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LOGCALC:

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

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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.

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^{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:

Accession For	
NRIS GRAAI	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	<i>[Handwritten signature]</i>
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A	



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

^{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

^{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 incorporated 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 \div 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/}

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

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:

$$\text{Board Feet} = \text{Length} \times \text{Factor}$$

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)

<u>Diameter (In.)</u>	<u>Factors for Lengths 1' to 15'</u>	<u>Factors for Lengths 16' to 31'</u>	<u>Factors for Lengths 32' to 40'</u>	<u>Diameter (In.)</u>	<u>Factors for Lengths 1' to 40'</u>
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

<u>/1/</u> Log Processing <u>/2/</u>				
S end	L end	Length	Edit	Edit

Section 1 -- Program Description and Misc. Information
(page 15)

Section 2 -- Program Instructions
(pages 16-17)

Section 3 -- Program Listing
(pages 18-21)

Section 4 -- Sample Run
(pages 22-24)

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 Key in program from listing Exit learn mode		LRN LRN	(000 00) (478 00) (0)
	B. Read card Insert side one of program card Clear display register Insert side two of program card Clear display register		CLR CLR	(1.) (0) (2.) (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) Enter Minimum Small End Diameter (Min SED) Enter Maximum Large End Diameter (Max LED) Enter Minimum Large End Diameter (Min LED) Enter Length	xx.x xx.x xx.x xx.x xx.x	A A B B C	xx.x 'SDIB' (xx.x) xx.x 'SDIB' (xx.) xx.x 'LDIB' (xx.x) xx.x 'LDIB' (xx.x) xx.x 'LEN' x 'LOGS' (0)
	<i>NOTE: Editing of the data can be done if any error is found while entering the log data See step 8.</i>			
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 (xxxxxxx.) 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. <i>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.</i>			
8A	Reenter diameters <u>before</u> length is entered (and log processed) Continue Reenter log data as in step 5 Go to step 6		D	'REENTER LOG' (0)
8B	Reenter diameters and length <u>after</u> length is entered (and log processed) Continue Reenter log data as in step 5 Go to step 6		E	'REENTER LOG' (0)
**	OPTIONAL - Record data on magnetic card Indicate data bank 3 to be written Insert first side of blank card Indicate data bank 4 to be written Insert second side of blank card Label magnetic card (sides 3 and 4 for bank numbers)	3 4	WRITE WRITE	 (3.) (4.)
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*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
000	76	LBL									
001	16	R*		046	03	3		091	00	0	
002	47	CMS		047	00	0		092	95	=	
003	02	2		048	00	0		093	42	STU	
004	07	7		049	03	3		094	05	05	
005	03	3		050	03	3		095	98	ADV	
006	02	2		051	03	3		096	03	3	
007	02	2		052	05	5		097	06	6	
008	02	2		053	03	3		098	03	3	
009	03	3		054	02	2		099	00	0	
010	06	6		055	69	DP		100	01	1	
011	42	STU		056	02	02		101	03	3	
012	09	09		057	01	1		102	02	2	
013	03	3		058	05	5		103	07	7	
014	06	6		059	01	1		104	02	2	
015	01	1		060	07	7		105	07	7	
016	06	6		061	03	3		106	69	DP	
017	02	2		062	06	6		107	01	01	
018	04	4		063	03	3		108	02	2	
019	01	1		064	06	6		109	00	0	
020	04	4		065	02	2		110	00	0	
021	42	STU		066	04	4		111	00	0	
022	07	07		067	69	DP		112	01	1	
023	02	2		068	03	03		113	03	3	
024	07	7		069	03	3		114	00	0	
025	01	1		070	01	1		115	00	0	
026	06	6		071	02	2		116	69	DP	
027	02	2		072	02	2		117	02	02	
028	04	4		073	00	0		118	02	2	
029	01	1		074	00	0		119	07	7	
030	04	4		075	00	0		120	01	1	
031	42	STU		076	00	0		121	03	3	
032	08	08		077	00	0		122	03	3	
033	06	6		078	00	0		123	05	5	
034	00	0		079	69	DP		124	02	2	
035	32	XIT		080	04	04		125	02	2	
036	98	ADV		081	69	DP		126	69	DP	
037	01	1		082	05	05		127	03	03	
038	06	6		083	98	ADV		128	01	1	
039	01	1		084	25	CLR		129	07	7	
040	03	3		085	91	R/S		130	00	0	
041	03	3		086	42	STU		131	00	0	
042	07	7		087	06	06		132	02	2	
043	69	DP		088	94	+/-		133	00	0	
044	01	01		089	85	+		134	00	0	
045	01	1		090	06	6		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*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
136	01	1		181	07	7		226	07	7	
137	04	4		182	01	1		227	03	3	
138	69	DP		183	07	7		228	02	2	
139	04	04		184	69	DP		229	02	2	
140	69	DP		185	04	04		230	02	2	
141	05	05		186	69	DP		231	69	DP	
142	02	2		187	05	05		232	03	03	
143	07	7		188	25	CLR		233	69	DP	
144	01	1		189	98	ADV		234	05	05	
145	07	7		190	98	ADV		235	69	DP	
146	03	3		191	61	GTO		236	00	00	
147	01	1		192	02	02	2	237	25	CLR	
148	02	2		193	80	80		238	61	GTO	
149	02	2		194	76	LBL		239	02	02	2
150	03	3		195	14	D		240	80	80	
151	07	7		196	22	INV		241	76	LBL	
152	69	DP		197	86	STF	St flg	242	15	E	
153	01	01		198	01	01	1	243	01	1	
154	02	2		199	22	INV		244	22	INV	
155	03	3		200	86	STF	St flg	245	44	SUM	
156	00	0		201	02	02	2	246	05	05	
157	00	0		202	98	ADV		247	03	3	
158	02	2		203	69	DP		248	05	5	
159	00	0		204	00	00		249	69	DP	
160	00	0		205	03	3		250	01	01	
161	00	0		206	05	5		251	01	1	
162	01	1		207	69	DP		252	07	7	
163	05	5		208	01	01		253	01	1	
164	69	DP		209	01	1		254	07	7	
165	02	02		210	07	7		255	03	3	
166	01	1		211	01	1		256	01	1	
167	07	7		212	07	7		257	03	3	
168	01	1		213	03	3		258	07	7	
169	06	6		214	01	1		259	01	1	
170	02	2		215	03	3		260	07	7	
171	04	4		216	07	7		261	69	DP	
172	03	3		217	01	1		262	02	02	
173	07	7		218	07	7		263	03	3	
174	69	DP		219	69	DP		264	05	5	
175	03	03		220	02	02		265	00	0	
176	02	2		221	03	3		266	00	0	
177	00	0		222	05	5		267	02	2	
178	01	1		223	00	0		268	07	7	
179	06	6		224	00	0		269	03	3	
180	05	5		225	02	2		270	02	2	

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

*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*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
406	65	X		451	02	2					
407	01	1		452	02	2					
408	00	0		453	69	DP					
409	95	=		454	01	01					
410	74	SM*	SUM Ind	455	01	1					
411	05	05		456	06	6					
412	22	INV		457	01	1					
413	58	FIX		458	03	3					
414	01	1		459	03	3					
415	44	SUM		460	07	7					
416	05	05		461	01	1					
417	43	RCL		462	03	3					
418	09	09		463	69	DP					
419	69	DP		464	02	02					
420	04	04		465	69	DP					
421	43	RCL		466	05	05					
422	05	05		467	25	CLR					
423	85	+		468	98	ADV					
424	43	RCL		469	43	RCL					
425	06	06		470	05	05					
426	75	-		471	75	-					
427	06	6		472	43	RCL					
428	00	0		473	06	06					
429	95	=		474	95	=					
430	69	DP		475	22	INV					
431	06	06		476	90	LST	List				
432	69	DP		477	92	RTN	INV SBR				
433	00	00									
434	43	RCL									
435	05	05									
436	77	GE	$x \geq t$								
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									

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

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 Min. Small End Diameter Max. Large End Diameter Min. Large End Diameter Length	A A B B C	23.2 18.9 24.7 23.5 11.2	SDIU SDIB LDIB LDIB LEN 4. LOGS
Max. Small End Diameter Min. Small End Diameter Max. Large End Diameter Min. Large End Diameter Length	E A A B B C	23.2 18.9 24.7 23.5 10.2	REENTER LOG SDIB SDIB LDIB LDIB LEN 4. LOGS
Max. Small End Diameter Min. Small End Diameter Max. Large End Diameter Min. Large End Diameter Length	A A B B C	23.2 23. 26.7 30. 12.3	SDIB SDIB LDIB LDIB LEN 5. LOGS
Store Data			LOG DATA 250313127. 55 220279102. 56 196206223. 57 211241102. 58 231284133. 59

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	
		198235101.	58
		250274128.	59
Store Data			

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

/1/		Log Volume		/2/	
Start	LRF	T	Only		

Section 1 -- Program Description and Misc. Information
(page 26)

Section 2 -- Program Instructions
(pages 27-28)

Section 3 -- Program Listing
(pages 29-32)

Section 4 -- Sample Run
(pages 33-35)

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
 : from Log Processing Program
 59
 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 Key in program from listing Exit learn mode		LRN LRN	(000 00) (475 00) (0)
	B. Read card Insert side 1 of program card Clear display register Insert side 2 of program card Clear display register		CLR CLR	(1.) (0) (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		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.xxxxxxxxxx xx.xxxxxxxxxx xx. xx.xxxxxxxxxx xx.

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

PROGRAM INSTRUCTIONS

STEPS/	PROCEDURE	ENTER	PRESS	DISPLAY*
2.	<p>Totals</p> <p>a. for odd and even mills: total number of logs total log overlength</p> <p>total log volume with overlength</p> <p>b. for random mills: total number of logs total log volume</p>			<p>xx. 'LOGS' 'TOT OVERLENGTH' xx.xxxxxxxxx 'FT' 'VOL W OVERLENGTH' xxx.xxxxxxxxx 'CUFT' (0) xx. 'LOGS' 'VOL' xxx.xxxxxxxxx 'CUFT' (0)</p>
9	<p>Process more log data (9A) or Calculate LRF for logs already processed (9B)</p>			
9A	<p>Process more log data Continue Enter data as in step 3 Go to step 7</p>		R/S	(0)
9B	<p>Calculate LRF Continue Enter tally The LRF is calculated using volume with overlength. <i>NOTE: Additional data can be entered after step 9B Go to step 9A</i></p>	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*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
000	07	7		046	85	+		091	22	INV	
001	69	DP		047	06	6		092	59	INT	
002	17	17		048	00	0		093	65	*	
003	43	RCL		049	95	=		094	01	1	
004	01	01		050	42	STD		095	00	0	
005	42	STD		051	01	01		096	00	0	
006	61	61		052	73	RC*	RCL IND	097	95	=	
007	43	RCL		053	01	01		098	58	FIX	
008	02	02		054	55	÷		099	01	01	1
009	42	STD		055	06	6		100	52	EE	
010	62	62		056	22	INV		101	22	INV	
011	93	.		057	28	LOG		102	52	EE	
012	00	0		058	95	=		103	22	INV	
013	00	0		059	42	STD		104	58	FIX	
014	02	2		060	04	04		105	42	STD	
015	07	7		061	59	INT		106	03	03	
016	02	2		062	55	÷		107	87	IFF	If flg
017	07	7		063	01	1		108	03	03	3
018	00	0		064	00	0		109	01	01	1
019	07	7		065	95	=		110	57	57	
020	06	6		066	42	STD		111	43	RCL	
021	09	9		067	05	05		112	03	03	
022	42	STD		068	43	RCL		113	55	÷	
023	63	63		069	04	04		114	43	RCL	
024	43	RCL		070	22	INV		115	61	61	
025	07	07		071	59	INT		116	95	=	
026	42	STD		072	65	*		117	59	INT	
027	64	64		073	03	3		118	65	*	
028	43	RCL		074	22	INV		119	43	RCL	
029	08	08		075	28	LOG		120	61	61	
030	42	STD		076	95	=		121	85	+	
031	65	65		077	59	INT		122	43	RCL	
032	25	CLR		078	55	÷		123	62	62	
033	42	STD		079	01	1		124	95	=	
034	66	66		080	00	0		125	32	X:T	
035	42	STD		081	95	=		126	43	RCL	
036	67	67		082	42	STD		127	03	03	
037	42	STD		083	04	04		128	77	GE	X ≥ t
038	68	68		084	73	RC*	RCL IND	129	01	01	1
039	98	ADV		085	01	01		130	41	41	
040	91	R/S		086	55	÷		131	32	X:T	
041	42	STD		087	03	3		132	75	-	
042	00	00		088	22	INV		133	43	RCL	
043	44	SUM		089	28	LOG		134	61	61	
044	66	66		090	95	=		135	95	=	
045	94	+/-									

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

Appendix III, Section 3

PROGRAM LISTING

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

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

Appendix III, Section 3

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
271	04	04		316	69	DP		361	00	0	
272	04	4		317	04	04		362	00	0	
273	02	2		318	25	CLR		363	04	4	
274	03	3		319	91	R/S		364	02	2	
275	02	2		320	42	STD		365	69	DP	
276	02	2		321	07	07		366	02	02	
277	07	7		322	55	+		367	03	3	
278	69	DP		323	43	RCL		368	02	2	
279	01	01		324	68	68		369	02	2	
280	69	DP		325	95	=		370	07	7	
281	05	05		326	69	DP		371	04	4	
282	43	RCL		327	06	06		372	01	1	
283	64	64		328	61	GTD		373	03	3	
284	69	DP		329	02	02	2	374	00	0	
285	04	04		330	90	90		375	01	1	
286	43	RCL		331	76	LBL		376	07	7	
287	68	68		332	11	A		377	69	DP	
288	69	DP		333	01	1		378	03	03	
289	06	06		334	05	5		379	98	ADV	
290	25	CLR		335	04	4		380	69	DP	
291	98	ADV		336	01	1		381	05	05	
292	91	R/S		337	02	2		382	25	CLR	
293	06	6		338	01	1		383	98	ADV	
294	69	DP		339	03	3		384	91	R/S	
295	17	17		340	07	7		385	42	STD	
296	25	CLR		341	42	STD		386	01	01	
297	91	R/S		342	07	07		387	99	PRT	
298	42	STD		343	01	1		388	32	XIT	
299	00	00		344	07	7		389	03	3	
300	07	7		345	03	3		390	22	INV	
301	69	DP		346	01	1		391	67	EQ	X = t
302	17	17		347	02	2		392	03	03	3
303	43	RCL		348	02	2		393	96	96	
304	00	00		349	03	3		394	86	STF	St flg
305	61	GTD		350	07	7		395	03	03	3
306	00	00	0	351	02	2		396	25	CLR	
307	43	43		352	03	3		397	91	R/S	
308	76	LBL		353	42	STD		398	99	PRT	
309	12	B		354	08	08		399	55	+	
310	02	2		355	02	2		400	01	1	
311	07	7		356	07	7		401	93	.	
312	03	3		357	03	3		402	02	2	
313	05	5		358	02	2		403	95	=	
314	02	2		359	02	2		404	54	INT	
315	01	1		360	02	2		405	55	+	

X = t
3
St flg
3

* 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	STD									
410	02	02									
411	99	PRT									
412	61	GTD									
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
Mill Type MLTA	C A R/S R/S	LOG VOLUME 2. 3. 0.2
Number of logs	R/S	5. LOGS TOT OVERLENGTH 0.7 FT VOL W OVERLENGTH 208.9448033 CUFT
Read log data Number of logs	R/S R/S	7. LOGS TOT OVERLENGTH 3.2 FT VOL W OVERLENGTH 282.4384403 CUFT
Tally	B R/S	5.459596782 LRF

SAMPLE RUN (continued)

ENTER	PRESS	OUTPUT
Tally	B R/S	1.9
		25.47055463
		6.
		0.6
		48.02308244
		7.
		7. LOGS
		TOT OVERLENGTH 3.2 FT
		VOL W OVERLENGTH 282.4384403 CUFY
		5.459596782 LRF

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

<u>1/</u>		Doyle		<u>2/</u>	
Start	More Logs	Short			

Section 1 -- Program Description and Misc. Information
(page 37)

Section 2 -- Program Instructions
(pages 38-39)

Section 3 -- Program Listing
(pages 40-43)

Section 4 -- Sample Run
(pages 44-46)

Appendix IV, Section 1

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
: Packed log data
59 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

Appendix IV, Section 2

PROGRAM INSTRUCTIONS

STEPS/	PROCEDURE	ENTER	PRESS	DISPLAY*
1	Clear program memory, and display register		CP, CLR	(0)
2	Enter program using method A <u>or</u> 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.

Appendix IV, Section 2

PROGRAM INSTRUCTIONS

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

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

PROGRAM LISTING

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

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

Appendix IV, Section 3

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
136	02	2		181	22	INV		226	44	SUM	
137	01	1		182	58	FIX		227	61	61	
138	03	3		183	87	IFF	If flg	228	42	STD	
139	07	7		184	02	02	2	229	07	07	
140	42	STD		185	18	C*		230	87	IFF	If flg
141	65	65		186	59	INT		231	01	01	1
142	76	LBL		187	15	E		232	10	E*	
143	43	RCL		188	76	LBL		233	43	RCL	
144	69	DP		189	18	C*		234	64	64	
145	23	23		190	55	+		235	69	DP	
146	73	RC*	RCL Ind	191	02	2		236	04	04	
147	02	02		192	95	=		237	43	RCL	
148	55	+		193	59	INT		238	03	03	
149	07	7		194	65	x		239	69	DP	
150	22	INV		195	02	2		240	06	06	
151	28	LOG		196	95	=		241	43	RCL	
152	85	+		197	76	LBL		242	65	65	
153	93	.		198	15	E		243	69	DP	
154	04	4		199	42	STD		244	04	04	
155	95	=		200	00	00		245	43	RCL	
156	59	INT		201	43	RCL		246	07	07	
157	42	STD		202	01	01		247	69	DP	
158	01	01		203	85	+		248	06	06	
159	73	RC*	RCL Ind	204	93	.		249	98	ADV	
160	02	02		205	04	4		250	76	LBL	
161	55	+		206	95	=		251	10	E*	
162	03	3		207	59	INT		252	69	DP	
163	22	INV		208	75	-		253	22	22	
164	28	LOG		209	04	4		254	43	RCL	
165	95	=		210	95	=		255	02	02	
166	22	INV		211	33	X ²		256	32	XIT	
167	59	INT		212	65	x		257	06	6	
168	65	x		213	43	RCL		258	00	0	
169	01	1		214	00	00		259	22	INV	
170	00	0		215	55	+		260	67	EQ	X = t
171	00	0		216	01	1		261	43	RCL	
172	75	-		217	06	6		262	43	RCL	
173	43	RCL		218	95	=		263	64	64	
174	66	66		219	58	FIX		264	69	DP	
175	95	=		220	00	00	0	265	04	04	
176	58	FIX		221	52	EE		266	43	RCL	
177	01	01	1	222	22	INV		267	63	63	
178	52	EE		223	52	EE		268	69	DP	
179	22	INV		224	22	INV		269	06	06	
180	52	EE		225	58	FIX		270	69	DP	

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

Appendix IV, Section 3

PROGRAM LISTING

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

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

Appendix IV, Section 3

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	X									
417	01	1									
418	00	0									
419	45	YX									
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
Mill Type	C A 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.
Read Log Data Number of logs	B R/S R/S	MORE LOGS? ENTER LOGS ENTER NO. LOGS 2. 7. LOGS TOTAL BDFT 1750.
Tally	R/S R/S	MORE LOGS? ENTER TALLY 1542. -11.88571429 XOR

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 181. BDFT 5. LOGS 271. BDFT 5. LOGS TOTAL BDFT 1306. MORE LOGS?

SAMPLE RUN (Continued)

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

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

International 1/4"				
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)

Appendix V, Section 1

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
: from Log Processing Program
59
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.

Appendix V, Section 2

PROGRAM INSTRUCTIONS

STEPS/	PROCEDURE	ENTER	PRESS	DISPLAY*
8	Process more log data (8A) <u>or</u> 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 <i>NOTE: Additional data can be entered after step 8B Go to step 8A</i>	tally	B	tally % overrun '%' (479.59)

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

Appendix V, Section 3

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
000	69	OP		046	01	01		091	52	EE	
001	17	17		047	87	IFF	If flg	092	22	INV	
002	43	RCL		048	03	03	3	093	58	FIX	
003	02	02		049	00	00	0	094	55	+	
004	22	INV		050	52	52		095	43	RCL	
005	67	EQ	X = t	051	98	ADV		096	66	66	
006	00	00	0	052	86	STF	St flg	097	95	=	
007	34	34		053	01	01	1	098	59	INT	
008	43	RCL		054	22	INV		099	65	*	
009	00	00		055	86	STF	St flg	100	43	RCL	
010	42	STO		056	02	02	2	101	66	66	
011	66	66		057	73	RC*	RCL IND	102	95	=	
012	43	RCL		058	01	01		103	42	STO	
013	01	01		059	55	÷		104	02	02	
014	42	STO		060	07	7		105	02	2	
015	69	69		061	22	INV		106	01	1	
016	43	RCL		062	28	LOG		107	32	X?T	
017	03	03		063	85	+		108	43	RCL	
018	42	STO		064	93	.		109	02	02	
019	64	64		065	04	4		110	22	INV	
020	43	RCL		066	95	=		111	77	GE	X ≥ t
021	04	04		067	59	INT		112	01	01	1
022	42	STO		068	42	STO		113	82	82	
023	65	65		069	03	03		114	22	INV	
024	43	RCL		070	73	RC*	RCL IND	115	86	STF	St flg
025	06	06		071	01	01		116	01	01	1
026	42	STO		072	55	÷		117	73	RC*	RCL IND
027	67	67		073	03	3		118	01	01	
028	00	0		074	22	INV		119	55	÷	
029	42	STO		075	28	LOG		120	06	6	
030	63	63		076	95	=		121	22	INV	
031	42	STO		077	22	INV		122	28	LOG	
032	60	60		078	59	INT		123	95	=	
033	91	R/S		079	65	*		124	22	INV	
034	69	OP		080	01	1		125	59	INT	
035	06	06		081	00	0		126	65	*	
036	44	SUM		082	00	0		127	01	1	
037	60	60		083	75	-		128	00	0	
038	42	STO		084	43	RCL		129	00	0	
039	06	06		085	69	69		130	85	+	
040	94	+/-		086	95	=		131	93	.	
041	85	+		087	58	FIX		132	04	4	
042	06	6		088	01	01	1	133	95	=	
043	00	0		089	52	EE		134	59	INT	
044	95	=		090	22	INV		135	75	-	
045	42	STO									

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

*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*
271	05	5		316	21	21		361	17	17	
272	95	=		317	06	6		362	06	6	
273	44	SUM		318	00	0		363	01	1	
274	63	63		319	32	XIT		364	69	DP	
275	42	STO		320	43	RCL		365	04	04	
276	04	04		321	01	01		366	32	XIT	
277	87	IFF	If flg	322	22	INV		367	75	-	
278	03	03	3	323	67	EQ	X = t	368	43	RCL	
279	02	02	2	324	00	00	0	369	63	63	
280	94	94		325	47	47		370	95	=	
281	69	DP		326	98	ADV		371	55	-	
282	00	00		327	43	RCL		372	43	RCL	
283	43	RCL		328	63	63		373	63	63	
284	08	08		329	69	DP		374	65	*	
285	99	PRT		330	06	06		375	01	1	
286	43	RCL		331	43	RCL		376	00	0	
287	67	67		332	09	09		377	00	0	
288	69	DP		333	69	DP		378	95	=	
289	04	04		334	04	04		379	69	DP	
290	43	RCL		335	43	RCL		380	06	06	
291	04	04		336	60	60		381	61	GTO	
292	69	DP		337	69	DP		382	03	03	3
293	06	06		338	06	06		383	39	39	
294	87	IFF	If flg	339	98	ADV		384	76	LBL	
295	01	01	1	340	98	ADV		385	11	A	
296	03	03	3	341	06	6		386	99	PRT	
297	15	15		342	69	DP		387	75	-	
298	87	IFF	If flg	343	17	17		388	01	1	
299	02	02	2	344	91	R/S		389	95	=	
300	03	03	3	345	42	STO		390	94	+/-	
301	15	15		346	02	02		391	85	+	
302	86	STF	St flg	347	43	RCL		392	01	1	
303	02	02	2	348	09	09		393	95	=	
304	43	RCL		349	69	DP		394	42	STO	
305	61	61		350	04	04		395	00	00	
306	42	STO		351	07	7		396	38	ADV	
307	02	02		352	61	GTO		397	03	3	
308	43	RCL		353	00	00	0	398	00	0	
309	62	62		354	00	00		399	02	2	
310	42	STO		355	76	LBL		400	07	7	
311	03	03		356	12	B		401	03	3	
312	61	GTO		357	99	PRT		402	07	7	
313	01	01	1	358	32	XIT		403	01	1	
314	95	95		359	07	7		404	03	3	
315	69	DP		360	69	DP		405	63	DP	

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

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

SAMPLE RUN

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

/D/ (1)		Scribner - 1		/A/ (2)	
Start	Yes	No	Short		

/B/ (1)		Scribner - 2		/C/ (2)	
Scribner version name					

- 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

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
 : from Log Processing Program
 59
 60
 :
 : - Factors for computing Scribner Scale
 96
 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 <u>or</u> B A. Key in <i>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)</i> 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 log scale			xxx xxx 'BDFT' 'ENTER D' (0)
11	Tabulate totals Insert side D of program card Clear display register Continue		CLR R/S	(1.) (0) '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 Enter log data as in step 3 Continue Insert side A of program card Clear display register Continue Go to step 7		B R/S CLR R/S	'ENTER LOGS' (0) 'ENTER A' (0) (2.) (0) 'ENTER NO. LOGS' (0)
12B	Calculate percent overrun Continue Enter tally <i>NOTE: Additional data can be entered after step 12B Go to step 12A</i>	tally	C R/S	'ENTER TALLY' tally % overrun 'OR' (% overrun)

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

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

PROGRAM INSTRUCTIONS

STEPS/	PROCEDURE	ENTER	PRESS	DISPLAY*
1	<u>Segment 1 - Side A</u>			
A	Clear program memory and display register		CP, CLR	0
B	Set program pointer	250	GTO	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	<u>Segment 2 - Sides B and C</u>			
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 17	OP	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 17	OP	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 Insert first side of blank card Indicate program bank 2 to be written Insert second side of blank card	1 2	WRITE WRITE	1. 2.																																				
L	Label bank 1 of card - "B"																																							
M	Label bank 2 of card - "C"																																							
3	<u>Segment 3 - Side D</u>																																							
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 Insert first side of blank card	1	WRITE	1.																																				
G	Label bank 1 of card - "D"																																							
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Z/D/</td> <td colspan="4" style="text-align: center;">Scribner - 1</td> <td style="text-align: center;">Z/A/</td> </tr> <tr> <td style="text-align: center;">(1)</td> <td colspan="4"></td> <td style="text-align: center;">(2)</td> </tr> <tr> <td style="text-align: center;">Start</td> <td style="text-align: center;">Yes</td> <td style="text-align: center;">No</td> <td style="text-align: center;">Short</td> <td colspan="2"></td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Z/B/</td> <td colspan="4" style="text-align: center;">Scribner - 2</td> <td style="text-align: center;">Z/C/</td> </tr> <tr> <td style="text-align: center;">(1)</td> <td colspan="4"></td> <td style="text-align: center;">(2)</td> </tr> <tr> <td colspan="6" style="text-align: center;">Scribner version name</td> </tr> </table>	Z/D/	Scribner - 1				Z/A/	(1)					(2)	Start	Yes	No	Short			Z/B/	Scribner - 2				Z/C/	(1)					(2)	Scribner version name								
Z/D/	Scribner - 1				Z/A/																																			
(1)					(2)																																			
Start	Yes	No	Short																																					
Z/B/	Scribner - 2				Z/C/																																			
(1)					(2)																																			
Scribner version name																																								

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

PROGRAM LISTING

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

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

Appendix VI, Section 3a

PROGRAM LISTING

STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*	STEP NO.	KEY CODE	KEY SYMBOL	PRESS*
376	69	DP		421	42	STD					
377	03	03		422	04	04					
378	69	DP		423	02	2					
379	04	04		424	07	7					
380	69	DP		425	03	3					
381	05	05		426	02	2					
382	68	NOP		427	02	2					
383	68	NOP		428	02	2					
384	68	NOP		429	03	3					
385	68	NOP		430	06	6					
386	68	NOP		431	42	STD					
387	68	NOP		432	05	05					
388	68	NOP		433	01	1					
389	68	NOP		434	07	7					
390	68	NOP		435	03	3					
391	68	NOP		436	01	1					
392	68	NOP		437	03	3					
393	91	R/S		438	07	7					
394	98	ADV		439	01	1					
395	01	1		440	07	7					
396	00	0		441	03	3					
397	61	GTD		442	05	5					
398	00	00	0	443	42	STD					
399	00	00		444	06	06					
400	76	LBL		445	92	RTN	INV SBR				
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									

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

Appendix VI, Section 3bi

PROGRAM LISTING

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

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

Appendix VI, Section 3bi

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

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

Appendix VI, Section 3bii

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	$X \geq t$								
137	00	00	0								
138	69	69									
139	75	-									
140	06	6									
141	95	=									
142	77	GE	$X \geq t$								
143	00	00	0								
144	69	69									
145	02	2									
146	05	5									
147	85	+									
148	61	GTD									
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.

Appendix VI, Section 3biii

PROGRAM LISTING

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

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

Appendix VI, Section 3biii

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	$X \geq t$								
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									

*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

Appendix VI, Section 3d

PROGRAM LISTING

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

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

Appendix VI, Section 3d

PROGRAM LISTING

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

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

SAMPLE RUN

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

SAMPLE RUN

ENTER	PRESS	OUTPUT
Mill Type	D 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
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
Read Side A Number of logs	R/S R/S	ENTER A ENTER NO. LOGS 2. LOGS
Read Sides B and C Read Side D	R/S R/S	ENTER B, C ENTER D
		TOTAL 7. LOGS 1830. BDFT
Tally	C R/S	MORE LOGS? B=YES C=NO ENTER TALLY 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
Read Side A Number of logs	R/S R/S	ENTER A ENTER NO. LOGS 2. LOGS
Read Sides B and C	R/S	ENTER B, C 1. 120. BDFT 2. 340. BDFT
Read Side D	R/S	ENTER D TOTAL 7. LOGS 1830. BDFT
Tally	C R/S	MORE LOGS? B=YES C=NO ENTER TALLY 1542. -15.73770492 NOR

SAMPLE RUN

ENTER	PRESS	OUTPUT
Mill Type	D 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
Read Side D	R/S	ENTER D
		TOTAL 5. LOGS 1320. BDFT
Read log Data	B R/S	MORE LOGS? B=YES C=NO ENTER LOGS
Read Side A Number of logs	R/S R/S	ENTER A ENTER NO. LOGS 2. LOGS
Read Sides B and C Read Side D	R/S R/S	ENTER B, C ENTER D
		TOTAL 7. LOGS 1780. BDFT
Tally	C R/S	MORE LOGS? B=YES C=NO ENTER TALLY 1542. -13.37078652 %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. 300. BDFT 4. 190. BDFT 5. 280. BDFT
Read Side D	R/S	ENTER D TOTAL 5. LOGS 1320. BDFT
Read log Data	B R/S	MORE LOGS? B=YES C=NO ENTER LOGS

SAMPLE RUN (Continued)

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