60	083	Sort	100		x		5					6	37125	7425			EHD
B	09.0	09.5	30	083	Sort	0090		x		8					1	21136	2642			EHD
C	09.5	09.8	18	407	List	1413 MA36N	1	x							1	5.9	749			EHD
D	09.8	10.4	36	407	List	1413 MA36H	1	x							1	2395	2395			EHD
E	10.4	12.4	*90	407/514	Summary Punch Hook-up	1511 141	1	x							8	62.1 (1000 summary cards)	4120			EHD
F	12.4	13.5	66	514	Inter. Gang Punch	1856		x			1		1		3	4041	4041			EHD
G	13.5	14.6	66	514	Repr.	Hoss		x							1	5326	5326			EHD
H	14.6	15.2	36	087	Merge	1851	1	x			3		3		2	20.4	4525			EHD
I	15.2	15.8	36	088	Merge	100		x							3	18174	18174			EHD
J	15.8	16.5	42	557	Interpret	7403		x			1		2		1	3487	3487			EHD
			480 minutes (8 hours)																	

*30 minutes deducted for lunch period.

THIS SECTION FOR COMPUTING PERFORMANCE

	Average Cards per Work Unit	Standard Minutes Produced: Card Cycles or Clock Time	Standard Minutes Produced: Work Units	Standard Minutes Produced: Set Up, Tests, Problem Cards	Total Standard Minutes Produced	Total Minutes Charged
	21	22	23	24	25	26
A	1238	39.0	30.6	3.0	72.6	60.0
B	2642	22.2	7.3	3.0	32.5	30.0
C	749	6.2	.8	10.5	17.5	18.0
D	2395	21.8	1.1	12.5	35.4	36.0
E	515	65.2	14.4	15.0	94.6	90.0
F	1347	42.4	2.0	17.0	61.4	66.0
G	5326	55.9	3.8	5.0	64.7	66.0
H	2262	21.4	3.8	11.8	37.0	36.0
I	6058	34.3	5.7	3.0	43.0	36.0
J	3487	36.6	1.7	8.3	46.6	42.0
					505.3	480.0

Standard Minutes Produced 505.3 / Minutes Charged 480.0 = 105% Performance

COMPUTING OPERATOR PERFORMANCE

Listed below are the machine jobs described in the reporting form on the preceding page. Each job has an outline of the standards used and the computations performed in determining standard minutes produced.

It should be noted that the "Set Up" is not a recordable columnar entry on the reporting form. Normally each line entry of a machine job represents a new job (different card file/different machine) and entitles the operator to a "Set Up." The exception is when an operator runs several different jobs on the same machine with the same file of cards. When entries on a reporting form indicate that this has occurred, which is quite unusual, the standards computation clerk allows only one "Set Up" for the series of jobs.

Preliminary notes:

To determine average cards per work unit (col. 21), divide total cards in file (col. 17) by number of work units (col. 15).

To verify total card cycles (col. 16) in a numerical sorting job, multiply total cards (col. 17) by number of columns sorted (col. 10).

To determine elapsed minutes (col. 3) from time clock recordings to tenths of an hour in "Start" and "End" columns (1 and 2), subtract start time from end time and multiply the difference by 60. (Be sure to subtract 30 minutes or whatever time is allocated for lunch period when it occurs.)

Example:		
	End	10.2
	Start	- 08.4
		1.8
		X 60
	Elapsed Minutes	108

The entry in column 3 is also posted in column 26, total minutes charged, for all jobs on standard. This provides parallel columns of entries for minutes produced (col. 25) and minutes charged which can be compared at a glance from job to job to detect any patterns or extremes in performance which may have to be analyzed.

Before continuing, please locate the section with detailed engineered standards in Part III for ready reference in analyzing the computations for the jobs on standard.

Job "A"

Sorting on 083

The entries posted for this job show that there were 7425 cards (col. 17) comprising 6 work units (col. 15) which were filed in boxes (col. 8). It was a 5-column sort (col. 10) involving 37125 card cycles (col. 16).

	Standard Minutes Produced
083 Sorter Standards:	
37125 Card Cycles @ .00105 .....(col. 22)	39.0
6 Work Units @ 5.103 .....(col. 23)	30.6
(The average size of the work units is 1238 cards (col. 21). The time value was selected from the 5-column sort group in work unit size 1201-2000 cards, using the standard tables for "Working from boxes.")	
Set Up (over 1000 cards in deck).....(col. 24)	3.0
Total Standard Minutes Produced....(col. 25)	72.6

Job "B"

Sorting on 083

The entries posted for this job show that there were 2642 cards (col. 17) which were filed in boxes (col. 8), and the job consisted of 1 work unit (col. 15). It was an 8-column sort (col. 10) involving 21136 card cycles (col. 16).

		Standard Minutes Produced
083 Sorter Standards:		
21136 Card Cycles @ .00105	(col. 22)	22.2
1 Work Unit @ 7.272	(col. 23)	7.3
(The size of the work unit is 2642 cards (col. 21). The time value was selected from the 8-column sort group in work unit size 2001-2800 cards, using the standard tables for "Working from boxes.")		
Set Up (over 1000 cards in deck)	(col. 24)	3.0
Total Standard Minutes Produced	(col. 25)	32.5

Job "C"

Listing on 407

This line entry shows that there were 749 cards in the job (col. 17), that it had 1 work unit (col. 15), and that 1 test was performed (col. 7). The machine clock registered 5.9 minutes of running time (col. 16).

			Standard Minutes Produced
407 Accounting Machine Standards:			
5.9 minutes running time plus 5% personal allowance	(col. 22)		6.2
1 Work Unit @ .798	(col. 23)		.8
(The work unit size is 749 cards (col. 21). The time value selected represents work unit range of 401-800 cards.)			
Set Up (less than 1001 cards in deck)		3.0	
First Test		7.5	
	(col. 24)		10.5
Total Standard Minutes Produced	(col. 25)		17.5

Job "D"

Listing on 407

This machine job had a total of 2395 cards (col. 17) comprising 1 work unit (col. 15). One test was performed (col. 7). A total of 2395 card cycles, the equivalent of total cards, was reported in column 16 because the machine had no clock.

407 Accounting Machine Standards:		Standard Minutes Produced
2395 Card Cycles @ .00909 (time value for Listing)	(col. 22)	21.8
1 Work Unit @ 1.097	(col. 23)	1.1
(The work unit size is 2395 cards (col. 21) which is within the range of "1201 or more" cards from which the time value was selected.)		
Set Up (over 1000 cards in deck) 5.0		
First Test 7.5		
	(col. 24)	12.5
Total Standard Minutes Produced	(col. 25)	35.4

Job "E"

Summary Punch Hookup on 407/514

This line entry shows that there were 4120 cards in the job (col. 17) which consisted of 8 work units (col. 15). One test was performed (col. 7). The machine clock registered 62.1 minutes of running time (col. 16). A count of 1000 summary cards punched is shown also in column 16 but this record is for control purposes only.

407/514 Summary Punch Hookup Standards:		Standard Minutes Produced
62.1 minutes running time plus 5% personal allowance	(col. 22)	65.2
8 Work Units @ 1.794	(col. 23)	14.4
(The average work unit size is 515 cards (col. 21), and the time value used is from the work unit range of 401-800 cards.)		
Set Up (over 1000 cards in deck) 5.0		
First Test 10.0		
	(col. 24)	15.0
Total Standard Minutes Produced	(col. 25)	94.6

Job "F"

Interspersed Gang Punching on 514

This machine job contained a total of 4041 cards (col. 17) and processed an equivalent number of card cycles (col. 16). There was 1 occurrence of problem cards (col. 11) involving 1 card (col. 13). The number and size of work units is not relevant because there are no work unit standards for this type of operation. Instead, a "Per Job" standard was developed to provide for the physical elements which must be performed while the machine is idle. This time value is earned for each job of this type, and it is posted in column 23, work units standard minutes produced.

514 Reproducer Standards for Interspersed Gang Punching:

		Standard Minutes Produced
4041 Card Cycles @ .0105	(col. 22)	42.4
Per Job (1.979)	(col. 23)	2.0
Set Up (over 1000 cards in deck)	15.0	
Problem Cards:		
1 occurrence of jam @ 1.35	1.4	
1 problem card @ .55	.6	
	(col. 24)	17.0
Total Standard Minutes Produced	(col. 25)	61.4

Job "G"

Reproducing on 514

This line entry shows that there were 5326 cards in the job (col. 17) which consisted of 1 work unit (col. 15). Processing the job required 5326 card cycles (col. 16).

514 Reproducer Standards for Reproducing:

		Standard Minutes Produced
5326 Card Cycles @ .0105	(col. 22)	55.9
1 Work Unit @ 3.786	(col. 23)	3.8
(The size of the work unit is 5326 cards (col. 21). It appears within the range of 5201-6800 cards which determined selection of the time value.)		
Set Up (over 1000 cards in deck)	(col. 24)	5.0
Total Standard Minutes Produced	(col. 25)	64.7

Job "H"

Merging on 087

This machine job contained 4525 cards (col. 17), based on a count of cards which passed through the primary feed of the machine. The cards were assembled in boxes (col. 8) and consisted of 2 work units (col. 15). One test was performed (col. 7), and there were 3 occurrences of a jam (col. 11) involving 3 cards (col. 13). The machine clock registered 20.4 minutes of running time (col. 16).

087 Collator Standards for Merging:

			Standard Minutes Produced
20.4 minutes running time plus 5% personal allowance	(col. 22)		21.4
2 Work Units @ 1.885	(col. 23)		3.8
(The average work unit size is 2262 cards (col. 21). The time value used is from the range of "1201 or more" cards, under the category "Working from boxes.")			
Set Up (over 1000 cards in deck)		3.0	
First Test		5.0	
Problem Cards:			
3 occurrences of jam @ .70		2.1	
3 problem cards @ .55		1.7	
	(col. 24)		11.8
Total Standard Minutes Produced	(col. 25)		37.0

Job "I"

Merging on 088

The machine on which this job was run had no clock so the count of cards which passed through the primary feed of the machine was used for standards computation purposes. This count is 18174 and is posted on the reporting form under card cycles (col. 16) and total cards (col. 17). The cards were filed in boxes (col. 8) and were grouped into 3 work units (col. 15).

088 Collator Standards for Merging:

		Standard Minutes Produced
18174 Card Cycles @ .00189 (no clock; count of primary feed used)	(col. 22)	34.3
3 Work Units @ 1.885	(col. 23)	5.7
(The average work unit size is 6058 cards (col. 21). The time value used is from the range of "1201 or more" cards, under the category "Working from boxes.")		
Set Up (over 1000 cards in deck)	(col. 24)	3.0
Total Standard Minutes Produced	(col. 25)	43.0

Job "J"

Interpret on 557

This machine job contained a total of 3487 cards (col. 17) and processed an equivalent number of card cycles (col. 16). There was 1 occurrence of problem cards (col. 11) involving 2 cards (col. 13). The number and size of work units is not relevant because there are no work unit standards for this type of operation. Instead, a "Per Job" standard was developed to provide for the physical elements which must be performed while the machine is idle. This time value is earned for each job of this type, and it is posted in column 23, work units standard minutes produced.

557 Interpreter Standards:		Standard Minutes Produced
3487 Card Cycles @ .0105	(col. 22)	36.6
Per Job (1.695)	(col. 23)	1.7
Set Up (over 1000 cards in deck)	6.5	
Problem Cards:		
1 occurrence of jam @ .70	.7	
2 problem cards @ .55	1.1	
	(col. 24)	8.3
Total Standard Minutes Produced	(col. 25)	46.6

The sum of standard minutes produced is 505.3 as shown in column 25 of the reporting form, and the sum of minutes charged is 480 as shown in column 26. These two figures are used to determine the operator's performance which is 105%. The formula for computing percent performance is:

$$\frac{\text{Standard Minutes Produced}}{\text{Minutes Charged}} \times 100 = \% \text{ Performance}$$

$$\text{or} \quad \frac{505.3}{480} \times 100 = 105\%$$

* U.S. GOVERNMENT PRINTING OFFICE: 1966—251-033/1034