AD-A124 580 LOGCALC: A CALCULATOR PROGRAM SERIES TO CALCULATE LOG VOLUME LUMBER RECOV..(U) FOREST PRODUCTS LAB MADISON WI P STEELE ET AL. OCT 81 1/1

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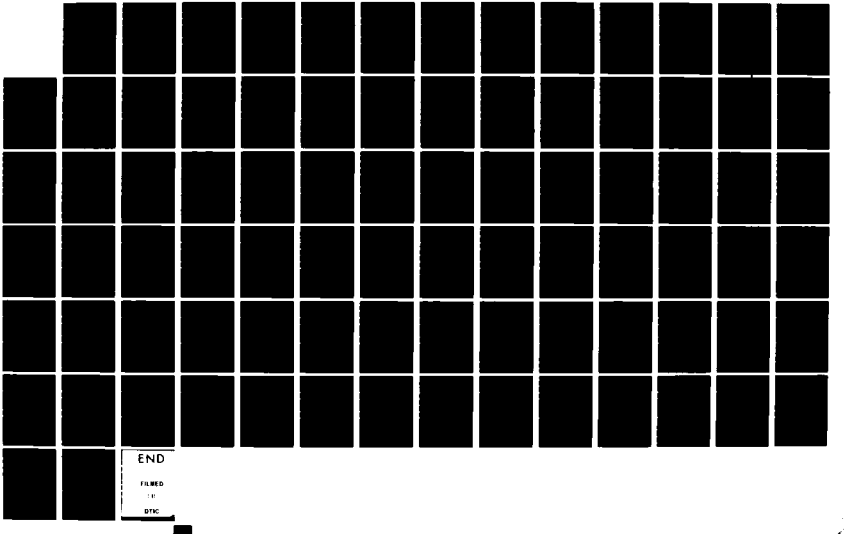

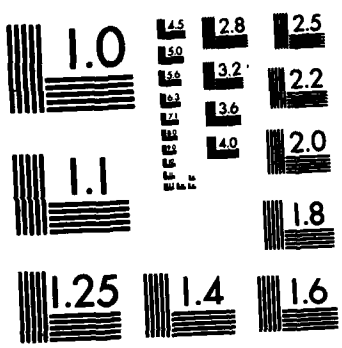

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(12)

LOGCALC:

A CALCULATOR PROGRAM SERIES TO CALCULATE LOG VOLUME, LUMBER RECOVERY, AND LOG SCALE (FOR A TI-59[1/] CALCULATOR WITH PRINTER)

By

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Abstract

This calculator program series is designed to be run on magnetic cards on a TI-59 programmable calculator. The following calculations are made by the program series:

(1) Log volume by Smalian's Formula;
(2) Lumber Recovery Factor;
(3) Overlength on logs; and
(4) Log scale and percent overrun for the following log rules:

(a) Doyle;
(b) International 1/4-Inch;
(c) Scribner;
(d) Scribner Decimal-C; and
(e) Bureau Scribner.

[1/] The use of a brand name in this paper is not to be construed as an endorsement of that product in any way.

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1. Introduction

Pocket calculators have become as efficient as early large computers. The newest programmable calculators with storage devices such as magnetic cards or tape are essentially small computers. In terms of software, the analogy between computers and calculators can be carried still further. As in the computer field, there is a general lack of special purpose programs that are well documented and easy to use.

The main competitors in the programmable calculator market do offer large numbers of documented programs for many applications. The applications that this publication addresses, however, are highly specialized and tailored for use by those interested in sawmilling.

In writing the series of programs described here, care was taken to make their use as simple as possible. A person who has absolutely no knowledge of programmable calculators should be able to operate these programs with only the program directions.1/

The calculations carried out by the program series are as follows: (1) log volume by Smalian's Formula; (2) overlength on logs; (3) lumber recovery factor; (4) log scale and percent overrun by the following log rules: (a) Doyle; (b) International 1/4-Inch; (c) Scribner; (d) Scribner Decimal-C; and (e) Bureau Scribner.

2. Program Series Design

The series of programs have been divided according to the functions carried out as follows: (A) program to process logs; (B) program to calculate log volume by Smalian's Formula, lumber recovery factor, and log overlength; (C) program to calculate log scale by Doyle Log Rule; (D) program to calculate log scale by International 1/4-Inch Log Rule; (E) program to calculate log scale by three versions of Scribner Log Rule. Each of the log scale programs (C, D, E above) also calculates percent overrun.

Before any of the calculation programs (B, C, D, E above) can be executed, it is necessary to input log data. The log data can only be entered into the calculator via a card prepared by the Log Processing Program. The data needed are log length and maximum and minimum diameters for each log end. The method used to enter log data and prepare a data card with the Log Processing Program is covered in detail later in these instructions.

The program series was designed so that entry of the stored log data is part of each calculation program. The log data card is numbered 3 in the upper left hand corner and 4 in the upper right. These numbers indicate the banks on which the data are recorded. For the same reason the calculation programs themselves are numbered 1 and 2 in the upper left and right hand corners. In all cases, programs will be located in banks 1 and 2, and log data located in banks 3 and 4.

1/ It is suggested, however, that the user keep Personal Programming, the TI-59 user's manual, close at hand when first using the program series.

For example, when the Log Volume by Smalian's Formula program is entered into the calculator, side 1 (bank 1) is read first followed by side 2 (bank 2). Log data, if read from a card is then entered by reading side 3 (bank 3) and side 4 (bank 4). Since any number of logs can be entered into the program, any number of log data cards might be needed, all numbered 3 and 4.

In the program design there was a constant tradeoff between two principles that in this case were often conflicting: consistency of operation versus the desire to prompt the user as much as possible. Some programs used so much space for program calculation that little was left for the amount of prompting that was considered desirable. In other programs there was more room for prompting, and for this reason, the prompting and data entry procedures differ somewhat between programs.

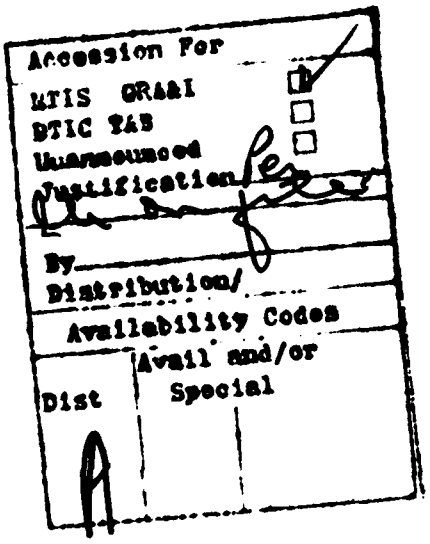
3. General Information on Running the Program Series

To actually run the programs the reader should turn to the appropriate documentation in the appendices. A program description, instructions, listing, and sample input and output are given for each program in the series. Seven logs are followed through the sample input and output for the program series.

In order for the program to run properly, the calculator memory must be partitioned correctly. This is done automatically for program card insertion if the calculator is turned on just before initial insertion of the program cards. Each program automatically repartitions the memory according to need. If work has been done on the calculator prior to initial insertion, it is suggested that the user turn the calculator off and then back on before attempting to use a program. This procedure should always be followed between running each program in the series of programs. For example, the calculator should be switched off and on between using the program for calculating log volume by Smalian's Formula and that for calculating International 1/4-Inch log scale.

If users do not have a magnetic card with a program already on it, they must key in the program steps and then store the program on a card. The program should be stored on a card immediately upon keying in the program since running certain of the programs erases part of the program code.

All of the programs except Scribner can be keyed in and stored according to the following procedure:



PROCEDURE	ENTER	PRESS	DISPLAY
Enter learn mode		LRN	000 00
Key in program from listing			xxx 00
Exit learn mode		LRN	
Reset program pointer		RST	
Indicate program bank 1 to be written	1	WRITE	
Insert first side of blank card			1.
Indicate program bank 2 to be written	2	WRITE	
Insert second side of blank card			2.
Label magnetic card (sides 1 and 2 for bank numbers)			

(Special instructions for keying in and storing the three Scribner log rules are given in Appendix VI, Section 2).

Care should be taken to number and letter the card as the designers of the program intended. So that this can be done properly, an image of the instruction side of each card as it should be set up is given in the appendices with the program instructions.

In some cases, cards written by one calculator cannot be read properly by another. If the user encounters this problem, the only recourse is to enter the program from the listing. Extreme care should obviously be exercised when doing so since in a series of hundreds of instructions, an entry error is easy to make. A listing of the program steps keyed in should be compared to the program listing given to insure exact duplication.

It will be noted that in no case is the instruction "2nd" included in the program instructions or listing. The user, it is assumed, should be able to determine key sequences requiring a "2nd" instruction when entering the program steps or running the programs.[2/]

Each calculation program has two options. One option prints individual log values as well as final totals. The other prints only final totals, skipping the individual log values. The program instructions give direction on using the option desired.

4. General Information on Program Series Data

The following explanation of the data necessary for running the program series provides details about the data not included in the program instructions.

[2/] Page VI-6 of the TI-59 user's manual, Personal Programming, gives a complete list of possible printer output and the key sequences used to create each one.

A. Log Data

The log processing program requires five measurements from each log studied. These are: maximum small end diameter, minimum small end diameter, maximum large end diameter, minimum large end diameter, and length. The diameters should be entered to the 0.1 inch and length to the 0.1 foot. See Appendix I for an explanation of the suggested procedure to use in measuring logs.

The raw data on maximum and minimum diameters for both the small and large ends of the log are used to calculate average small and large end diameters. The average diameters are then rounded to the nearest 0.1 inch. This reduced amount of data consisting of average maximum and minimum end diameters and length is then packed into one storage location to save storage space in the calculator. The raw data prior to averaging the maximum and minimum diameters is not saved.

When the data is packed, decimal points are dropped with allowance made for 3 digits (2 to the left of the decimal, 1 to the right) for small end diameter, large end diameter and length. For example:

Small end diameter = 12.3
Large end diameter = 15.6
Length = 18.9

Would become 123156189 in the packed register. This packing allows up to 50 logs to be stored on one magnetic card.

This system of storing the data is necessary to conserve storage space in the calculator and allow the log data to be stored on relatively few magnetic cards. The loss of data involved in the method used to do this does cause some differences to exist between the workings of the program and the log rules being modeled.

Two of the log rules available in the series are officially recognized by the U.S. Forest Service.[3/] These are the International 1/4-Inch and Scribner Decimal-C. The Forest Service rules for determining diameter measurements require that the maximum and minimum diameter measurements be rounded to the nearest inch before averaging. When one of a pair of maximum/minimum diameters falls right on the 1/2-inch mark, it is rounded up. When both of the pair of maximum/minimum measurements falls on the 1/2 inch, one is rounded up and the other down.

After the maximum/minimum pair has been averaged, if the average diameter falls on the 1/2 inch, the diameter is rounded down. This means that both measured diameters and averaged diameters are always rounded to the whole inch before their use for scaling.

As opposed to this method, the data stored by the calculator program averages maximum and minimum log diameters without first rounding to the nearest inch. This will cause slight differences in log scale between that calculated by the program and that given by using Forest Service rules.

This difference can be avoided if the user rounds each log's diameter measurements according to Forest Service rules prior to entering the data. A user who wishes

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[3/] National Forest Log Scaling Handbook. 1973. For. Serv. Handbook. FSH 2408.11. U.S. Govt. Printing Office, Washington, D.C.

to do this should round maximum or minimum diameter measurements ending in .5 up unless both the maximum and minimum pair end in .5; in this case, the user should round one of the pair up and the other down.

A user should determine whether extreme accuracy in estimation of log scale or log volume is of most importance before deciding how to enter the log data. If log diameter measurements are altered to suit a particular log rule, they will not give completely accurate estimates of log volume.

Bureau or Long Log Scribner is the rule authorized by several scaling bureaus.[4/] The rules of these scaling bureaus differ from the scaling rules used by both the Forest Service and the Log Processing Program. Bureau rules require that the maximum and minimum diameter measurements taken be truncated to the inch before averaging. Likewise, the averaged diameter is also truncated to the inch.

A user who wishes to exactly follow the scaling practices of Bureau Scribner should determine the average small end scaling diameter prior to entering it (using the Bureau Scale practice of truncation) and enter this same diameter twice. Again, a user should determine before altering the data entry procedures whether exact accuracy in log scale or volume is most important. If accuracy in volume rather than scale is most important, the method of diameter entry should not be altered.

Diameter measurements for Doyle and Scribner Log Rules (straight Scribner as opposed to Scribner Decimal-C or Bureau Scribner) are taken in many variations across the country. If user requirements are different from the Log Processing Program, the user must make any necessary adjustments. The calculation programs for Doyle and Scribner round the average diameter stored by the Log Processing Program to the nearest inch rounding .5 inch down.

Another aspect of the log data to be considered is the constraints put upon log size by memory limitations in the calculation programs. There are no constraints for two of the calculation programs, Log Volume and Doyle Scale. Of the other four calculation programs, three are limited by log diameter and all four are limited by log length. Limits set upon the diameter are due to the factors stored for the three Scribner programs. The limits are logs with diameters between 1" and 30" for Scribner and Scribner Decimal-C and logs with diameters between 6" and 30" for Bureau Scribner. Limits are set for log length because of the rules governing the scaling of long logs. U.S. Forest Service rules state that logs longer than 20' must be segmented and scaled as two or more logs. The International 1/4-Inch program is able to handle logs up to and including 40' because there was space in the calculator program to do the segmenting. Scribner and Scribner Decimal-C programs required too much room for the segmenting to be included. This means that these two programs can handle logs only up to 20'; requiring users to segment longer logs themselves. Bureau Scribner also requires segmenting logs by hand. Bureau Scribner, however, handles logs up to 40' before segmenting is necessary.

If length limitations interfere with the sample of logs taken, the logs can be segmented by hand. If the long logs are segmented, these logs can be stored on

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[4/] See the "Official Rules for the Following Log Scaling and Grading Bureaus: Columbia River, Grays Harbor, Northern California, Puget Sound, Southern Oregon, Yamhill," January 1, 1980 Edition.

a separate data card from the short logs. For example, if in a sample of 45 logs three were too long for scaling by the Scribner rule on the calculator, the 42 short logs could be processed and stored on one card and then the other three could be processed and stored twice, once as 3 long logs stored on a card for calculating volume (since the Log Volume Program has no restriction on length) and once as 6 segments stored on another card for calculating scale by the Scribner rule for short logs. Since the calculation programs can handle any number of data cards, this method of grouping logs can be to the user's advantage in dealing with other problems of this type.

B. Number of Logs to be Processed

The total number of logs that can be processed by any of the calculation programs in the series is not limited. There is, however, a limit of 50 logs that can be stored on a single magnetic card and in the memory set aside for log data by each program. This is also the limit to the number of logs that can be entered in the Log Processing Program. The calculation programs can process more than 50 logs because they have been set up to sum the results from more than one card. It is important to note that even if more than one data card is used in running one of the calculation programs there is no requirement that any data card hold the full 50 logs. Thus any data card can hold any number of logs from 1 to 50 inclusive.

C. Mill Type

Mill type classifies the mill according to the lengths of lumber produced. The designations of "Odd," "Even," and "Random" length have the following meanings. An "Odd" length mill is one that produces lumber in both odd and even lengths. An "Even" length mill is one that produces lumber in only even lengths. A "Random" length mill by definition has no overlength or lumber trim allowance since the logs are always the correct length for the lumber produced. The "Random" length designation is only used by the program to calculate log volume, and lumber recovery factor, since a scaling length must be assigned to a log in order to use the scaling rules.

D. Minimum Lumber Trim Allowance

"Odd" and "Even" length mills allow for some amount of log length in excess of the nominal length for the trimming operation, although this allowance may be zero in a rare mill. Minimum lumber trim allowance (MLTA) is the minimum length over the nominal required on a log to manufacture a given product. For example, a sawmill may require 4" in length over nominal to manufacture 12' lumber. If this is the case, a log 12' 2" long is not long enough and it is cut back to the next nominal length plus the MLTA of 4". If the mill is cutting odd lengths that next nominal length plus MLTA would be 11' 4"; if it is cutting only even lengths it would be 10' 4".

MLTA is calculated from the input of trim allowance entered as inches in the programs. MLTA given in terms of inches is standard industry practice. Because log lengths are measured to tenths of feet, however, conversion is necessary.

The log measurement methodology given in Appendix I suggests that all log measurements be taken to the tenth foot and truncated. If log lengths are truncated, then MLTA must also be truncated to the tenth foot so that the two can be compared on the same basis.

The MLTA input as inches is converted to the decimal fraction of a foot. This is then truncated to the tenth of a foot. MLTA of 4 inches converts to .333 ... foot and when truncated becomes .3 foot.

When using the calculation program for log volume it should be remembered that tree length logs and logs taken from the top of a tree should not be penalized for extra log length. To get an accurate overlength figure these logs should be noted and a revised length entered for them. The revised length should be the longest nominal log length plus MLTA that does not exceed the actual log length. In the example above, the 12' 2" log should be entered as 11.3' for an "Odd" length mill or as 10.3' for an "Even" length mill (nominal length plus the MLTA of 4" converted to .3') if it is a top log.

5. Running the Individual Programs

The following descriptions of the individual programs making up the program series provides details about running the program not included in the program instructions.

A. Log Processing Program

As has already been described, the log processing program takes log measurements (maximum and minimum diameters for both the small and large end rounded to the nearest 0.1 inch; length to the 0.1 foot truncated), processes, and packs them into one calculator storage location for each log. These log data are then usable in each of the calculation programs.

The log data can be edited in two ways. The easiest way is as the log values are being read in. An edit routine is incorproated in the program to allow this. The details of the edit procedure are given in the program instructions. If the user suspects an error as an individual log is being entered, a review of stored data can be made to corroborate this. The log data can then be entered correctly. This can only be done, however, if the user detects the error before continuing on to enter data for the next log. If a log has been entered incorrectly and not corrected before entering a new log, the user should finish processing all log data and use the second method of editing log data which is to directly edit the packed data.

Editing the packed data is a three-step process: (1) determine the correct packed data; (2) determine the register the incorrect data is stored in; and (3) store the edited data in that register. The first step can be done on a scrap of paper. For each end of the log, average the diameters and round to the nearest 0.1 inch (follow the Forest Service, Bureau rules etc., given previously for rounding to an average diameter). Write these two numbers, small end first, and the length side by side on the paper. Each number will be 3 digits (if necessary, precede a number with a zero to get three digits). Ignoring the decimal points gives the user the packed data. For example:

$$\text{Small end diameter} = \frac{12.2 + 12.4}{2} = 12.3 = 12.3$$

$$\text{Large end diameter} = \frac{15.5 + 15.6}{2} = 15.55 = 15.6$$

$$\text{Length} = 9.9 = 09.9$$

Writing these together gives "12.3 15.6 09.0." Thus the packed data is "123145099" when decimal points are ignored. Next, the register to be changed can be determined by locating the incorrect entry on the listing or can be found by adding 59 to the log number and subtracting the total number of logs input. Thus, if the above example was for the 32nd of 40 logs entered, the register number would be 32+59-40 or 51. Finally, clear the display register by pressing the CLR key, input the packed data, press the STO key and input the register number. For this example the process is as follows:

ENTER	PRESS
123145099 51	CLR STO

If the data to be edited is stored on a card, read sides 3 and 4 of the card, edit the data, and write the edited data onto sides 3 and 4 of the same card.

Once the log data are correctly on a magnetic card, they can be used in one or more of the calculation programs. They can be reused for other log data or stored to save the logs for future processing.

B. Program to Calculate Log Volumes By Smalian's Formula, Lumber Recovery Factor and Log Overlength

This program calculates log volume by Smalian's Formula, overlength on the logs, and Lumber Recovery Factor. The equation to calculate volume by Smalian's Formula is of the following form:

$$\text{Cubic Feet} = 0.002\ 727\ 0769\ (D_0^2 + D_1^2)\ L$$

where D_0 = average small end diameter, D_1 = average large end diameter, and L = length. Only volume with overlength is calculated. (Overlength was explained in section 4.)

Lumber Recovery Factor (LRF) is the ratio of nominal board feet of lumber recovered to each cubic foot of log with log overlength eliminated. (Lumber Tally ÷ Log Volume). It provides a relatively unbiased estimator of mill efficiency as compared to overrun and for this reason is becoming more widely accepted by the industry for reporting mill efficiency.

LRF will be calculated by the program if the lumber tally from the logs on which the volume has been calculated is entered after the appropriate program prompt.

C. Program to Calculate Log Scale by Doyle Log Rule

This program calculates log scale by the Doyle Log Rule. The equation is of the following form.[5/]

$$\text{Board Feet} = (D-4)^2 \, L/16$$

where D = small end diameter and L = length. The scale is rounded to the nearest board foot for each log.

D. Program to Calculate Log Scale by International 1/4-Inch Log Rule

This program calculates log scale by the International 1/4-Inch Log Rule. The equation is Grosenbaugh's Integrated Formula given as follows:[6/]

$$\text{Board Feet} = 0.049\ 761\ 912\ LD^2 + 0.006\ 220\ 239\ L^2D - 0.185\ 476\ 2\ LD + 0.000\ 259\ 176\ 6\ L^3 - 0.011\ 592\ 262\ 5\ L^2 + 0.042\ 222\ 22\ L$$

where D = small end diameter and L = length. The scale is rounded to the nearest 5 board feet for each log.

Logs longer than 20 feet are broken into two segments before the equation is applied. They are broken as nearly in half as possible. The new small end diameter for the segment with the largest diameter is then calculated using taper as calculated from the original log. This new small end diameter is then used as D in the equation.

E. Program to Calculate Log Scale by Scribner Log Rules

This program calculates log scale by any of three versions of the Scribner Log Rule. The Scribner Rule is a tabular rule but the tabular values are approximated by the following equation:

Board Feet = Length X Factor

Factor is obtained from Table 1.[7/]

[5/] Freese, F. 1974. A collection of log rules. p. 17. USDA For. Serv. Gen. Tech. Rep. FPL 1. For. Prod. Lab., Madison, Wis.

[6/] Ibid. p. 24.

[7/] See the "Official Rules for the Following Log Scaling and Grading Bureaus: Columbia River, Grays Harbor, Northern California, Puget Sound, Southern Oregon, Yamhill," January 1, 1980 Edition.

Table 1.--Factors for Calculating Scribner Log Rule

(For Scribner, Scribner Decimal-C, and Bureau Scribner)

Diameter (In.)	Factors for Lengths 1' to 15'	Factors for Lengths 16' to 31'	Factors for Lengths 32' to 40'	Diameter (In.)	Factors for Lengths 1' to 40'
1	0.000	*	*	16	10.000
2	0.143	*	*	17	11.528
3	0.390	*	*	18	13.290
4	0.676	*	*	19	14.990
5	1.070	*	*	20	17.499
6	1.160	1.249	1.570	21	18.990
7	1.400	1.608	1.800	22	20.880
8	1.501	1.854	2.200	23	23.510
9	2.084	2.410	2.900	24	25.510
10	3.126	3.542	3.815	25	28.677
11	3.749	4.167	4.499	26	31.249
12	4.900	*	*	27	34.220
13	6.043	*	*	28	36.376
14	7.140	*	*	29	38.040
15	8.880	*	*	30	41.060

*The factors for these diameters remain constant for logs 1' to 40' in length.

The three versions of Scribner that are included are (1) Scribner[8/]; (2) Scribner Decimal-C, the version of Scribner recognized by the Forest Service; and (3) Bureau Scribner, a variant of Scribner Decimal-C used in the Douglas-fir region of the West Coast. The scale is rounded to the nearest board foot for Scribner and to the nearest 10 board feet for both Scribner Decimal-C[9/] and Bureau Scribner.

Due to the large amount of space taken in the calculator to store the Scribner factor array, it was necessary to use more than one card for this program. Each of the other calculation programs employ one card numbered 1 and 2 for the edges to be read.

This program requires two program cards and the reuse of banks 1 and 2 for the second card. To avoid the confusion of having two cards numbered 1 and 2 to correspond to the banks used, the program cards are labeled with the letters A, B, C, and D. This indicates the order in which the edges are to be read. Each is still subheaded 1 and 2 to indicate that banks 1 and 2 are still used.

Another result of storage space limitations is that the second program card is specific to the version of Scribner Rule to be used. To select an option the user selects the appropriate program card. Thus there are three different second cards. The user need concern himself only with one version at a time. If the user is only interested in running Scribner Decimal-C, for example, there is no need for the other two second cards for the other two Scribner rules. This again leaves the user with only two cards.

6. Calculation of Overrun

Percent overrun will be calculated by the program for each of the three Log Scale Programs (C, D, E above). This requires that the lumber tally from the logs on which the scale has been calculated is entered after the appropriate program prompt.

The equation used is:

$$\text{Percent Overrun} = \frac{\text{Actual Tally} - \text{Scale Tally}}{\text{Scale Tally}} \times 100$$

[8/] This is the original version as devised by Reverend Scribner but extended to allow logs shorter than 12' and longer than 24' to be scaled. For this purpose the factors cited in Table 1 were used. These model very closely the Scribner rule in use in the State of Florida.

[9/] For very small logs, Scribner Decimal-C allows scaling to 5-board feet. Six-inch logs shorter than 10', 7" logs shorter than 7', and 8" logs shorter than 4' are scaled at 5 board feet. Due to space limitations, this is not done by the calculator.

Appendix I -- Log Measurement Methodology

Appendix I

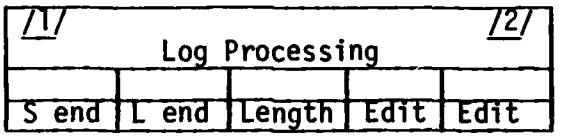
Log Measurement Methodology

The following procedures are suggested for measuring the logs to be input to this series of programs.

Log diameter measurements are taken inside bark to the nearest 0.1 inch. Maximum and minimum diameter measurements are taken at each end of the log to obtain an accurate calculation of true log volume. These measurements are taken at right angles to each other.

Log length is measured and truncated to the 0.1 foot. The truncation is done since in calculating overlength a log must be at least a given length. It either is this long or it is not.

Appendix II -- User Instructions for Log Processing Program



Appendix II, Section 1

PROGRAM DESCRIPTION

This program prepares log data for use in the program series. The maximum and minimum end diameters entered as data to the program are averaged, then rounded to the nearest 0.1 inch. The log data is packed by placing average small end diameter, average large end diameter, and length into one data register. A maximum of 50 logs per card are allowed. Edit keys are available to reenter log data if a log is entered incorrectly (only before next log is entered). The packed data can also be edited according to the instructions given in the discussion of the Log Processing Program in the body of the paper (Section 5A).

MISCELLANEOUS INFORMATION

User Defined Keys

A Small End Diameter
B Large End Diameter
C Length
D Edit before entering length
E Edit after entering length
A' Start Program

Labels Used - 6

A,B,C,D,E,A'

Data Registers

00 Maximum Small End Diameter
01 Minimum Small End Diameter
02 Maximum Large End Diameter
03 Minimum Large End Diameter
04 Length
05 Current Register
06 Number of Logs
07 36162414 = 'SDIB'
08 27162414 = 'LDIB'
09 27322236 = 'LOGS'
10

: - Packed log data
:
59

Flags

1 2nd Small End Diameter
2 2nd Large End Diameter

Partitioned -- 479.59
Library Module -- any
Printer -- yes
Cards -- 1

PROGRAM INSTRUCTIONS

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
1	Clear program memory and display register		CP, CLR	(0)
2	Enter program using method A or B			
	A. Key in			
	Enter learn mode		LRN	(000 00)
	Key in program from listing			(478 00)
	Exit learn mode		LRN	(0)
	B. Read card			
	Insert side one of program card			(1.)
	Clear display register		CLR	(0)
	Insert side two of program card			(2.)
	Clear display register		CLR	(0)
3	Start program		A'	'DATA PROCESSING' (0)
4	Enter the number of logs to be processed this run (Max 50)	# logs	R/S	'SMALL - A LARGE - B LENGTH - C EDIT -D,E' (0)
5	Enter data			
	Enter Maximum Small End Diameter (Max SED)	xx.x	A	xx.x 'SDIB' (xx.x)
	Enter Minimum Small End Diameter (Min SED)	xx.x	A	xx.x 'SDIB' (xx.)
	Enter Maximum Large End Diameter (Max LED)	xx.x	B	xx.x 'LDIB' (xx.x)
	Enter Minimum Large End Diameter (Min LED)	xx.x	B	xx.x 'LDIB' (xx.x)
	Enter Length	xx.x	C	xx.x 'LEN' x 'LOGS' (0)
	NOTE: Editing of the data can be done if any error is found while entering the log data See step 8.			
6	Repeat step 5 for all logs			
7	When finished, the program will list the data. This is a listing of the data as it is stored in the calculator. The listing will have a number (xxxxxxxxx.) followed by the data register number (DR). The number is actually the Average SED, Average LED, and the Length. The packed data breaks down like this:			'LOG DATA' xxxxxxxxx. xx xxxxxxxxx. xx ⋮

*Output indicated inside parentheses is shown in display register. All other output is printed.

PROGRAM INSTRUCTIONS

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
	123145189 DR 12.3 15.6 18.9 DR SED LED Len DR			
8	Editing data can be done only before the input for the next log is begun. Edit data using method A or B depending on when the error is discovered. *NOTE: The user cannot edit any previously entered logs, only current log and previous log (before entering the first diameter of the current log). Section 5A in the body of the paper explains how to correct the packed data.*			
8A	Reenter diameters before length is entered (and log processed) Continue		D	'REENTER LOG' (0)
	Reenter log data as in step 5 Go to step 6			
8B	Reenter diameters and length after length is entered (and log processed) Continue		E	'REENTER LOG' (0)
	Reenter log data as in step 5 Go to step 6			
**	OPTIONAL - Record data on magnetic card Indicate data bank 3 to be written	3	WRITE	
	Insert first side of blank card			(3.)
	Indicate data bank 4 to be written	4	WRITE	
	Insert second side of blank card			(4.)
	Label magnetic card (sides 3 and 4 for bank numbers)			
9	To enter additional logs to be saved on additional magnetic cards, begin at Step 1.			

*Output indicated inside parentheses is shown in display register. All other output is printed.

Appendix II, Section 3

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
000	76	LBL	
001	16	A'	
002	47	CMS	
003	02	2	
004	07	7	
005	03	3	
006	02	2	
007	02	2	
008	02	2	
009	03	3	
010	06	6	
011	42	STO	
012	09	09	
013	03	3	
014	06	6	
015	01	1	
016	06	6	
017	02	2	
018	04	4	
019	01	1	
020	04	4	
021	42	STO	
022	07	07	
023	02	2	
024	07	7	
025	01	1	
026	06	6	
027	02	2	
028	04	4	
029	01	1	
030	04	4	
031	42	STO	
032	08	08	
033	06	6	
034	00	0	
035	32	X:T	
036	98	ADV	
037	01	1	
038	06	6	
039	01	1	
040	03	3	
041	03	3	
042	07	7	
043	69	OP	
044	01	01	
045	01	1	
046	03	3	
047	00	0	
048	00	0	
049	03	3	
050	03	3	
051	03	3	
052	05	5	
053	03	3	
054	02	2	
055	69	OP	
056	02	02	
057	01	1	
058	05	5	
059	01	1	
060	07	7	
061	03	3	
062	06	6	
063	03	3	
064	06	6	
065	02	2	
066	04	4	
067	69	OP	
068	03	03	
069	03	3	
070	01	1	
071	02	2	
072	02	2	
073	00	0	
074	00	0	
075	00	0	
076	00	0	
077	00	0	
078	00	0	
079	69	OP	
080	04	04	
081	69	OP	
082	05	05	
083	98	ADV	
084	25	CLR	
085	91	R/S	
086	42	STO	
087	06	06	
088	94	+/-	
089	85	+	
090	06	6	
091	00	0	
092	95	=	
093	42	STO	
094	05	05	
095	98	ADV	
096	03	3	
097	06	6	
098	03	3	
099	00	0	
100	01	1	
101	03	3	
102	02	2	
103	07	7	
104	02	2	
105	07	7	
106	69	OP	
107	01	01	
108	02	2	
109	00	0	
110	00	0	
111	00	0	
112	01	1	
113	03	3	
114	00	0	
115	00	0	
116	69	OP	
117	02	02	
118	02	2	
119	07	7	
120	01	1	
121	03	3	
122	03	3	
123	05	5	
124	02	2	
125	02	2	
126	69	OP	
127	03	03	
128	01	1	
129	07	7	
130	00	0	
131	00	0	
132	02	2	
133	00	0	
134	00	0	
135	00	0	

*If input is different from key symbol. This does not include implied 2nd.

Appendix II, Section 3

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
136	01	1	
137	04	4	
138	69	□P	
139	04	04	
140	69	□P	
141	05	05	
142	02	2	
143	07	7	
144	01	1	
145	07	7	
146	03	3	
147	01	1	
148	02	2	
149	02	2	
150	03	3	
151	07	7	
152	69	□P	
153	01	01	
154	02	2	
155	03	3	
156	00	0	
157	00	0	
158	02	2	
159	00	0	
160	00	0	
161	00	0	
162	01	1	
163	05	5	
164	69	□P	
165	02	02	
166	01	1	
167	07	7	
168	01	1	
169	06	6	
170	02	2	
171	04	4	
172	03	3	
173	07	7	
174	69	□P	
175	03	03	
176	02	2	
177	00	0	
178	01	1	
179	06	6	
180	05	5	
181	07	7	
182	01	1	
183	07	7	
184	69	□P	
185	04	04	
186	69	□P	
187	05	05	
188	25	CLR	
189	98	ADV	
190	98	ADV	
191	61	GTO	
192	02	02	2
193	80	80	
194	76	LBL	
195	14	D	
196	22	INV	
197	86	STF	St flg
198	01	01	1
199	22	INV	
200	86	STF	St flg
201	02	02	2
202	98	ADV	
203	69	□P	
204	00	00	
205	03	3	
206	05	5	
207	69	□P	
208	01	01	
209	01	1	
210	07	7	
211	01	1	
212	07	7	
213	03	3	
214	01	1	
215	03	3	
216	07	7	
217	01	1	
218	07	7	
219	69	□P	
220	02	02	
221	03	3	
222	05	5	
223	00	0	
224	00	0	
225	02	2	
226	07	7	
227	03	3	
228	02	2	
229	02	2	
230	02	2	
231	69	□P	
232	03	03	
233	69	□P	
234	05	05	
235	69	□P	
236	00	00	
237	25	CLR	
238	61	GTO	
239	02	02	2
240	80	80	
241	76	LBL	
242	15	E	
243	01	1	
244	22	INV	
245	44	SUM	
246	05	05	
247	03	3	
248	05	5	
249	69	□P	
250	01	01	
251	01	1	
252	07	7	
253	01	1	
254	07	7	
255	03	3	
256	01	1	
257	03	3	
258	07	7	
259	01	1	
260	07	7	
261	69	□P	
262	02	02	
263	03	3	
264	05	5	
265	00	0	
266	00	0	
267	02	2	
268	07	7	
269	03	3	
270	02	2	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
271	02	2	
272	02	2	
273	69	DP	
274	03	03	
275	69	DP	
276	05	05	
277	69	DP	
278	00	00	
279	25	CLR	
280	68	NOP	
281	91	R/S	
282	76	LBL	
283	11	A	
284	87	IFF	If flg
285	01	01	1
286	03	03	3
287	03	03	
288	42	STO	
289	00	00	
290	43	RCL	
291	07	07	
292	69	DP	
293	04	04	
294	43	RCL	
295	00	00	
296	69	DP	
297	06	06	
298	86	STF	St flg
299	01	01	1
300	61	GTO	
301	02	02	2
302	80	80	
303	68	NOP	
304	42	STO	
305	01	01	
306	69	DP	
307	06	06	
308	69	DP	
309	00	00	
310	68	NOP	
311	91	R/S	
312	76	LBL	
313	12	B	
314	87	IFF	If flg
315	02	02	2
316	03	03	3
317	33	33	
318	42	STO	
319	02	02	
320	43	RCL	
321	08	08	
322	69	DP	
323	04	04	
324	43	RCL	
325	02	02	
326	69	DP	
327	06	06	
328	86	STF	St flg
329	02	02	2
330	61	GTO	
331	03	03	3
332	10	10	
333	68	NOP	
334	42	STO	
335	03	03	
336	69	DP	
337	06	06	
338	69	DP	
339	00	00	
340	91	R/S	
341	76	LBL	
342	13	C	
343	42	STO	
344	04	04	
345	02	2	
346	07	7	
347	01	1	
348	07	7	
349	03	3	
350	01	1	
351	69	DP	
352	04	04	
353	43	RCL	
354	04	04	
355	69	DP	
356	06	06	
357	98	ADV	
358	22	INV	
359	86	STF	St flg
360	01	01	1
361	22	INV	
362	86	STF	St flg
363	02	02	2
364	58	FIX	
365	01	01	1
366	43	RCL	
367	00	00	
368	85	+	
369	43	RCL	
370	01	01	
371	95	=	
372	55	÷	
373	02	2	
374	95	=	
375	52	EE	
376	22	INV	
377	52	EE	
378	65	×	
379	07	7	
380	22	INV	
381	28	LOG	
382	95	=	
383	72	ST*	STO Ind
384	05	05	
385	43	RCL	
386	02	02	
387	85	+	
388	43	RCL	
389	03	03	
390	95	=	
391	55	÷	
392	02	2	
393	95	=	
394	52	EE	
395	22	INV	
396	52	EE	
397	65	×	
398	04	4	
399	22	INV	
400	28	LOG	
401	95	=	
402	74	SM*	SUM Ind
403	05	05	
404	43	RCL	
405	04	04	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
406	65	×	
407	01	1	
408	00	0	
409	95	=	
410	74	SM*	SUM Ind
411	05	05	
412	22	INV	
413	58	FIX	
414	01	1	
415	44	SUM	
416	05	05	
417	43	RCL	
418	09	09	
419	69	□P	
420	04	04	
421	43	RCL	
422	05	05	
423	85	+	
424	43	RCL	
425	06	06	
426	75	-	
427	06	6	
428	00	0	
429	95	=	
430	69	□P	
431	06	06	
432	69	□P	
433	00	00	
434	43	RCL	
435	05	05	
436	77	GE	x ≥ t
437	04	04	4
438	44	44	
439	25	CLR	
440	98	ADV	
441	61	GTO	
442	02	02	2
443	80	80	
444	68	NOP	
445	98	ADV	
446	98	ADV	
447	02	2	
448	07	7	
449	03	3	
450	02	2	
451	02	2	
452	02	2	
453	69	□P	
454	01	01	
455	01	1	
456	06	6	
457	01	1	
458	03	3	
459	03	3	
460	07	7	
461	01	1	
462	03	3	
463	69	□P	
464	02	02	
465	69	□P	
466	05	05	
467	25	CLR	
468	98	ADV	
469	43	RCL	
470	05	05	
471	75	-	
472	43	RCL	
473	06	06	
474	95	=	
475	22	INV	
476	90	LST	List
477	92	RTN	INV SBR

*If input is different from key symbol. This does not include implied 2nd.

Card 1 - 5 logs

SAMPLE RUN

ENTER	PRESS	OUTPUT
	A'	DATA PROCESSING
Number of logs	R/S	SMALL - A LARGE - B LENGTH - C EDIT -D, E
Max. Small End Diameter	A	25. SDIB
Min. Small End Diameter	A	25. SDIB
Max. Large End Diameter	B	31.3 LDIB
Min. Large End Diameter	B	31.3 LDIB
Length	C	12.7 LEN
		1. LOGS
Max. Small End Diameter	A	22.5 SDIB
Min. Small End Diameter	A	21.5 SDIB
Max. Large End Diameter	B	24.5 LDIB
Min. Large End Diameter	B	22.2 LDIB
	D	REENTER LOG
Max. Small End Diameter	A	22.5 SDIB
Min. Small End Diameter	A	21.5 SDIB
Max. Large End Diameter	B	24.5 LDIB
Min. Large End Diameter	B	31.3 LDIB
Length	C	10.2 LEN
		2. LOGS
Max. Small End Diameter	A	20.5 SDIB
Min. Small End Diameter	A	18.6 SDIB
Max. Large End Diameter	B	21.5 LDIB
Min. Large End Diameter	B	19.7 LDIB
Length	C	22.3 LEN
		3. LOGS

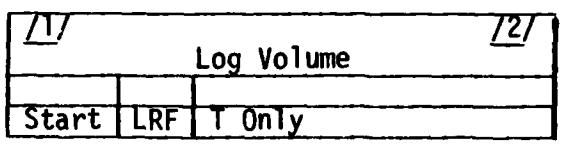
SAMPLE RUN (Continued)

ENTER	PRESS	OUTPUT
Max. Small End Diameter	A	23.2 SDIB
Min. Small End Diameter	A	18.9 SDIB
Max. Large End Diameter	B	24.7 LDIB
Min. Large End Diameter	B	23.5 LDIB
Length	C	11.2 LEN
		4. LOGS
	E	REENTER LOG
Max. Small End Diameter	A	23.2 SDIB
Min. Small End Diameter	A	18.9 SDIB
Max. Large End Diameter	B	24.7 LDIB
Min. Large End Diameter	B	23.5 LDIB
Length	C	10.2 LEN
		4. LOGS
		23.2 SDIB
Max. Small End Diameter	A	23. SDIB
Min. Small End Diameter	A	26.7 LDIB
Max. Large End Diameter	B	30. LDIB
Min. Large End Diameter	B	12.3 LEN
Length	C	
		5. LOGS
		LOG DATA
		250313127. 55
		220279102. 56
		196206223. 57
		211241102. 58
		231284123. 59
Store Data		

SAMPLE RUN

ENTER	PRESS	OUTPUT
	A'	DATA PROCESSING
Number of logs	R/S	SMALL - A LARGE - B LENGTH - C EDIT -D,E
Max. Small End Diameter	A	19.8 SDIB
Min. Small End Diameter	A	18.8 SDIB
Max. Large End Diameter	B	25.3 LDIB
Min. Large End Diameter	B	21.7 LDIB
Length	C	10.1 LEN
		1. LOGS
Max. Small End Diameter	A	25. SDIB
Min. Small End Diameter	A	25. SDIB
Max. Large End Diameter	B	27.4 LDIB
Min. Large End Diameter	B	27.4 LDIB
Length	C	12.8 LEN
		2. LOGS
		LOG DATA
		1983*5101. 58
		2500274128. 59
Store Data		

Appendix III - User Instructions for Program to Calculate Log Volume by Smalian's Formula, Lumber Recovery Factor, and Log Overlength



PROGRAM DESCRIPTION

This program calculates log volume by Smalian's Formula, log overlength, and lumber recovery factor. The log data processed is that created by the Log Processing Program. Data input from the keyboard are mill type (odd, even, random), MLTA, number of logs to be processed, and mill lumber tally.

If the Individual and Total Option is requested, the output for each log, in order, is overlength, volume with overlength, and log number for odd and even mills. Output for random mills for each log is volume and log number. For the Total Only Option, the output is total number of logs and the totals in each of the other categories.

If requested, LRF is given for the mill using the volume with overlength.

Additional data cards can be introduced and the program will sum overlength and volume to new totals. In this way, total volume and LRF for more than 50 logs can be accumulated.

MISCELLANEOUS INFORMATION

User Defined Keys

A Start Program
B LRF
C Total Only Option

Labels Used - 3

A,B,C

Data Registers

00 Number of Logs Remaining
01 Current Register
02 Nominal Length + MLTA
03 Actual Length
04 Large End Diameter
05 Small End Diameter
06 Calculations
07 15412137 -- temporary
08 1731223723 -- temporary
09 'LOGS' -- from Log Processing Program
10
: Packed log data
59 from Log Processing Program
60
61 Mill Type
62 MLTA(ft.)
63 .0027270769
64 15412137 = 'CUFT'
65 1731223723 = 'ENGTH'
66 Total Number of Logs
67 Total Overlength
68 Volume with Overlength
69

Flags

1 Total Only Option
3 Random Mill

Partitioned -- 479.59 and 399.69
Library Module -- any
Printer -- yes
Cards -- 1

PROGRAM INSTRUCTIONS

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
1	Clear program memory and display register		CP, CLR	(0)
2	Enter program using method A or B			
	A. Key in			
	Enter learn mode		LRN	(000 00)
	Key in program from listing			(475 00)
	Exit learn mode		LRN	(0)
	B. Read card			
	Insert side 1 of program card			(1.)
	Clear display register		CLR	(0)
	Insert side 2 of program card			(2.)
	Clear display register		CLR	(0)
3	Enter log data			
	Insert side 3 of data card			(3.)
	Clear display register		CLR	(0)
	Insert side 4 of data card			(4.)
	Clear display register		CLR	(0)
**	OPTIONAL - Print Total Only		C	(0)
4	Start program		A	'LOG VOLUME' (0)
5	Enter mill type (odd=1, even=2, random=3)	1,2, or 3	R/S	Mill type code (0)
6	Enter MLTA (enter zero for random mill)	MLTA(in.)	R/S	MLTA(in.) MLTA(ft.) (0)
7	Enter the number of logs to be processed this run (MAX 50), not total	# logs	R/S	
8	Log data is processed and printed Output: 1. Individual logs - if desired a. for odd and even mills: log overlength log volume with overlength log number b. for random mills: log volume log number			 x.xxxxxxxxx xx.xxxxxxxx xx. xx.xxxxxxxx xx.

*Output indicated inside parentheses is shown in display register. All other output is printed.

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
	2. Totals a. for odd and even mills: total number of logs total log overlength total log volume with overlength b. for random mills: total number of logs total log volume			 xx. 'LOGS' 'TOT OVERLENGTH' xx.xxxxxxxx 'FT' 'VOL W OVERLENGTH' xxx.xxxxxxxx 'CUFT' (0) xx. 'LOGS' 'VOL' xxx.xxxxxxxx 'CUFT' (0)
9	Process more log data (9A) or Calculate LRF for logs already processed (9B)			
9A	Process more log data Continue Enter data as in step 3 Go to step 7		R/S	(0)
9B	Calculate LRF Continue Enter tally The LRF is calculated using volume with overlength. *NOTE: Additional data can be entered after step 9B* *Go to step 9A*	 tally	 B R/S	 (0) xx.xxxxxxxxx 'LRF' (0)

*Output indicated inside parentheses is shown in display register. All other output is printed.

Appendix III,Section 3

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
000	07	7	
001	69	DP	
002	17	17	
003	43	RCL	
004	01	01	
005	42	STO	
006	61	61	
007	43	RCL	
008	02	02	
009	42	STO	
010	62	62	
011	93	.	
012	00	0	
013	00	0	
014	02	2	
015	07	7	
016	02	2	
017	07	7	
018	00	0	
019	07	7	
020	06	6	
021	09	9	
022	42	STO	
023	63	63	
024	43	RCL	
025	07	07	
026	42	STO	
027	64	64	
028	43	RCL	
029	08	08	
030	42	STO	
031	65	65	
032	25	CLR	
033	42	STO	
034	66	66	
035	42	STO	
036	67	67	
037	42	STO	
038	68	68	
039	98	ADV	
040	91	R/S	
041	42	STO	
042	00	00	
043	44	SUM	
044	66	66	
045	94	+/-	
046	85	+	
047	06	6	
048	00	0	
049	95	=	
050	42	STO	
051	01	01	
052	73	RC*	RCL IND
053	01	01	
054	55	÷	
055	06	6	
056	22	INV	
057	28	LOG	
058	95	=	
059	42	STO	
060	04	04	
061	59	INT	
062	55	÷	
063	01	1	
064	00	0	
065	95	=	
066	42	STO	
067	05	05	
068	43	RCL	
069	04	04	
070	22	INV	
071	59	INT	
072	65	×	
073	03	3	
074	22	INV	
075	28	LOG	
076	95	=	
077	59	INT	
078	55	÷	
079	01	1	
080	00	0	
081	95	=	
082	42	STO	
083	04	04	
084	73	RC*	RCL IND
085	01	01	
086	55	÷	
087	03	3	
088	22	INV	
089	28	LOG	
090	95	=	
091	22	INV	
092	59	INT	
093	65	×	
094	01	1	
095	00	0	
096	00	0	
097	95	=	
098	58	FIX	
099	01	01	1
100	52	EE	
101	22	INV	
102	52	EE	
103	22	INV	
104	58	FIX	
105	42	STO	
106	03	03	
107	87	IFF	If flg
108	03	03	3
109	01	01	1
110	57	57	
111	43	RCL	
112	03	03	
113	55	÷	
114	43	RCL	
115	61	61	
116	95	=	
117	59	INT	
118	65	×	
119	43	RCL	
120	61	61	
121	85	+	
122	43	RCL	
123	62	62	
124	95	=	
125	32	X:T	
126	43	RCL	
127	03	03	
128	77	GE	X ≥ t
129	01	01	1
130	41	41	
131	32	X:T	
132	75	-	
133	43	RCL	
134	61	61	
135	95	=	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
136	42	STO	
137	02	02	
138	61	GTO	
139	01	01	1
140	44	44	
141	32	X:T	
142	42	STO	
143	02	02	
144	43	RCL	
145	03	03	
146	75	-	
147	43	RCL	
148	02	02	
149	95	=	
150	87	IFF	If flg
151	01	01	1
152	01	01	1
153	55	55	
154	99	PRT	
155	44	SUM	
156	67	67	
157	43	RCL	
158	04	04	
159	33	X^2	
160	42	STO	
161	06	06	
162	43	RCL	
163	05	05	
164	33	X^2	
165	44	SUM	
166	06	06	
167	43	RCL	
168	63	63	
169	49	PRD	
170	06	06	
171	43	RCL	
172	03	03	
173	65	×	
174	43	RCL	
175	06	06	
176	95	=	
177	87	IFF	If flg
178	01	01	1
179	01	01	1
180	82	82	
181	99	PRT	
182	44	SUM	
183	68	68	
184	87	IFF	If flg
185	01	01	1
186	01	01	1
187	99	99	
188	43	RCL	
189	01	01	
190	85	+	
191	43	RCL	
192	66	66	
193	75	-	
194	05	5	
195	09	9	
196	95	=	
197	99	PRT	
198	98	ADV	
199	69	OP	
200	21	21	
201	97	DSZ	
202	00	00	0
203	00	00	0
204	52	52	
205	98	ADV	
206	43	RCL	
207	09	09	
208	69	OP	
209	04	04	
210	43	RCL	
211	66	66	
212	69	OP	
213	06	06	
214	98	ADV	
215	69	OP	
216	00	00	
217	87	IFF	If flg
218	03	03	3
219	02	02	2
220	72	72	
221	03	3	
222	07	7	
223	03	3	
224	02	2	
225	03	3	
226	07	7	
227	00	0	
228	00	0	
229	69	OP	
230	02	02	
231	03	3	
232	02	2	
233	04	4	
234	02	2	
235	01	1	
236	07	7	
237	03	3	
238	05	5	
239	02	2	
240	07	7	
241	69	OP	
242	03	03	
243	43	RCL	
244	65	65	
245	69	OP	
246	04	04	
247	69	OP	
248	05	05	
249	02	2	
250	01	1	
251	03	3	
252	07	7	
253	69	OP	
254	04	04	
255	43	RCL	
256	67	67	
257	69	OP	
258	06	06	
259	98	ADV	
260	04	4	
261	03	3	
262	00	0	
263	00	0	
264	00	0	
265	00	0	
266	69	OP	
267	02	02	
268	43	RCL	
269	65	65	
270	69	OP	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
271	04	04	
272	04	4	
273	02	2	
274	03	3	
275	02	2	
276	02	2	
277	07	7	
278	69	OP	
279	01	01	
280	69	OP	
281	05	05	
282	43	RCL	
283	64	64	
284	69	OP	
285	04	04	
286	43	RCL	
287	68	68	
288	69	OP	
289	06	06	
290	25	CLR	
291	98	ADV	
292	91	R/S	
293	06	6	
294	69	OP	
295	17	17	
296	25	CLR	
297	91	R/S	
298	42	STO	
299	00	00	
300	07	7	
301	69	OP	
302	17	17	
303	43	RCL	
304	00	00	
305	61	GTO	
306	00	00	0
307	43	43	
308	76	LBL	
309	12	B	
310	02	2	
311	07	7	
312	03	3	
313	05	5	
314	04	4	
315	01	1	
316	69	OP	
317	04	04	
318	25	CLR	
319	91	R/S	
320	42	STO	
321	07	07	
322	55	÷	
323	43	RCL	
324	68	68	
325	95	=	
326	69	OP	
327	06	06	
328	61	GTO	
329	02	02	2
330	90	90	
331	76	LBL	
332	11	A	
333	01	1	
334	05	5	
335	04	4	
336	01	1	
337	02	2	
338	01	1	
339	03	3	
340	07	7	
341	42	STO	
342	07	07	
343	01	1	
344	07	7	
345	03	3	
346	01	1	
347	02	2	
348	02	2	
349	03	3	
350	07	7	
351	02	2	
352	03	3	
353	42	STO	
354	08	08	
355	02	2	
356	07	7	
357	03	3	
358	02	2	
359	02	2	
360	01	2	
361	00	0	
362	00	0	
363	04	4	
364	02	2	
365	69	OP	
366	02	02	
367	03	3	
368	02	2	
369	02	2	
370	07	7	
371	04	4	
372	01	1	
373	03	3	
374	00	0	
375	01	1	
376	07	7	
377	69	OP	
378	03	03	
379	98	ADV	
380	69	OP	
381	05	05	
382	25	CLR	
383	98	ADV	
384	91	R/S	
385	42	STO	
386	01	01	
387	99	PRT	
388	32	X:T	
389	03	3	
390	22	INV	
391	67	EQ	X = t
392	03	03	3
393	96	96	
394	86	STF	St flg
395	03	03	3
396	25	CLR	
397	91	R/S	
398	99	PRT	
399	55	÷	
400	01	1	
401	93	.	
402	02	2	
403	95	=	
404	50	INT	
405	55	÷	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
406	01	1									
407	00	0									
408	95	=									
409	42	STO									
410	02	02									
411	99	PRT									
412	61	GTO									
413	00	00	0								
414	00	00									
415	76	LBL									
416	13	C									
417	86	STF	St flg								
418	01	01	1								
419	91	R/S									

*If input is different from key symbol. This does not include implied 2nd.

SAMPLE RUN

ENTER	PRESS	OUTPUT
	C	
	A	LOG VOLUME
Mill Type	R/S	2.
MLTA	R/S	3.
		0.2
Number of logs	R/S	5. LOGS
		TOT OVERLENGTH
		0.7 FT
		VOL W OVERLENGTH
		208.9448033 CUFT
	R/S	
Read log data		
Number of logs	R/S	7. LOGS
		TOT OVERLENGTH
		3.2 FT
		VOL W OVERLENGTH
		282.4384403 CUFT
	B	
Tally	R/S	5.459596782 LRF

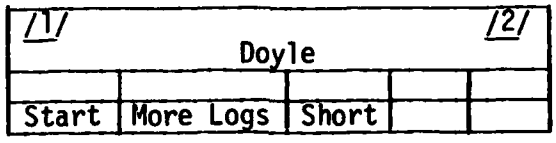
SAMPLE RUN

ENTER	PRESS	OUTPUT
	A	LOG VOLUME
Mill Type	R/S	2.
MLTA	R/S	3. 0.2
Number of logs	R/S	
		0.5 55.57663549 1.
		0. 35.11542932 2.
		0.1 44.75939317 3.
		0. 28.5399615 4.
		0.1 44.95338378 5.
		5. LOGS
		TOT OVERLENGTH 0.7 FT
		VOL W OVERLENGTH 208.4448033 CUFT
Read Log Data Number of Logs	R/S	

SAMPLE RUN (continued)

ENTER	PRESS	OUTPUT
		1.9 25.4?055463 6. 0.6 48.0?308244 7. 7. LOGS TOT OVERLENGTH 3.2 FT VOL W OVERLENGTH 282.?384403 CUFT
Tally	B R/S	5.45?596782 LRF

Appendix IV -- User Instructions for Program to Calculate Log Scale and Overrun by Doyle Log Rule



PROGRAM DESCRIPTION

This program calculates board foot scale and percent overrun for the Doyle Log Rule. The log data processed is that created by the Log Processing Program. Data input from the keyboard are mill type (odd, even), MLTA, number of logs to be processed, and mill lumber tally. These inputs are prompted for by the program.

If the Individual and Total Option is requested, the output for each log is log number being processed and individual log scale. For the Total Only Option, the output is number of logs processed, total log scale, and percent overrun.

Additional data cards can be introduced and the program will sum log scale to a new total. In this way log scale and percent overrun for more than 50 logs can be accomplished.

MISCELLANEOUS INFORMATION

User Defined Keys

A Start Program
B More Logs
C Total Only Option
B' Label
C' Label
D' Label
E' Label

Labels Used - 10

A,B,C,E,A',B',C',E',RCL,Prt

Data Registers

00 Length
01 Small End Diameter
02 Current Register
03 Log Number
04
05
06
07 Log BDFT
08
09
10
:
59 Packed log data from Log Processing Program
60
61 Total BDFT
62 1731371735 = 'ENTER'
63 Total Number of Logs
64 27322236 = 'LOGS'
65 14162137 = 'BDFT'
66 MLTA(ft.)
67
68
69

Flags

1 Total Only Option
2 Even Mill

Partitioned -- 479.99 and 399.69
Library Module -- any
Printer -- yes
Cards -- 1

PROGRAM INSTRUCTIONS

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
1	Clear program memory, and display register		CP, CLR	(0)
2	Enter program using method A or B			
	A. Key in			
	Enter learn mode		LRN	(000 00)
	Key in program from listing			(423 00)
	Exit learn mode		LRN	(0)
	B. Read card			
	Insert side one of program card			(1.)
	Clear display register		CLR	(0)
	Insert side two of program card			(2.)
	Clear display register		CLR	(0)
3	Enter log data			
	Insert side three of data card			(3.)
	Clear display register		CLR	(0)
	Insert side four of data card			(4.)
	Clear display register		CLR	(0)
**	OPTIONAL -- Print Total Only		C	(0)
4	Start program		A	'ENTER MILL TYPE' (0)
5	Enter mill type (odd=1, even=0)	1 or 0	R/S	Mill type code 'ENTER MLTA' (0)
6	Enter MLTA	MLTA(in.)	R/S	MLTA(in.) MLTA(ft.) 'ENTER NO. LOGS' (0)
7	Enter the number of logs to be processed this run (MAX 50), not total	# logs	R/S	# logs
8	Log Data is processed and printed Output:			
	1. Individual logs - if desired			
	log number			xxx 'LOGS'
	log scale			xxx 'BDFT'
	2. Totals			
	total number of logs			xxx 'LOGS'
	total scale			'TOTAL BDFT' xxx 'MORE LOGS?'

*Output indicated inside parentheses is shown in display register. All other output is printed.

PROGRAM INSTRUCTIONS

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
9	Process more log data (9A) or Calculate overrun for logs already processed (9B)			
9A	Process more log data			
	Partition calculator for new data		B	'ENTER LOGS' (0)
	Enter log data as in step 3			
	Repartition calculator		R/S	'ENTER NO. LOGS' (0)
	Go to step 7			
9B	Calculate percent overrun			
	Continue		R/S	'ENTER TALLY'
	Enter Tally	tally	R/S	tally %overrun '%OR' (0)
	NOTE: Additional data can be entered after step 9B			
	Go to step 9A			

*Output indicated inside parentheses is shown in display register. All other output is printed.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
000	76	LBL	
001	11	A	
002	07	7	
003	69	□P	
004	17	17	
005	01	1	
006	07	7	
007	03	3	
008	01	1	
009	03	3	
010	07	7	
011	01	1	
012	07	7	
013	03	3	
014	05	5	
015	42	STO	
016	62	62	
017	69	□P	
018	01	01	
019	03	3	
020	00	0	
021	02	2	
022	04	4	
023	02	2	
024	07	7	
025	02	2	
026	07	7	
027	69	□P	
028	02	02	
029	03	3	
030	07	7	
031	04	4	
032	05	5	
033	03	3	
034	03	3	
035	01	1	
036	07	7	
037	69	□P	
038	03	03	
039	69	□P	
040	05	05	
041	25	CLR	
042	91	R/S	
043	99	PRT	
044	98	ADV	
045	32	X:T	
046	25	CLR	
047	67	EQ	X = T
048	16	A'	
049	22	INV	
050	76	LBL	
051	16	A'	
052	86	STF	St flg
053	02	02	2
054	03	3	
055	00	0	
056	02	2	
057	07	7	
058	03	3	
059	07	7	
060	01	1	
061	03	3	
062	69	□P	
063	02	02	
064	25	CLR	
065	69	□P	
066	03	03	
067	69	□P	
068	05	05	
069	91	R/S	
070	99	PRT	
071	55	÷	
072	01	1	
073	02	2	
074	65	×	
075	01	1	
076	00	0	
077	95	=	
078	59	INT	
079	55	÷	
080	01	1	
081	00	0	
082	95	=	
083	99	PRT	
084	98	ADV	
085	42	STO	
086	66	66	
087	76	LBL	
088	17	B'	
089	43	RCL	
090	62	62	
091	69	□P	
092	01	01	
093	03	3	
094	01	1	
095	03	3	
096	02	2	
097	04	4	
098	00	0	
099	69	□P	
100	02	02	
101	02	2	
102	07	7	
103	03	3	
104	02	2	
105	02	2	
106	02	2	
107	03	3	
108	06	6	
109	42	STO	
110	64	64	
111	69	□P	
112	03	03	
113	69	□P	
114	05	05	
115	25	CLR	
116	91	R/S	
117	69	□P	
118	06	06	
119	98	ADV	
120	44	SUM	
121	63	63	
122	94	+/-	
123	85	+	
124	06	6	
125	00	0	
126	95	=	
127	42	STO	
128	02	02	
129	25	CLR	
130	42	STO	
131	03	03	
132	01	1	
133	04	4	
134	01	1	
135	06	6	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
136	02	2	
137	01	1	
138	03	3	
139	07	7	
140	42	STO	
141	65	65	
142	76	LBL	
143	43	RCL	
144	69	OP	
145	23	23	
146	73	RC*	RCL Ind
147	02	02	
148	55	÷	
149	07	7	
150	22	INV	
151	28	LOG	
152	85	+	
153	93	.	
154	04	4	
155	95	=	
156	59	INT	
157	42	STO	
158	01	01	
159	73	RC*	RCL Ind
160	02	02	
161	55	÷	
162	03	3	
163	22	INV	
164	28	LOG	
165	95	=	
166	22	INV	
167	59	INT	
168	65	×	
169	01	1	
170	00	0	
171	00	0	
172	75	-	
173	43	RCL	
174	66	66	
175	95	=	
176	58	FIX	
177	01	01	1
178	52	EE	
179	22	INV	
180	52	EE	
181	22	INV	
182	58	FIX	
183	87	IFF	If flg
184	02	02	2
185	18	C'	
186	59	INT	
187	15	E	
188	76	LBL	
189	18	C'	
190	55	÷	
191	02	2	
192	95	=	
193	59	INT	
194	65	×	
195	02	2	
196	95	=	
197	76	LBL	
198	15	E	
199	42	STO	
200	00	00	
201	43	RCL	
202	01	01	
203	85	+	
204	93	.	
205	04	4	
206	95	=	
207	59	INT	
208	75	-	
209	04	4	
210	95	=	
211	33	X²	
212	65	×	
213	43	RCL	
214	00	00	
215	55	÷	
216	01	1	
217	06	6	
218	95	=	
219	58	FIX	
220	00	00	0
221	52	EE	
222	22	INV	
223	52	EE	
224	22	INV	
225	58	FIX	
226	44	SUM	
227	61	61	
228	42	STO	
229	07	07	
230	87	IFF	If flg
231	01	01	1
232	10	E'	
233	43	RCL	
234	64	64	
235	69	OP	
236	04	04	
237	43	RCL	
238	03	03	
239	69	OP	
240	06	06	
241	43	RCL	
242	65	65	
243	69	OP	
244	04	04	
245	43	RCL	
246	07	07	
247	69	OP	
248	06	06	
249	98	ADV	
250	76	LBL	
251	10	E'	
252	69	OP	
253	22	22	
254	43	RCL	
255	02	02	
256	32	X:T	
257	06	6	
258	00	0	
259	22	INV	
260	67	EQ	X = t
261	43	RCL	
262	43	RCL	
263	64	64	
264	69	OP	
265	04	04	
266	43	RCL	
267	63	63	
268	69	OP	
269	06	06	
270	69	OP	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
271	00	00	
272	03	3	
273	07	7	
274	03	3	
275	02	2	
276	03	3	
277	07	7	
278	01	1	
279	03	3	
280	02	2	
281	07	7	
282	69	OP	
283	01	01	
284	43	RCL	
285	65	65	
286	69	OP	
287	02	02	
288	69	OP	
289	05	05	
290	43	RCL	
291	61	61	
292	99	PRT	
293	98	ADV	
294	03	3	
295	00	0	
296	03	3	
297	02	2	
298	03	3	
299	05	5	
300	01	1	
301	07	7	
302	00	0	
303	00	0	
304	69	OP	
305	01	01	
306	43	RCL	
307	64	64	
308	65	×	
309	01	1	
310	00	0	
311	00	0	
312	85	+	
313	07	7	
314	01	1	
315	95	=	
316	69	OP	
317	02	02	
318	69	OP	
319	05	05	
320	25	CLR	
321	91	R/S	
322	43	RCL	
323	62	62	
324	69	OP	
325	01	01	
326	06	6	
327	69	OP	
328	17	17	
329	71	SBR	
330	99	PRT	
331	52	EE	
332	22	INV	
333	52	EE	
334	69	OP	
335	03	03	
336	69	OP	
337	05	05	
338	07	7	
339	69	OP	
340	17	17	
341	25	CLR	
342	91	R/S	
343	99	PRT	
344	98	ADV	
345	75	-	
346	43	RCL	
347	61	61	
348	95	=	
349	55	÷	
350	43	RCL	
351	61	61	
352	65	×	
353	01	1	
354	00	0	
355	00	0	
356	95	=	
357	32	X:T	
358	06	6	
359	01	1	
360	03	3	
361	02	2	
362	03	3	
363	05	5	
364	69	OP	
365	04	04	
366	32	X:T	
367	69	OP	
368	06	06	
369	69	OP	
370	00	00	
371	25	CLR	
372	98	ADV	
373	98	ADV	
374	98	ADV	
375	91	R/S	
376	76	LBL	
377	12	B	
378	43	RCL	
379	62	62	
380	69	OP	
381	01	01	
382	43	RCL	
383	64	64	
384	69	OP	
385	02	02	
386	69	OP	
387	05	05	
388	06	6	
389	69	OP	
390	17	17	
391	25	CLR	
392	91	R/S	
393	07	7	
394	69	OP	
395	17	17	
396	17	B'	
397	76	LBL	
398	13	C	
399	86	STF	St flg
400	01	01	1
401	91	R/S	
402	76	LBL	
403	99	PRT	
404	03	3	
405	07	7	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
406	01	1									
407	03	3									
408	02	2									
409	07	7									
410	02	2									
411	07	7									
412	69	DP									
413	02	02									
414	04	4									
415	05	5									
416	65	×									
417	01	1									
418	00	0									
419	45	Y×									
420	08	8									
421	95	=									
422	92	RTN	INV SBR								

*If input is different from key symbol. This does not include implied 2nd.

SAMPLE RUN

ENTER	PRESS	OUTPUT
	C A	
Mill Type	R/S	ENTER MILL TYPE 0.
MLTA	R/S	ENTER MLTA 3. 0.2
Number of logs	R/S	ENTER NO. LOGS 5.
		5. LOGS TOTAL BDFT 1306.
	B	MORE LOGS? ENTER LOGS
Read Log Data	R/S	
Number of logs	R/S	ENTER NO. LOGS 2.
		7. LOGS TOTAL BDFT 1750.
	R/S	MORE LOGS? ENTER TALLY
Tally	R/S	1542.
		-11.88571429 %OR

SAMPLE RUN

ENTER	PRESS	OUTPUT
Mill Type	A R/S	ENTER MILL TYPE 0.
MLTA	R/S	ENTER MLTA 3. 0.2
Number of logs	R/S	ENTER NO. LOGS 5.
		1. LOGS 331. BDFT
		2. LOGS 203. BDFT
		3. LOGS 320. BDFT
		4. LOGS 131. BDFT
		5. LOGS 271. BDFT
		5. LOGS TOTAL BDFT 1306.
		MORE LOGS?

SAMPLE RUN (Continued)

ENTER	PRESS	OUTPUT
	B	ENTER LOGS
Read log data	R/S	ENTER NO. LOGS
Number of logs	R/S	2.
		1. LOGS
		113. BDFT
		2. LOGS
		331. BDFT
		7. LOGS
		TOTAL BDFT
		1750.
		MORE LOGS?
	R/S	ENTER TALLY
Tally	R/S	1542.
		-11.88571429 %OR

Appendix V -- User Instructions for Program to Calculate Log Scale and Overrun by International 1/4-Inch Log Rule

/1/	International 1/4"			/2/
Mill	Tally	T Only		

Section 1 -- Program Description and Misc. Information (page 48)

Section 2 -- Program Instructions (pages 49-50)

Section 3 -- Program Listing (pages 51-54)

Section 4 -- Sample Run (pages 55-56)

PROGRAM DESCRIPTION

This program calculates board foot scale and percent overrun by the International 1/4-Inch Log Rule. The log data processed is that created by the Log Processing Program. Data input from the keyboard are mill type (odd, even), MLTA, number of logs to be processed, and mill lumber tally.

If the Individual and Total Option is requested, the output for each log is log number and individual log scale. For the Total Only Option, the output is total log scale, logs processed, and percent overrun.

Additional data cards can be introduced and the program will sum log scale to a new total. In this way log scale and percent overrun for more than 50 logs can be accumulated.

MISCELLANEOUS INFORMATION

User Defined Keys

A Mill Type
B Overrun Calculation
C Total Only Option

Labels Used - 3

A,B,C

Data Registers

00 Type Factor
01 Current Register
02 Length
03 Small End Diameter
04 Log BDFT
05
06 Number of Logs this Run
07
08 Log Number
09 'LOGS' -- from Log Processing Program
10
: Packed log data
59 from Log Processing Program
60 Total Number of Logs
61 Length -- Second Half of Long Log
62 Diameter -- Second Half of Long Log
63 Total BDFT
64 .006220239
65 .1854762
66 Mill Type Factor
67 14162137 - 'BDFT'
68
69 MLTA(ft.)

Flags

1 Short Log
2 Second Half of Long Log
3 Total Only Option

Partitioned -- 479.59 and 399.69
Library Module -- any
Printer -- yes
Cards -- 1

PROGRAM INSTRUCTIONS

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
1	Clear program memory, and display register		CP, CLR	(0)
2	Enter program using A or B			
	A. Key in			
	Enter learn mode		LRN	(000 00)
	Key in program from listing			(476 00)
	Exit learn mode		LRN	(0)
	B. Read card			
	Insert side one of program card			(1.)
	Clear display register		CLR	(0)
	Insert side two of program card			(2.)
	Clear display register		CLR	(0)
3	Enter log data			
	Insert side three of data card			(3.)
	Clear display register		CLR	(0)
	Insert side four of data card			(4.)
	Clear display register		CLR	(0)
**	OPTIONAL - Print Total Only		C	(0)
4	Enter mill type (odd=1, even=0)	1 or 0	A	Mill type code 'MLTA' (0)
5	Enter MLTA	MLTA(in.)	R/S	MLTA(in.) MLTA(ft.) (0)
6	Enter the number of logs to be processed this run (MAX 50), not total	# logs	R/S	xx 'LOGS'
7	Log Data is processed and printed Output:			
	1. Individual logs - if desired			
	log number			xx.
	log scale			xxx 'BDFT'
	2. Totals			
	total scale			xxx 'BDFT'
	total number of logs			xxx 'LOGS' (479.59)

*Output indicated inside parentheses is shown in display register. All other output is printed.

PROGRAM INSTRUCTIONS

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
8	Process more log data (8A) or Calculate overrun for logs already processed (8B)			
8A	Process more log data Clear display register Enter log data as in step 3 Got to step 6		CLR	(0)
8B	Calculate percent overrun Enter tally *NOTE: Additional data can be entered after step 8B* *Go to step 8A*	tally	B	tally % overrun '%' (479.59)

*Output indicated inside parentheses is shown in display register. All other output is printed.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
000	69	DP	
001	17	17	
002	43	RCL	
003	02	02	
004	22	INV	
005	67	EQ	X = t
006	00	00	0
007	34	34	
008	43	RCL	
009	00	00	
010	42	STO	
011	66	66	
012	43	RCL	
013	01	01	
014	42	STO	
015	69	69	
016	43	RCL	
017	03	03	
018	42	STO	
019	64	64	
020	43	RCL	
021	04	04	
022	42	STO	
023	65	65	
024	43	RCL	
025	06	06	
026	42	STO	
027	67	67	
028	00	0	
029	42	STO	
030	63	63	
031	42	STO	
032	60	60	
033	91	R/S	
034	69	DP	
035	06	06	
036	44	SUM	
037	60	60	
038	42	STO	
039	06	06	
040	94	+/-	
041	85	+	
042	06	6	
043	00	0	
044	95	=	
045	42	STO	
046	01	01	
047	37	IFF	If flg
048	03	03	3
049	00	00	0
050	52	52	
051	98	ADV	
052	86	STF	St flg
053	01	01	1
054	22	INV	
055	86	STF	St flg
056	02	02	2
057	73	RC*	RCL IND
058	01	01	
059	55	÷	
060	07	7	
061	22	INV	
062	28	LOG	
063	85	+	
064	93	.	
065	04	4	
066	95	=	
067	59	INT	
068	42	STO	
069	03	03	
070	73	RC*	RCL IND
071	01	01	
072	55	÷	
073	03	3	
074	22	INV	
075	28	LOG	
076	95	=	
077	22	INV	
078	59	INT	
079	65	×	
080	01	1	
081	00	0	
082	00	0	
083	75	-	
084	43	RCL	
085	69	69	
086	95	=	
087	58	FIX	
088	01	01	1
089	52	EE	
090	22	INV	
091	52	EE	
092	22	INV	
093	58	FIX	
094	55	÷	
095	43	RCL	
096	66	66	
097	95	=	
098	59	INT	
099	65	×	
100	43	RCL	
101	66	66	
102	95	=	
103	42	STO	
104	02	02	
105	02	2	
106	01	1	
107	32	X:T	
108	43	RCL	
109	02	02	
110	22	INV	
111	77	GE	X ≥ t
112	01	01	1
113	82	82	
114	22	INV	
115	86	STF	St flg
116	01	01	1
117	73	RC*	RCL IND
118	01	01	
119	55	÷	
120	06	6	
121	22	INV	
122	28	LOG	
123	95	=	
124	22	INV	
125	59	INT	
126	65	×	
127	01	1	
128	00	0	
129	00	0	
130	85	+	
131	93	.	
132	04	4	
133	95	=	
134	59	INT	
135	75	-	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
136	43	RCL	
137	03	03	
138	85	+	
139	01	1	
140	95	=	
141	55	÷	
142	02	2	
143	85	+	
144	43	RCL	
145	03	03	
146	85	+	
147	93	.	
148	04	4	
149	95	=	
150	59	INT	
151	42	STO	
152	62	62	
153	43	RCL	
154	02	02	
155	85	+	
156	01	1	
157	95	=	
158	55	÷	
159	02	2	
160	95	=	
161	59	INT	
162	85	+	
163	43	RCL	
164	66	66	
165	75	-	
166	01	1	
167	95	=	
168	55	÷	
169	43	RCL	
170	66	66	
171	95	=	
172	59	INT	
173	65	×	
174	43	RCL	
175	66	66	
176	95	=	
177	42	STO	
178	61	61	
179	94	+/-	
180	44	SUM	
181	02	02	
182	69	OP	
183	00	00	
184	43	RCL	
185	01	01	
186	85	+	
187	43	RCL	
188	06	06	
189	75	-	
190	05	5	
191	09	9	
192	95	=	
193	42	STO	
194	08	08	
195	43	RCL	
196	64	64	
197	65	×	
198	08	8	
199	65	×	
200	43	RCL	
201	02	02	
202	65	×	
203	43	RCL	
204	03	03	
205	33	X^2	
206	85	+	
207	43	RCL	
208	64	64	
209	65	×	
210	43	RCL	
211	02	02	
212	33	X^2	
213	65	×	
214	43	RCL	
215	03	03	
216	75	-	
217	43	RCL	
218	65	65	
219	65	×	
220	43	RCL	
221	02	02	
222	65	×	
223	43	RCL	
224	03	03	
225	85	+	
226	43	RCL	
227	64	64	
228	55	÷	
229	02	2	
230	04	4	
231	65	×	
232	43	RCL	
233	02	02	
234	45	Y^X	
235	03	3	
236	75	-	
237	43	RCL	
238	65	65	
239	55	÷	
240	01	1	
241	06	6	
242	65	×	
243	43	RCL	
244	02	02	
245	33	X^2	
246	85	+	
247	93	.	
248	00	0	
249	04	4	
250	02	2	
251	02	2	
252	02	2	
253	02	2	
254	02	2	
255	02	2	
256	65	×	
257	43	RCL	
258	02	02	
259	95	=	
260	55	÷	
261	05	5	
262	95	=	
263	58	FIX	
264	00	00	0
265	52	EE	
266	22	INV	
267	52	EE	
268	22	INV	
269	58	FIX	
270	65	×	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
271	05	5	
272	95	=	
273	44	SUM	
274	63	63	
275	42	STO	
276	04	04	
277	87	IFF	If flg
278	03	03	3
279	02	02	2
280	94	94	
281	69	OP	
282	00	00	
283	43	RCL	
284	08	08	
285	99	PRT	
286	43	RCL	
287	67	67	
288	69	OP	
289	04	04	
290	43	RCL	
291	04	04	
292	69	OP	
293	06	06	
294	87	IFF	If flg
295	01	01	1
296	03	03	3
297	15	15	
298	87	IFF	If flg
299	02	02	2
300	03	03	3
301	15	15	
302	86	STF	St flg
303	02	02	2
304	43	RCL	
305	61	61	
306	42	STO	
307	02	02	
308	43	RCL	
309	62	62	
310	42	STO	
311	03	03	
312	61	GTO	
313	01	01	1
314	95	95	
315	69	OP	
316	21	21	
317	06	6	
318	00	0	
319	32	X:T	
320	43	RCL	
321	01	01	
322	22	INV	
323	67	EQ	X = t
324	00	00	0
325	47	47	
326	98	ADV	
327	43	RCL	
328	63	63	
329	69	OP	
330	06	06	
331	43	RCL	
332	09	09	
333	69	OP	
334	04	04	
335	43	RCL	
336	60	60	
337	69	OP	
338	06	06	
339	98	ADV	
340	98	ADV	
341	06	6	
342	69	OP	
343	17	17	
344	91	R/S	
345	42	STO	
346	02	02	
347	43	RCL	
348	09	09	
349	69	OP	
350	04	04	
351	07	7	
352	61	GTO	
353	00	00	0
354	00	00	
355	76	LBL	
356	12	B	
357	99	PRT	
358	32	X:T	
359	07	7	
360	69	OP	
361	17	17	
362	06	6	
363	01	1	
364	69	OP	
365	04	04	
366	32	X:T	
367	75	-	
368	43	RCL	
369	63	63	
370	95	=	
371	55	÷	
372	43	RCL	
373	63	63	
374	65	×	
375	01	1	
376	00	0	
377	00	0	
378	95	=	
379	69	OP	
380	06	06	
381	61	GTO	
382	03	03	3
383	39	39	
384	76	LBL	
385	11	A	
386	99	PRT	
387	75	-	
388	01	1	
389	95	=	
390	94	+/-	
391	85	+	
392	01	1	
393	95	=	
394	42	STO	
395	00	00	
396	98	ADV	
397	03	3	
398	00	0	
399	02	2	
400	07	7	
401	03	3	
402	07	7	
403	01	1	
404	03	3	
405	69	OP	

*If input is different from key symbol. This does not include implied 2nd.

Appendix V, Section 3

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
406	01	01	
407	69	□P	
408	05	05	
409	25	CLR	
410	42	STO□	
411	02	02	
412	91	R/S	
413	99	PRT	
414	55	÷	
415	01	1	
416	02	2	
417	65	×	
418	01	1	
419	00	0	
420	95	=	
421	59	INT	
422	55	÷	
423	01	1	
424	00	0	
425	95	=	
426	99	PRT	
427	98	HDV	
428	42	STO□	
429	01	01	
430	69	□P	
431	00	00	
432	93	.	
433	00	0	
434	00	0	
435	06	6	
436	02	2	
437	02	2	
438	00	0	
439	02	2	
440	03	3	
441	09	9	
442	42	STO□	
443	03	03	
444	93	.	
445	01	1	
446	08	8	
447	05	5	
448	04	4	
449	07	7	
450	06	6	
451	02	2	
452	42	STO□	
453	04	04	
454	01	1	
455	04	4	
456	01	1	
457	06	6	
458	02	2	
459	01	1	
460	03	3	
461	07	7	
462	42	STO□	
463	06	06	
464	43	RCL	
465	09	09	
466	69	□P	
467	04	04	
468	07	7	
469	61	GTO□	
470	00	00	0
471	00	00	
472	76	LBL	
473	13	C	
474	86	STF	St flg
475	03	03	3
476	91	R/S	

*If input is different from key symbol. This does not include implied 2nd.

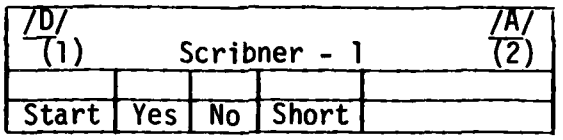
SAMPLE RUN

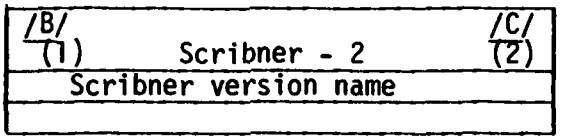
ENTER	PRESS	OUTPUT
	C	
Mill Type	A	0.
		MLTR
MLTA	R/S	3.
		0.2
Number of logs	R/S	5. LOGS
		1405.
		5. LOGS
	CLR	
Read log data		
Number of logs	R/S	2. LOGS
		1870.
		7. LOGS
Tally	B	1542.
		-17.54010695 %

SAMPLE RUN

ENTER	PRESS	OUTPUT
Mill Type	A	0.
MLTA	R/S	MLTA 3. 0.2
Number of logs	R/S	5. LOGS
		1. 340. BDFT
		2. 215. BDFT
		3. 370. BDFT
		4. 195. BDFT
		5. 285. BDFT
		1405. BDFT 5. LOGS
	CLR	
Read log data Number of logs	R/S	2. LOGS
		1. 125. BDFT
		2. 340. BDFT
		1870. BDFT 7. LOGS
Tally	B	1542. -17.54010695 %

Appendix VI -- User Instructions for Program to Calculate Log Scale and Overrun by Scribner Log Rules (Scribner, Scribner Decimal-C, and Bureau Scribner)





Section 1 -- Program Description and Misc. Information (page 58)

Section 2 -- Program Instructions (pages 59-62)

a. Running the program
b. Keying in the program

Section 3 -- Program Listing (pages 63-73)

a. Side A -- used by Scribner, Scribner Decimal-C, and Bureau Scribner
b. Side B
   i. -- used by Scribner
   ii. -- used by Scribner Decimal-C
   iii. -- used by Bureau Scribner
c. Side C -- Factor Table for Scribner and Scribner Decimal-C and Factor Table for Bureau Scribner
d. Side D -- Used by Scribner, Scribner Decimal-C, and Bureau Scribner

Section 4 -- Sample Run (pages 74-82)

i. -- Scribner
ii. -- Scribner Decimal-C
iii. -- Bureau Scribner

Appendix VI, Section 1

PROGRAM DESCRIPTION

This program calculates board foot scale and percent overrun by three versions of the Scribner Log Rule. The log data processed is that created by the Log Processing Program. Data input from the keyboard are mill type (odd, even), MLTA, number of logs to be processed, and mill lumber tally. These inputs are prompted for by the program.

The three versions of the Scribner Log Rule available in this program are Scribner, Scribner Decimal-C, and Bureau Scribner. Scribner refers to the original Scribner rule as developed by Rev. Scribner. Scribner Decimal-C is the version recognized by the Forest Service. Bureau Scale is a variant of Scribner Decimal-C recognized by several scaling bureaus for use west of the Cascades. All versions require starting with the mag card labeled in the left corner followed by the mag card for the specific version desired as the instructions indicate.

If the Individual and Total Option is requested, the output for each log is log number and individual log scale. For the Total Only Option, the output is number of logs processed, total log scale, and percent overrun.

Additional data cards can be introduced and the program will sum log scale to a new total. In this way log scale and percent overrun for more than 50 logs can be accumulated.

MISCELLANEOUS INFORMATION

User Defined Keys

A Start Program
B More Logs
C Overrun Calculation
D Total Only Option
E Label
E' Label

Labels Used - 6

A,B,C,D,E,E'

Data Registers

00 Length
01 Diameter and Register
02 Log Number
03 Current Register
04 14162137 = 'BDFT'
05 27322236 = 'LOGS'
06 1731371735 = 'ENTER'
07 Total Number of Logs
08 Total BDFT
09 MLTA(ft.)
10
: - Packed log data
59 from Log Processing Program
60
:
96 - Factors for computing Scribner Scale
66 'ENTER' -- temporary
67 Number of Logs -- temporary
68 Total BDFT -- temporary
69 MLTA(ft.) -- temporary

Flags

1 Total Only Option
2 Mill Type

Partitioned -- 479.59, 399.69, and 159.99
Library Module -- any
Printer -- yes
Cards -- 2 from a possible total of 4
First card contains sides A and D
Second card contains sides B and C
for one of the three versions

PROGRAM INSTRUCTIONS

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
1	Clear program memory, and display register		CP, CLR	(0)
2	Enter program using method A or B			
	A. Key in *NOTE: Due to limited space two magnetic cards will be required to record and run this program. There are special instructions at the end of the program instructions (Section 2b)*			
	B. Read card Insert side A of program card Clear display register		 CLR	 (2.) (0)
3	Enter log data Insert side 3 of data card Clear display register Insert side 4 of data card Clear display register		 CLR CLR	 (3.) (0) (4.) (0)
**	OPTIONAL - Print Total Only		D	(0)
4	Start program		A	'ENTER MILL TYPE' (0)
5	Enter mill type (odd=1, even=0)	1 or 0	R/S	Mill type code 'ENTER MLTA' (0)
6	Enter MLTA	MLTA(in.)	R/S	MLTA(in.) MLTA(ft.) 'ENTER NO. LOGS' (0)
7	Enter the number of logs to be processed this run (MAX 50), not total	# logs	R/S	# logs 'ENTER B, C' (0)
8	Enter mag card with version of Scribner desired Insert side B of program card Clear display register Insert side C of program card Clear display register		 CLR CLR	 (1.) (0) (2.) (0)
9	Continue		R/S	

*Output indicated inside parentheses is shown in display register. All other output is printed.

PROGRAM INSTRUCTIONS

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
10	Log Data is processed and Individual log data is printed if desired			
	Output - if desired			
	log number			xxx
	log scale			xxx 'BDFT'
				'ENTER D'
				(0)
11	Tabulate totals			
	Insert side D of program card			(1.)
	Clear display register		CLR	(0)
	Continue		R/S	'TOTAL'
				xxx 'LOGS'
				xxx 'BDFT'
				'MORE LOGS?'
				'B=YES'
				'C=NO'
				(0)
12	Process more log data (12A) or Calculate overrun for logs already processed (12B)			
12A	Process more log data			
	Continue		B	'ENTER LOGS'
				(0)
	Enter log data as in step 3			
	Continue		R/S	'ENTER A'
				(0)
	Insert side A of program card			(2.)
	Clear display register		CLR	(0)
	Continue		R/S	'ENTER NO. LOGS'
				(0)
	Go to step 7			
12B	Calculate percent overrun			
	Continue		C	'ENTER TALLY'
	Enter tally	tally	R/S	tally
	NOTE: Additional data can be entered after step 12B			% overrun 'OR'
	Go to step 12A			(% overrun)

*Output indicated inside parentheses is shown in display register. All other output is printed.

Appendix VI, Section 2b — Special Instructions for Keying in Program

This program is divided into 3 segments. Please follow the directions carefully.

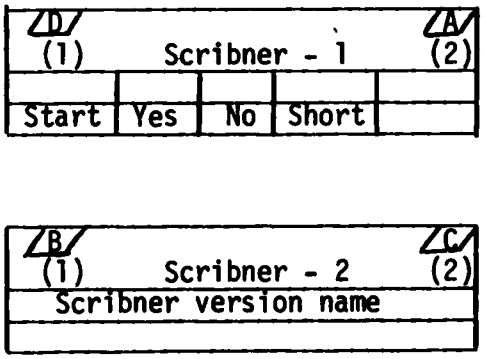
PROGRAM INSTRUCTIONS

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
1	Segment 1 - Side A			
A	Clear program memory and display register		CP, CLR	0
B	Set program pointer		GTO	
		250		0
C	Enter learn mode		LRN	240 00
D	Key in steps from listing for side A			446 00
E	Exit learn mode		LRN	0
F	Reset program pointer		RST	0
G	Record segment 1 on bank 2 of a magnetic card			
	Indicate program bank 2 to be written	2	WRITE	
	Insert second side of blank card			2.
H	Label bank 2 of card - "A"			
2	Segment 2 - Sides B and C			
A	Select version to be keyed in -- B and C must be for the same version			
B	Clear program memory and display register		CP, CLR	0
C	Enter learn mode		LRN	000 00
D	Key in steps from listing for side B (for selected version of Scribner)			180 00
E	Exit learn mode		LRN	0
F	Repartition calculator memory	10	OP	
		17		159.99
G	Store factor table in data registers from listing for side C (for selected version of Scribner)	factor register	STO	factor
H	Repartition calculator memory	6	OP	
		17		479.59
I	Clear display register		CLR	0
J	Reset program pointer		RST	0

*Output indicated inside parentheses is shown in display register. All other output is printed.

PROGRAM INSTRUCTIONS

STEPS	PROCEDURE	ENTER	PRESS	DISPLAY*
K	Record segment 2 on banks 1 and 2 of a second blank magnetic card (not the same card as segment 1)			
	Indicate program bank 1 to be written	1	WRITE	
	Insert first side of blank card			1.
	Indicate program bank 2 to be written	2	WRITE	
	Insert second side of blank card			2.
L	Label bank 1 of card - "B"			
M	Label bank 2 of card - "C"			
3	Segment 3 - Side D			
A	Clear program memory and display register		CP, CLR	0
B	Enter learn mode		LRN	000 00
C	Key in steps from listing for side D			240 00
D	Exit learn mode		LRN	0
E	Reset program pointer		RST	0
F	Record segment 3 on bank 1 of the first magnetic card (the other side of the card with segment 1)			
	Indicate program bank 1 to be written	1	WRITE	
	Insert first side of blank card			1.
G	Label bank 1 of card - "D"			



*Output indicated inside parentheses is shown in display register. All other output is printed.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
240	61	GTO	
241	10	E'	
242	76	LBL	
243	11	A	
244	25	CLR	
245	42	STO	
246	07	07	
247	42	STO	
248	08	08	
249	71	SBR	
250	15	E	
251	43	RCL	
252	06	06	
253	69	OP	
254	01	01	
255	03	3	
256	00	0	
257	02	2	
258	04	4	
259	02	2	
260	07	7	
261	02	2	
262	07	7	
263	69	OP	
264	02	02	
265	03	3	
266	07	7	
267	04	4	
268	05	5	
269	03	3	
270	03	3	
271	01	1	
272	07	7	
273	69	OP	
274	03	03	
275	69	OP	
276	05	05	
277	25	CLR	
278	91	R/S	
279	99	PRT	
280	98	ADV	
281	32	X:T	
282	25	CLR	
283	22	INV	
284	67	EQ	X = t
285	02	02	2
286	09	09	
287	86	STF	St flg
288	02	02	2
289	03	3	
290	00	0	
291	02	2	
292	07	7	
293	03	3	
294	07	7	
295	01	1	
296	03	3	
297	69	OP	
298	02	02	
299	25	CLR	
300	69	OP	
301	03	03	
302	69	OP	
303	05	05	
304	91	R/S	
305	99	PRT	
306	55	÷	
307	01	1	
308	02	2	
309	65	×	
310	01	1	
311	00	0	
312	95	=	
313	59	INT	
314	55	÷	
315	01	1	
316	00	0	
317	95	=	
318	99	PRT	
319	98	ADV	
320	42	STO	
321	09	09	
322	69	OP	
323	00	00	
324	61	GTO	
325	03	03	3
326	31	31	
327	76	LBL	
328	10	E'	
329	71	SBR	
330	15	E	
331	43	RCL	
332	06	06	
333	69	OP	
334	01	01	
335	03	3	
336	01	1	
337	03	3	
338	02	2	
339	04	4	
340	00	0	
341	69	OP	
342	02	02	
343	43	RCL	
344	05	05	
345	69	OP	
346	03	03	
347	69	OP	
348	05	05	
349	69	OP	
350	04	04	
351	25	CLR	
352	91	R/S	
353	69	OP	
354	06	06	
355	98	ADV	
356	44	SUM	
357	07	07	
358	94	+/-	
359	85	+	
360	06	6	
361	00	0	
362	95	=	
363	42	STO	
364	03	03	
365	01	1	
366	04	4	
367	05	5	
368	07	7	
369	00	0	
370	00	0	
371	01	1	
372	05	5	
373	69	OP	
374	02	02	
375	25	CLR	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
376	69	DP	
377	03	03	
378	69	DP	
379	04	04	
380	69	DP	
381	05	05	
382	68	NOP	
383	68	NOP	
384	68	NOP	
385	68	NOP	
386	68	NOP	
387	68	NOP	
388	68	NOP	
389	68	NOP	
390	68	NOP	
391	68	NOP	
392	68	NOP	
393	91	R/S	
394	98	ADV	
395	01	1	
396	00	0	
397	61	GTO	
398	00	00	0
399	00	00	
400	76	LBL	
401	14	D	
402	86	STF	St flg
403	01	01	1
404	91	R/S	
405	76	LBL	
406	15	E	
407	36	PGM	
408	01	01	
409	71	SBR	
410	25	CLR	
411	69	DP	
412	00	00	
413	01	1	
414	04	4	
415	01	1	
416	06	6	
417	02	2	
418	01	1	
419	03	3	
420	07	7	
421	42	STO	
422	04	04	
423	02	2	
424	07	7	
425	03	3	
426	02	2	
427	02	2	
428	02	2	
429	03	3	
430	06	6	
431	42	STO	
432	05	05	
433	01	1	
434	07	7	
435	03	3	
436	01	1	
437	03	3	
438	07	7	
439	01	1	
440	07	7	
441	03	3	
442	05	5	
443	42	STO	
444	06	06	
445	92	RTN	INV SBR

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
000	69	OP	
001	17	17	
002	73	RC*	RCL IND
003	03	03	
004	55	÷	
005	03	3	
006	22	INV	
007	28	LOG	
008	95	=	
009	42	STO	
010	01	01	
011	22	INV	
012	59	INT	
013	65	×	
014	01	1	
015	00	0	
016	00	0	
017	75	-	
018	43	RCL	
019	09	09	
020	95	=	
021	58	FIX	
022	01	01	1
023	52	EE	
024	22	INV	
025	52	EE	
026	22	INV	
027	58	FIX	
028	42	STO	
029	00	00	
030	43	RCL	
031	01	01	
032	55	÷	
033	04	4	
034	22	INV	
035	28	LOG	
036	85	+	
037	93	.	
038	04	4	
039	95	=	
040	59	INT	
041	42	STO	
042	01	01	
043	43	RCL	
044	00	00	
045	87	IFF	If flg
046	02	02	2
047	00	00	0
048	53	53	
049	59	INT	
050	61	GTO	
051	00	00	0
052	60	60	
053	55	÷	
054	02	2	
055	95	=	
056	59	INT	
057	65	×	
058	02	2	
059	95	=	
060	42	STO	
061	00	00	
062	32	X:T	
063	01	1	
064	05	5	
065	22	INV	
066	77	GE	X ≥ t
067	01	01	1
068	31	31	
069	43	RCL	
070	01	01	
071	85	+	
072	05	5	
073	09	9	
074	95	=	
075	42	STO	
076	01	01	
077	73	RC*	RCL IND
078	01	01	
079	65	×	
080	43	RCL	
081	00	00	
082	68	NOP	
083	68	NOP	
084	68	NOP	
085	95	=	
086	58	FIX	
087	00	00	0
088	52	EE	
089	22	INV	
090	52	EE	
091	22	INV	
092	58	FIX	
093	68	NOP	
094	68	NOP	
095	68	NOP	
096	68	NOP	
097	44	SUM	
098	08	08	
099	87	IFF	If flg
100	01	01	1
101	01	01	1
102	18	18	
103	32	X:T	
104	01	1	
105	44	SUM	
106	02	02	
107	43	RCL	
108	02	02	
109	99	PRT	
110	43	RCL	
111	04	04	
112	69	OP	
113	04	04	
114	32	X:T	
115	69	OP	
116	06	06	
117	98	ADV	
118	69	OP	
119	23	23	
120	43	RCL	
121	03	03	
122	32	X:T	
123	06	6	
124	00	0	
125	67	EQ	X = t
126	01	01	1
127	57	57	
128	61	GTO	
129	00	00	0
130	02	02	
131	06	6	
132	32	X:T	
133	43	RCL	
134	01	01	
135	22	INV	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
136	77	GE	X ≥ t								
137	00	00	0								
138	69	69									
139	75	-									
140	06	6									
141	95	=									
142	77	GE	X ≥ t								
143	00	00	0								
144	69	69									
145	02	2									
146	05	5									
147	85	+									
148	61	GTO									
149	00	00	0								
150	69	69									
151	68	NOP									
152	68	NOP									
153	68	NOP									
154	68	NOP									
155	68	NOP									
156	68	NOP									
157	06	6									
158	69	OP									
159	17	17									
160	43	RCL									
161	06	06									
162	69	OP									
163	00	00									
164	69	OP									
165	01	01									
166	01	1									
167	06	6									
168	00	0									
169	00	0									
170	00	0									
171	00	0									
172	00	0									
173	00	0									
174	69	OP									
175	02	02									
176	69	OP									
177	05	05									
178	25	CLR									
179	91	R/S									

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
000	69	DP	
001	17	17	
002	73	RC*	RCL Ind
003	03	03	
004	55	÷	
005	03	3	
006	22	INV	
007	28	LOG	
008	95	=	
009	42	STO	
010	01	01	
011	22	INV	
012	59	INT	
013	65	×	
014	01	1	
015	00	0	
016	00	0	
017	75	-	
018	43	RCL	
019	09	09	
020	95	=	
021	58	FIX	
022	01	01	1
023	52	EE	
024	22	INV	
025	52	EE	
026	22	INV	
027	58	FIX	
028	42	STO	
029	00	00	
030	43	RCL	
031	01	01	
032	55	÷	
033	04	4	
034	22	INV	
035	28	LOG	
036	85	+	
037	93	.	
038	04	4	
039	95	=	
040	59	INT	
041	42	STO	
042	01	01	
043	43	RCL	
044	00	00	
045	87	IFF	If flg
046	02	02	2
047	00	00	0
048	53	53	
049	59	INT	
050	61	GTO	
051	00	00	0
052	60	60	
053	55	÷	
054	02	2	
055	95	=	
056	59	INT	
057	65	×	
058	02	2	
059	95	=	
060	42	STO	
061	00	00	
062	32	X:T	
063	01	1	
064	05	5	
065	22	INV	
066	77	GE	X ≥ t
067	01	01	1
068	31	31	
069	43	RCL	
070	01	01	
071	85	+	
072	05	5	
073	09	9	
074	95	=	
075	42	STO	
076	01	01	
077	73	RC*	RCL Ind
078	01	01	
079	65	×	
080	43	RCL	
081	00	00	
082	55	÷	
083	01	1	
084	00	0	
085	95	=	
086	58	FIX	
087	00	00	0
088	52	EE	
089	22	INV	
090	52	EE	
091	22	INV	
092	58	FIX	
093	65	×	
094	01	1	
095	00	0	
096	95	=	
097	44	SUM	
098	08	08	
099	87	IFF	If flg
100	01	01	1
101	01	01	1
102	18	18	
103	32	X:T	
104	01	1	
105	44	SUM	
106	02	02	
107	43	RCL	
108	02	02	
109	99	PRT	
110	43	RCL	
111	04	04	
112	69	DP	
113	04	04	
114	32	X:T	
115	69	DP	
116	06	06	
117	98	ADV	
118	69	DP	
119	23	23	
120	43	RCL	
121	03	03	
122	32	X:T	
123	06	6	
124	00	0	
125	67	EQ	X = t
126	01	01	1
127	57	57	
128	61	GTO	
129	00	00	0
130	02	02	
131	06	6	
132	32	X:T	
133	43	RCL	
134	01	01	
135	22	INV	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
136	77	GE	X ≥ t
137	00	00	0
138	69	69	
139	75	-	
140	06	6	
141	95	=	
142	77	GE	X ≥ t
143	00	00	0
144	69	69	
145	02	2	
146	05	5	
147	85	+	
148	61	GTO	
149	00	00	0
150	69	69	
151	68	NOP	
152	68	NOP	
153	68	NOP	
154	68	NOP	
155	68	NOP	
156	68	NOP	
157	06	6	
158	69	OP	
159	17	17	
160	43	RCL	
161	06	06	
162	69	OP	
163	00	00	
164	69	OP	
165	01	01	
166	01	1	
167	06	6	
168	00	0	
169	00	0	
170	00	0	
171	00	0	
172	00	0	
173	00	0	
174	69	OP	
175	02	02	
176	69	OP	
177	05	05	
178	25	CLR	
179	91	R/S	

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
000	69	□P	
001	17	17	
002	73	RC*	RCL Ind
003	03	03	
004	55	÷	
005	03	3	
006	22	INV	
007	28	LOG	
008	95	=	
009	42	STO	
010	01	01	
011	22	INV	
012	59	INT	
013	65	×	
014	01	1	
015	00	0	
016	00	0	
017	75	-	
018	43	RCL	
019	09	09	
020	95	=	
021	58	FIX	
022	01	01	1
023	52	EE	
024	22	INV	
025	52	EE	
026	22	INV	
027	58	FIX	
028	42	STO	
029	00	00	
030	43	RCL	
031	01	01	
032	55	÷	
033	04	4	
034	22	INV	
035	28	LOG	
036	95	=	
037	59	INT	
038	42	STO	
039	01	01	
040	43	RCL	
041	00	00	
042	87	IFF	If flg
043	02	02	2
044	00	00	0
045	50	50	
046	59	INT	
047	61	GTO	
048	00	00	0
049	57	57	
050	55	÷	
051	02	2	
052	95	=	
053	59	INT	
054	65	×	
055	02	2	
056	95	=	
057	42	STO	
058	00	00	
059	32	X↕T	
060	01	1	
061	05	5	
062	22	INV	
063	77	GE	X ≥ t
064	01	01	1
065	25	25	
066	43	RCL	
067	01	01	
068	85	+	
069	05	5	
070	04	4	
071	95	=	
072	42	STO	
073	01	01	
074	73	RC*	RCL Ind
075	01	01	
076	65	×	
077	43	RCL	
078	00	00	
079	95	=	
080	58	FIX	
081	00	00	0
082	52	EE	
083	22	INV	
084	52	EE	
085	22	INV	
086	58	FIX	
087	65	×	
088	01	1	
089	00	0	
090	95	=	
091	44	SUM	
092	08	08	
093	87	IFF	If flg
094	01	01	1
095	01	01	1
096	12	12	
097	32	X↕T	
098	01	1	
099	44	SUM	
100	02	02	
101	43	RCL	
102	02	02	
103	99	PRT	
104	43	RCL	
105	04	04	
106	69	□P	
107	04	04	
108	32	X↕T	
109	69	□P	
110	06	06	
111	98	ADV	
112	69	□P	
113	23	23	
114	43	RCL	
115	03	03	
116	32	X↕T	
117	06	6	
118	00	0	
119	67	EQ	X = t
120	01	01	1
121	57	57	
122	61	GTO	
123	00	00	0
124	02	02	
125	06	6	
126	32	X↕T	
127	43	RCL	
128	01	01	
129	22	INV	
130	77	GE	X ≥ t
131	00	00	0
132	66	66	
133	75	-	
134	06	6	
135	95	=	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
136	77	GE	X ≥ t
137	00	00	0
138	66	66	
139	43	RCL	
140	00	00	
141	55	÷	
142	03	3	
143	02	2	
144	95	=	
145	59	INT	
146	65	×	
147	06	6	
148	95	=	
149	85	+	
150	02	2	
151	05	5	
152	85	+	
153	61	GTO	
154	00	00	0
155	66	66	
156	68	NOP	
157	06	6	
158	69	OP	
159	17	17	
160	43	RCL	
161	06	06	
162	69	OP	
163	00	00	
164	69	OP	
165	01	01	
166	01	1	
167	06	6	
168	00	0	
169	00	0	
170	00	0	
171	00	0	
172	00	0	
173	00	0	
174	69	OP	
175	02	02	
176	69	OP	
177	05	05	
178	25	CLR	
179	91	R/S	

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*

*If input is different from key symbol. This does not include implied 2nd.

FACTOR TABLES

Scribner and Scribner Decimal-C	
Factor	Data Register
0.	60
0.143	61
0.39	62
0.676	63
1.07	64
1.16	65
1.4	66
1.501	67
2.084	68
3.126	69
3.749	70
4.9	71
6.043	72
7.14	73
8.88	74
10.	75
11.528	76
13.29	77
14.99	78
17.499	79
18.99	80
20.88	81
23.51	82
25.218	83
28.677	84
31.249	85
34.22	86
36.376	87
38.04	88
41.06	89
1.249	90
1.608	91
1.854	92
2.41	93
3.542	94
4.167	95
0.	96

Bureau Scribner	
Factor	Data Register
0.116	60
0.14	61
0.1501	62
0.2084	63
0.3126	64
0.3749	65
0.49	66
0.6043	67
0.714	68
0.888	69
1.	70
1.1528	71
1.329	72
1.499	73
1.7499	74
1.899	75
2.088	76
2.351	77
2.5218	78
2.8677	79
3.1249	80
3.422	81
3.6376	82
3.804	83
4.106	84
0.1249	85
0.1608	86
0.1854	87
0.241	88
0.3542	89
0.4167	90
0.157	91
0.18	92
0.22	93
0.29	94
0.3815	95
0.4499	96

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
000	98	ADV	
001	69	□P	
002	00	00	
003	03	3	
004	07	7	
005	03	3	
006	02	2	
007	03	3	
008	07	7	
009	01	1	
010	03	3	
011	02	2	
012	07	7	
013	69	□P	
014	01	01	
015	69	□P	
016	05	05	
017	43	RCL	
018	05	05	
019	69	□P	
020	00	00	
021	69	□P	
022	04	04	
023	43	RCL	
024	07	07	
025	69	□P	
026	06	06	
027	43	RCL	
028	04	04	
029	69	□P	
030	04	04	
031	43	RCL	
032	08	08	
033	69	□P	
034	06	06	
035	98	ADV	
036	69	□P	
037	00	00	
038	03	3	
039	00	0	
040	03	3	
041	02	2	
042	03	3	
043	05	5	
044	01	1	
045	07	7	
046	00	0	
047	00	0	
048	69	□P	
049	01	01	
050	43	RCL	
051	05	05	
052	65	×	
053	01	1	
054	00	0	
055	00	0	
056	85	+	
057	07	7	
058	01	1	
059	95	=	
060	69	□P	
061	02	02	
062	69	□P	
063	05	05	
064	69	□P	
065	00	00	
066	01	1	
067	04	4	
068	06	6	
069	04	4	
070	04	4	
071	05	5	
072	01	1	
073	07	7	
074	03	3	
075	06	6	
076	69	□P	
077	01	01	
078	69	□P	
079	05	05	
080	01	1	
081	05	5	
082	06	6	
083	04	4	
084	03	3	
085	01	1	
086	03	3	
087	02	2	
088	00	0	
089	00	0	
090	69	□P	
091	01	01	
092	69	□P	
093	05	05	
094	25	CLR	
095	91	R/S	
096	76	LBL	
097	13	C	
098	43	RCL	
099	06	06	
100	69	□P	
101	01	01	
102	03	3	
103	07	7	
104	01	1	
105	03	3	
106	02	2	
107	07	7	
108	02	2	
109	07	7	
110	69	□P	
111	02	02	
112	04	4	
113	05	5	
114	65	×	
115	08	8	
116	22	INV	
117	28	LOG	
118	95	=	
119	52	EE	
120	22	INV	
121	52	EE	
122	69	□P	
123	03	03	
124	69	□P	
125	05	05	
126	25	CLR	
127	91	R/S	
128	99	PRT	
129	75	-	
130	43	RCL	
131	08	08	
132	95	=	
133	55	÷	
134	43	RCL	
135	08	08	

*If input is different from key symbol. This does not include implied 2nd.

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
136	65	×	
137	01	1	
138	00	0	
139	00	0	
140	95	=	
141	32	X:T	
142	06	6	
143	01	1	
144	03	3	
145	02	2	
146	03	3	
147	05	5	
148	69	□P	
149	04	04	
150	32	X:T	
151	69	□P	
152	06	06	
153	91	R/S	
154	76	LBL	
155	12	B	
156	07	7	
157	69	□P	
158	17	17	
159	43	RCL	
160	06	06	
161	42	STO	
162	66	66	
163	43	RCL	
164	07	07	
165	42	STO	
166	67	67	
167	43	RCL	
168	08	08	
169	42	STO	
170	68	68	
171	43	RCL	
172	09	09	
173	42	STO	
174	69	69	
175	06	6	
176	69	□P	
177	17	17	
178	69	□P	
179	00	00	
180	43	RCL	
181	06	06	
182	61	GTO	
183	01	01	1
184	88	88	
185	61	GTO	
186	00	00	0
187	00	00	
188	69	□P	
189	01	01	
190	43	RCL	
191	05	05	
192	69	□P	
193	02	02	
194	69	□P	
195	05	05	
196	98	ADV	
197	25	CLR	
198	91	R/S	
199	07	7	
200	69	□P	
201	17	17	
202	43	RCL	
203	66	66	
204	42	STO	
205	06	06	
206	43	RCL	
207	67	67	
208	42	STO	
209	07	07	
210	43	RCL	
211	68	68	
212	42	STO	
213	08	08	
214	43	RCL	
215	69	69	
216	42	STO	
217	09	09	
218	06	6	
219	69	□P	
220	17	17	
221	43	RCL	
222	06	06	
223	69	□P	
224	01	01	
225	01	1	
226	03	3	
227	00	0	
228	00	0	
229	00	0	
230	00	0	
231	00	0	
232	00	0	
233	69	□P	
234	02	02	
235	69	□P	
236	05	05	
237	25	CLR	
238	91	R/S	
239	68	NOP	

*If input is different from key symbol. This does not include implied 2nd.

SAMPLE RUN

ENTER	PRESS	OUTPUT
	D A	ENTER MILL TYPE
Mill Type	R/S	0.
		ENTER MLTA
MLTA	R/S	3. 0.2
		ENTER NO. LOGS
Number of logs	R/S	5. LOGS
		ENTER B, C
Read Sides B and C	R/S	
		ENTER D
Read Side D	R/S	
		TOTAL
		5. LOGS 1375. BDFT
		MORE LOGS? B=YES C=NO
	B	ENTER LOGS
Read log data	R/S	
		ENTER A
Read Side A	R/S	ENTER NO. LOGS
Number of logs	R/S	2. LOGS
		ENTER B, C
Read Sides B and C	R/S	
Read Side D	R/S	ENTER D
		TOTAL
		7. LOGS 1839. BDFT
		MORE LOGS? B=YES C=NO
	C	ENTER TALLY
Tally	R/S	1542. -16.15008157 %OR

SAMPLE RUN

ENTER	PRESS	OUTPUT
Mill Type	A R/S	ENTER MILL TYPE 0.
MLTA	R/S	ENTER MLTA 3. 0.2
Number of logs	R/S	ENTER NO. LOGS 5. LOGS
Read Sides B and C	R/S	ENTER B, C 1. 344. BDFT 2. 209. BDFT 3. 350. BDFT 4. 190. BDFT 5. 282. BDFT
Read Side D	R/S	ENTER D TOTAL 5. LOGS 1375. BDFT
Read log data	B R/S	MORE LOGS? B=YES C=NO ENTER LOGS

SAMPLE RUN (Continued)

ENTER	PRESS	OUTPUT
		ENTER A ENTER NO. LOGS
Read Side A	R/S	
Number of logs	R/S	2. LOGS
		ENTER B, C
Read Sides B and C	R/S	
		1. 120. BDFT
		2. 344. BDFT
		ENTER D
Read Side D	R/S	
		TOTAL 7. LOGS 1839. BDFT
		MORE LOGS? B=YES C=NO
	C	ENTER TALLY
Tally	R/S	1542. -16.15008157 %OR

SAMPLE RUN

ENTER	PRESS	OUTPUT
	D	ENTER MILL TYPE
	A	0.
Mill Type	R/S	
		ENTER MLTA
MLTA	R/S	3.
		0.2
		ENTER NO. LOGS
Number of logs	R/S	5. LOGS
		ENTER B, C
Read Sides B and C	R/S	
		ENTER D
Read Side D	R/S	
		TOTAL
		5. LOGS
		1370. BDFT
		MORE LOGS?
		B=YES
		C=NO
	B	ENTER LOGS
Read log Data	R/S	
		ENTER A
Read Side A	R/S	ENTER NO. LOGS
Number of logs	R/S	2. LOGS
		ENTER B, C
Read Sides B and C	R/S	ENTER D
Read Side D	R/S	
		TOTAL
		7. LOGS
		1830. BDFT
		MORE LOGS?
		B=YES
		C=NO
	C	ENTER TALLY
Tally	R/S	1542.
		-15.73770492 %DR

SAMPLE RUN

ENTER	PRESS	OUTPUT
Mill Type	A R/S	ENTER MILL TYPE 0.
MLTA	R/S	ENTER MLTA 3. 0.2
Number of logs	R/S	ENTER NO. LOGS 5. LOGS
Read Sides B and C	R/S	ENTER B, C 1. 340. BDFT 2. 210. BDFT 3. 350. BDFT 4. 190. BDFT 5. 280. BDFT
Read Side D	R/S	ENTER D TOTAL 5. LOGS 1370. BDFT
Read log Data	B R/S	MORE LOGS? B=YES C=NO ENTER LOGS

SAMPLE RUN (Continued)

ENTER	PRESS	OUTPUT
		ENTER A ENTER NO. LOGS
Read Side A	R/S	
Number of logs	R/S	2. LOGS
		ENTER B, C
Read Sides B and C	R/S	
		1. 120. BDFT
		2. 340. BDFT
		ENTER D
Read Side D	R/S	
		TOTAL
		7. LOGS 1830. BDFT
		MORE LOGS? B=YES C=NO
	C	ENTER TALLY
Tally	R/S	1542. -15.73770492 %DR

SAMPLE RUN

ENTER	PRESS	OUTPUT
	D	
	A	ENTER MILL TYPE
Mill Type	R/S	0.
		ENTER MLTA
MLTA	R/S	3.
		0.2
		ENTER NO. LOGS
Number of logs	R/S	5. LOGS
		ENTER B, C
Read Sides B and C	R/S	
		ENTER D
Read Side D	R/S	
		TOTAL
		5. LOGS
		1320. BDFT
		MORE LOGS?
		B=YES
		C=NO
	B	ENTER LOGS
Read log Data	R/S	
		ENTER A
Read Side A	R/S	ENTER NO. LOGS
Number of logs	R/S	2. LOGS
		ENTER B, C
Read Sides B and C	R/S	ENTER D
Read Side D	R/S	
		TOTAL
		7. LOGS
		1780. BDFT
		MORE LOGS?
		B=YES
		C=NO
	C	ENTER TALLY
Tally	R/S	1542.
		-13.37078652 %OR

SAMPLE RUN

ENTER	PRESS	OUTPUT
Mill Type	A R/S	ENTER MILL TYPE 0.
MLTA	R/S	ENTER MLTA 3. 0.2
Number of logs	R/S	ENTER NO. LOGS 5. LOGS
Read Sides B and C	R/S	ENTER B, C 1. 340. BDFT 2. 210. BDFT 3. 300. BDFT 4. 190. BDFT 5. 280. BDFT
Read Side D	R/S	ENTER D TOTAL 5. LOGS 1320. BDFT MORE LOGS? B=YES C=NO ENTER LOGS
Read log Data	B R/S	

SAMPLE RUN (Continued)

ENTER	PRESS	OUTPUT
		ENTER A ENTER NO. LOGS
Read Side A	R/S	
Number of logs	R/S	2. LOGS
		ENTER B, C
Read Sides B and C	R/S	
		1. 120. BDFT
		2. 340. BDFT
		ENTER D
Read Side D	R/S	
		TOTAL
		7. LOGS 1780. BDFT
		MORE LOGS? B=YES C=NO
	C	ENTER TALLY
Tally	R/S	1542.
		-13.37078652 %OR