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GR-1ST User's Guide

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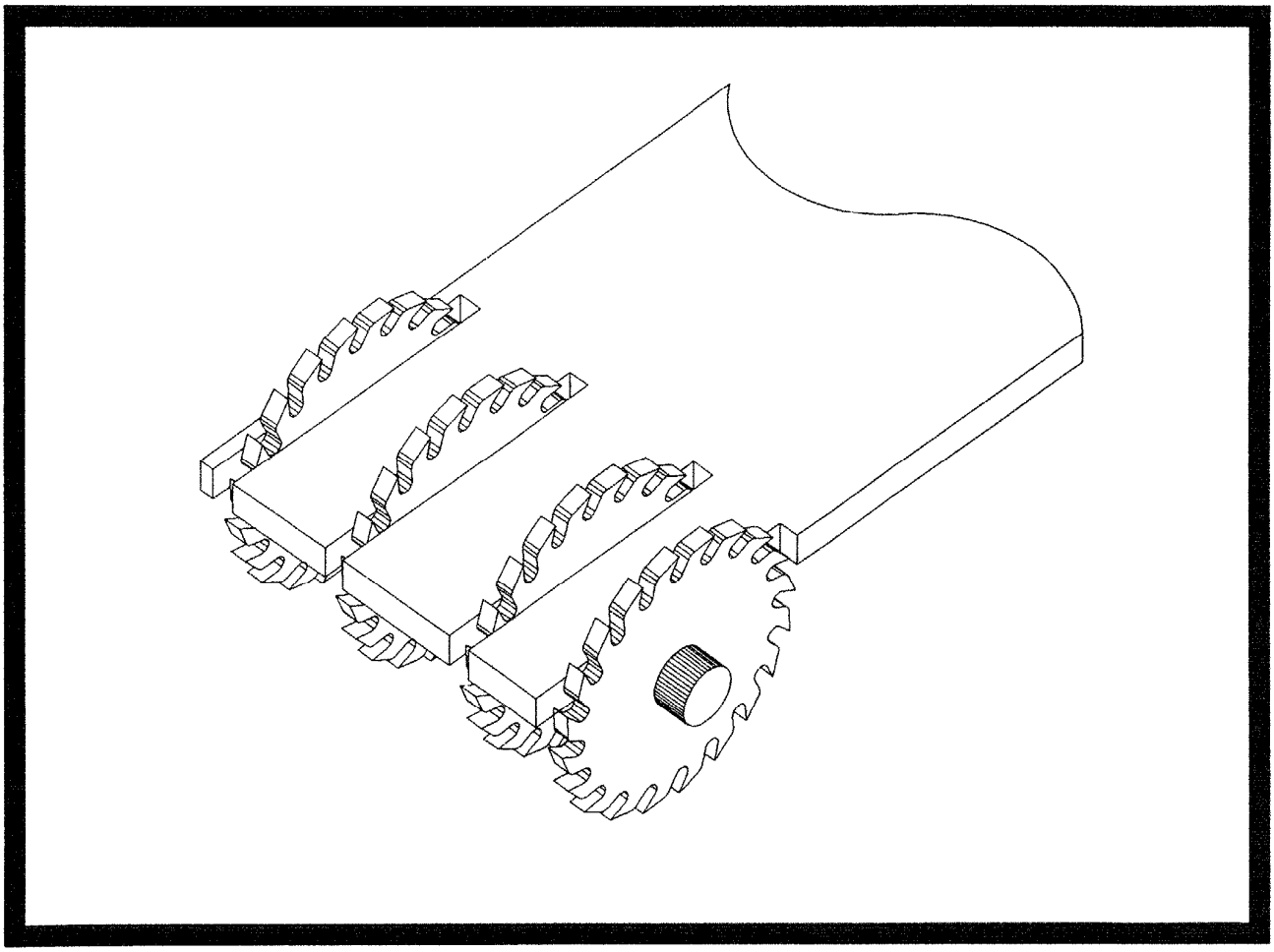

Abstract

A procedural guide for using the GR-1ST microcomputer system to evaluate different gang-rip-first procedures for processing boards into solid-wood parts. Step-by-step instructions are provided to set up the processing procedure to be evaluated. This procedure is then used to simulate the processing of digitized boards provided by a board-defect data file. The output from the simulated cut-up procedure consists of: (1) parts yield information for individual boards; (2) printer plots of each board, its defects, and the resulting parts; (3) summary tables of surface-area yields and number of parts by part sizes; (4) a data file that can be used to obtain plots of the boards, defects, and parts on a pen plotter; and (5) a data file that can be used with any statistical package to obtain additional information on the parts produced from a group of boards.

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GR-1ST User's Guide

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Introduction

GR-1ST (Gang-Rip-First)[1] is a microcomputer system for evaluating the use of various gang-rip-first procedures that might be used to process boards into parts (cuttings) needed in the manufacture of products requiring solid-wood components. The system features a question-and-answer session at the beginning of each computer run to help the user select the options necessary to set up the gang-rip-first procedure to be evaluated. This procedure is then used to simulate the optimum sawing of digitized boards into desired part sizes. The results for the gang-rip-first procedure being evaluated are provided as both printed outputs and data file outputs. A detailed discussion of the run options and the printed outputs is presented in Forest Service General Technical Report NE-150 "GR-1ST: PC Program for Evaluating Gang-Rip-First Board Cut-Up Procedures" (Hoff et al. 1991). Users should read this report before using the GR-1ST system. A detailed discussion of the data file outputs and their uses is presented in this user's manual.

Use of the GR-1ST system requires a microcomputer, the GR-1ST system diskette, and a board-defect data file. The microcomputer must be IBM compatible with (1) an 80286 or 80386 microprocessor; (2) a math coprocessor; (3) MS-DOS operating system, Version 3.3 or later; (4) a 5.25-inch floppy disk drive with 1.2 megabyte storage capacity or a 3.5-inch disk drive with 1.44 megabyte storage capacity; and (5) an attached printer with graphics capabilities. The GR-1ST system diskette (specify 5.25 or 3.5 inches) can be obtained from one of the authors by writing: USDA Forest Service, Forestry Sciences Laboratory, Route 2, Box 562-B, Princeton, WV 24740; Phone: (304) 425-8106; FAX (304) 425-1476.

The GR-1ST system diskette contains four files: (1) a batch file for running the GR-1ST program (RUNGR.BAT); (2) the compiled and linked GR-1ST program (GR1ST.EXE); (3) a compiled and linked program for modifying board-defect data files (DATAMOD.EXE); and (4) a sample board-defect data file for 10 boards (SAMPLEDF.DAT). The system can be run from a single disk drive or from a hard disk drive.

The following section provides information on the required board-defect data files. The second section provides instructions for setting up the GR-1ST system on the computer. The third section provides instructions for running the DATAMOD program to remove allowable defects from a board-defect data file. The fourth section provides instructions for running the GR-1ST program to simulate the board cut up for a given gang-rip-first procedure. The final section provides information on possible uses of the two output data files.

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[1]The computer program described in this publication is available on request with the understanding that the U.S. Department of Agriculture cannot assure its accuracy, completeness, reliability, or suitability for any other purpose than that reported. The recipient may not assert any proprietary rights thereto nor represent it to anyone as other than a Government-produced computer program.

Board-Defect Data File

The GR-1ST system requires a board-defect data file as input. Although the system comes with a sample file containing digitized defect data for 10 boards, users must obtain board-defect data files for the board grades they wish to process through the GR-1ST system. For each board, the board-defect data file must contain the board lumber grade, board identification number, number of defects, width of the board, and the X and Y coordinates of the lower left corner and upper right corner of a rectangle that encloses the entire board. It must also contain the X and Y coordinates of the lower left corners and upper right corners of rectangles used to box in all defects and voids found inside the rectangle that encloses the board. Instructions for generating a board-defect data file are in the Appendix.

A program (DATAMOD.EXE) is provided for modifying board-defect data files. This program can be used to produce a new board-defect data file by removing selected defects from an existing data file. This is done when certain types and/or sizes of defects are allowed in the parts to be produced from the boards being processed by the GR-1ST program. Defects that are removed are not considered during board processing.

It should be pointed out that although the program allows the removal of defects on one side of the boards, the GR-1ST processing of these boards into parts does not necessarily represent optimum solutions that one might expect when those defects are acceptable on one side of the parts. Realistically, the decision to remove the defect from consideration on a given side would have to be made on a part-by-part basis, not on a board basis. Therefore, it is recommended that the DATAMOD.EXE program be used only to remove defects from both sides of the boards, for example, when sound knots up to three-quarters of an inch might be acceptable for interior furniture parts.

The provisions for removing defects on a particular side of a group of boards have been included for research purposes. Used in conjunction with board plots, they allow specific defects to be removed from individual boards for detailed studies of different cut-up procedures on those boards.

Setting Up GR-1ST System

Some software packages require additional statements in the computer CONFIG.SYS file. These statements may cause problems when running the GR-1ST system. If you find this to be true on your computer, it will be necessary to use a basic CONFIG.SYS file without these additional statements to run this system.

The GR-1ST microcomputer system has been developed to run from a single disk drive or a hard disk drive. If a single disk drive is used, it must be a 5.25-inch (1.2 megabyte) floppy drive or a 3.5-inch (1.44 megabyte) drive.

rive

If the system is to be run from a single disk drive, copy RUNGR.BAT, GR1ST.EXE, and DATAMOD.EXE from the system diskette to a blank formatted diskette. Then copy SAMPLEDF.DAT to another blank formatted diskette. By always putting the board-defect data file on a different diskette than the one containing the GR-1ST

program, you will reduce the possibility of running out of disk storage space when processing large board-defect data files.

Hard Disk Drive

If the system is to be run from a hard disk drive, copy all four files from the system diskette to the hard drive. It is recommended that a separate GR-1ST directory be created to accommodate these files. Any user supplied board-defect data files must be placed in the same directory.

Running DATAMOD Program

It is necessary to use the DATAMOD program only when certain defects are to be removed from a board-defect data file before the boards are processed through the GR-1ST program. If the program is to be run from a diskette, insert the GR-1ST system diskette into the disk drive. If that drive is the "A" drive and the prompt shown on the screen is "A:", you are ready to run. If the screen prompt shows another drive as the current drive, you must type "A:" and hit the RETURN key to make the "A" drive the current drive. You also must have the board-defect data file on the system diskette or on a separate diskette. If the program is to be run from a hard disk drive, you must be in the hard disk directory containing both the DATAMOD.EXE program and the board-defect data file. The board-defect data file must have an eight character name plus a ".DAT" extension.

As soon as one of these conditions has been met, use the following procedure to run the program. When you are told to enter a response to a request for information, type in the response and then hit the RETURN or ENTER key.

Step 1. At the video screen prompt for the current drive or hard disk directory, enter DATAMOD.

Step 2. The video screen shows:
ARE YOU RUNNING FROM A HARD DISK? (Y/N) -->___

Enter Y for yes or N for no. If you enter Y, go to Step 4. If you enter N, go to Step 3.

Step 3. The video screen shows:
REMOVE PROGRAM DISKETTE AND INSERT DATA DISKETTE IN DESIGNATED DRIVE. THEN STRIKE ENTER OR RETURN KEY TO CONTINUE.

Follow the instructions shown on the screen.

Step 4. The video screen shows:
ENTER INPUT DATA FILE NAME (MUST BE 8 CHARACTERS)
XXXXXXXX

Under the X's enter the eight-character board-defect data file name to be used as input for the run. Although the data file must have the ".DAT" extension, do not type it in. The program adds the extension to the file name.

Step 5. The video screen shows:
ENTER OUTPUT DATA FILE NAME (MUST BE 8 CHARACTERS)
XXXXXXXX

Under the X's enter the eight-character board-defect data file name to be created as output for the run. Although the data file must have the ".DAT" extension, do not type it in. The program adds the extension to the file name.

Step 6. The video screen shows:
ENTER CODE FOR DEFECT TO BE REMOVED (I2) -->____

Enter a two-digit code number for the defect to be removed from the boards in the board-defect data file. If the code is "1", it must be entered as "01". These codes are the ones assigned to the different types of defects during the development of the board-defect data file as discussed in the Appendix.

Step 7. The video screen shows:
BOARD FACE(S) FROM WHICH DEFECT IS TO BE REMOVED:
ENTER: (1 = GRADING FACE; 2 = REVERSE FACE; 3 = BOTH FACES)
(I1) -->____

Enter the code representing the board face(s) from which the defect selected in Step 6 is to be removed.

Step 8. The video screen shows:
MAXIMUM WIDTH (IN 1/4 INCHES) OF DEFECTS TO BE REMOVED
-->____

Enter the maximum width in quarter inches for the selected defect (from Step 6) that is to be removed. This must be a two-digit number. A width of "2" would be entered as "02".

Step 9. The video screen shows:
MAXIMUM LENGTH (IN 1/4 INCHES) OF DEFECTS TO BE REMOVED
-->____

Enter the maximum length in quarter inches for the selected defect (from Step 6) that is to be removed. This must be a two-digit number. A length of "2" would be entered as "02".

Step 10. The video screen shows:
IS ANOTHER DEFECT TO BE REMOVED? (Y/N) -->____

Enter Y for yes or N for no. If you enter Y, the program will return to Step 6 and repeat Steps 6 through 9 for another defect. Each time Y is given as a response to this question, another type of defect can be removed from the board-defect data file. When N is given as a response, the program creates a new board-defect data file with the selected defects removed. The original board-defect file is left unchanged.

If the DATAMOD.EXE program is run from a diskette, the new board-defect data file will be written to the diskette containing the original data file. If the program is

run from hard disk, the new data file will be written to the same directory containing the original data file.

Running GR-1ST Program

If the GR-1ST program is to be run from a diskette, insert the GR-1ST system diskette into the disk drive and make sure the drive you are using is the current drive. If you are going to run from the "A" drive and the prompt shown on the screen is "A:", you are ready to run. If the screen prompt shows another drive as the current drive you must type "A:" and hit the RETURN key to make the "A" drive the current drive. Do not forget that you must also have the board-defect data file on the system diskette or on a separate diskette. The board-defect data file must have an eight character name plus a ".DAT" extension.

If the program is to be run from a hard disk drive, you must be in the hard disk directory containing the GR1ST.EXE program, the RUNGR.BAT batch file, and the board-defect data file. The board-defect data file must have an eight character name plus a ".DAT" extension.

As soon as one of these conditions has been met, use the following procedure to run the program. When you are told to enter a response to a request for information, type in the response and then hit the RETURN or ENTER key. When entering codes or values in response to the prompts on the screen, you must satisfy the format specification shown for the individual values. A format specification of "(I1)" indicates that a single-digit integer is requested. A format specification of "(I2)" indicates that a two-digit integer is requested. For this situation, if the response is the integer "5", you must enter "05". A format specification of "(F6.2)" indicates a real number with up to two digits to the right of the decimal point and up to three digits to the left of the decimal point. It is not necessary to enter leading or trailing "0's" so long as the decimal point is entered. For example, the number "12." is satisfactory so long as the decimal point also is entered.

General Technical Report NE-150 (Hoff et al. 1991) includes a detailed discussion of the options presented in the following procedure. The page numbers given refer the user to specific information provided in that report.

Step 1. At the screen prompt for the current drive or hard drive directory, enter RUNGR.

Step 2. The video screen shows:
ARE YOU RUNNING FROM A HARD DISK? (Y/N) -->____

Enter Y for yes or N for no. If you enter Y, go to Step 4. If you enter N, go to Step 3.

Step 3. The video screen shows:
REMOVE SYSTEM DISKETTE AND INSERT DATA DISKETTE IN DESIGNATED DRIVE. THEN STRIKE ENTER OR RETURN KEY TO CONTINUE.

Follow the instructions shown on the screen.

Step 4. The video screen shows:
ENTER INPUT DATA FILE NAME (MUST BE 8 CHARACTERS)
XXXXXXXX

Under the X's enter the eight-character board-defect data file name to be input for the GR-1ST run. Although the data file must have the ".DAT" extension, do not type it in. The program adds the extension to the file name.

Step 5. The video screen shows:
DO YOU WANT PARTS YIELD INFORMATION BY BOARD? (Y/N) -->____

If the printed output for the computer run is to show parts-yield information for each individual board, enter "Y" for this question (NE-150, pages 3 and 7).

Step 6. The video screen shows:
DO YOU WANT PLOTS OF THE PROCESSED BOARDS? (Y/N) -->____

If the printed output for the computer run is to show printer plots for each individual board, enter "Y" for this question. Depending on the speed of the printer, this can significantly increase the computer run time for a group of boards (NE-150, pages 3 and 8).

Step 7. The video screen shows:
DO YOU WANT SUMMARY TABLES FOR ALL PROCESSED BOARDS? (Y/N) -->____

If the printed output is to show summary tables of surface-area yields and numbers of parts for the group of boards, enter "Y" for this question (NE-150, pages 3 and 10 through 15).

Step 8. If the run options (filename.SET) have previously been set up for the board-defect data file being used for the computer run, go to Step 24. If the run options have not previously been set up, go to Step 9.

Step 9. The video screen will show:
CREATE NEW SETUP DATA FILE

NUMBER OF PIECES PER CLEAR PRIMARY SECTION (1, 2, OR 3)? (I1) -->____

Enter the number of clear pieces allowed per clear primary ripped section (NE-150, page 3).

Step 10. The video screen shows:
ENTER CODE FOR CUTTING LENGTH DETERMINATION
(SPECIFIED LENGTHS = 0; RANDOM LENGTHS = 1) (I1) -->____

If you enter "0" for specified lengths, go to Step 11. If you enter "1" for random lengths, go to Step 13 (NE-150, page 4).

Step 11. The video screen shows:
NUMBER OF PART LENGTHS TO BE USED (10 MAX.)? (I2) -->___

Enter the number of part lengths to be used from "1" to "10" (NE-150, page 4).

Step 12. The video screen shows:
ENTER PART LENGTH (F6.2) -->____

Enter the shortest of the lengths to be used. A decimal point must be included when entering this length. This step will be repeated until you have entered the number of lengths that were specified in Step 11. Make sure that the lengths are entered in ascending order from the shortest to the longest. Once you have entered all of the lengths, the program will jump to Step 15 (NE-150, page 4).

Step 13. The video screen shows:
ENTER MINIMUM PART LENGTH (F6.2) -->____

Enter the minimum allowable part length to be used when processing the boards into random-length parts. A decimal point must be included when entering this length (NE-150, page 4).

Step 14. The video screen shows:
ENTER MAXIMUM PART LENGTH (F6.2) -->____

Enter the maximum allowable part length to be used when processing the boards into random-length parts. A decimal point must be included when entering this length (NE-150, page 4).

Step 15. The video screen shows:
NUMBER OF PART WIDTHS TO BE USED (3 MAX.)? -->____

Enter a number from 1 to 3 to indicate the number of different part widths to be used when processing the boards. If the "equal spaced saws with a movable outer blade option" is to be used for this run, only one part width should be used (NE-150, page 4).

Step 16. The video screen shows:
ENTER PART WIDTH (F6.2) -->____

Enter the narrowest part width to be used in processing the boards. This step will be repeated for the number of part widths indicated in Step 15. You must include the decimal points when entering these widths. Also, make sure that you enter the widths from the narrowest to the widest (NE-150, page 4).

Step 17. The video screen shows:
MINIMUM WIDTH FOR SALVAGE PARTS? (F6.2) -->____

Enter the minimum width allowed when determining salvage parts that can be

produced from the boards. A decimal point must be included when entering this width (NE-150, page 4).

Step 18. The video screen shows:
BOARDS TO BE EDGED (BOTH EDGES) (Y/N)? (A1) -->____

If you enter "Y" for yes the board is to be edged, go to Step 19. If you answer "N" for no the boards are not to be edged, go to Step 20 (NE-150, page 4).

Step 19. The video screen shows:
DESIRED BOARD EDGING CUT IN 1/4 INCHES? (I1) -->____

Enter the width of material that is to be removed from both edges in quarter inches. If one-quarter of an inch is to be removed, enter "1" as an integer without a decimal point (NE-150, page 4).

Step 20. The video screen shows:
SELECT ARBOR TYPE
(0 = VARIABLE; 1 = FIXED; 2 = EQUAL SPACED WITH MOVABLE OUTER BLADE) (I1) -->____

If you enter "0" for variable arbor, go to Step 24. If you enter "1" for fixed arbor, go to Step 21. If you enter "2" for equally spaced saws with a movable outer blade, go to Step 22 (NE-150, page 5).

Step 21. The video screen shows:
STARTING AT THE RIGHT FENCE, ENTER THE SAW SPACINGS THAT ARE TO BE SET ON THE ARBOR. — (FOR EXAMPLE (2,2,3,3,1,1)
SPACING NO. 1
ENTER WIDTH NUMBER (I1) -->____

Enter the width number corresponding to the selected width entered in Step 16. For example, if you had input a width of 2.5 inches as the second part width, you would enter "2" here to use that width as the first spacing on the arbor. The program will then ask for width numbers for the other five spacings. Six spacings must be entered and they must correspond to the allowable part widths that you entered in Step 16. If you have entered only one part width, you will enter "1" for all six spacings here. When finished with this Step, go to Step 24 (NE-150, page 5).

Step 22. The video screen shows:
ENTER: 1 – IF LAST RIP TOWARD LEFT FENCE IS TO BE ADJUSTED
2 – IF LAST RIP TOWARD RIGHT FENCE IS TO BE ADJUSTED
ENTER CODE (I1) -->____

Enter the appropriate code to place the floating blade on the desired side of the boards as they are processed (NE-150, page 5).

Step 23. The video screen shows:
ENTER WIDTH LIMIT FOR ADJUSTMENT DECISION (IN.) (F5.2) -->____

The value to be entered here is used to determine whether or not the floating blade is to make a cut. If the width of the last gang-rip strip would be greater than the value entered, the floating blade will make a cut at the part width entered in Step 16 and the last strip will be less than the set part width. If the width of the gang-rip strip would be less than the width limit entered here, the floating blade will not make a rip cut and the width of the last gang-rip strip will be equal to the set width strip plus the leftover width. The decimal point must be included when entering this adjustment width (NE-150, page 5).

Step 24. The video screen shows:

```
NUMBER OF PIECES PER CLEAR PRIMARY SECTION (1, 2, OR 3) .. 1
PART LENGTH DETERMINATION (0 = SPECIFIED; 1 = RANDOM) ... 0
PART LENGTHS.. 15.00 21.00 35.00 40.00 55.00 .00 .00 .00 .00 .00
WIDTHS FOR PRIMARY PARTS (MAX. 3) ..... 2.00 2.50 3.00
MINIMUM WIDTH FOR SALVAGE PARTS ..... 1.00
BOARDS TO BE EDGED (BOTH EDGES) (Y/N) ..... Y
    EDGING TRIM IN 1/4 INCHES ..... 1
ARBOR TYPE: (0 = VARIABLE; 1 = FIXED; 2 = MOVABLE OUTER BLADE) . 0

SET UP DATA FILE TO BE USED FOR RUN:
(1 = USE EXISTING FILE; 2 = MODIFY EXISTING FILE; 3 = CREATE
NEW FILE) -->___
```

The options and their values shown on the screen for this step are those that have been set up for a previous run or that have been set up during this run.

If the code "1" is entered, the program proceeds to process the data boards using the options shown on the screen. However, before entering the code "1", make sure the printer is ready to print the output. At the completion of the run, go to Step 25.

If the code "2" is entered, the program will show the existing value(s) for the individual options and ask if they are to be changed. The steps for making these modifications to an existing setup file are the same as those for creating a new setup file. The only difference is that for Steps 9 through 23, the video screen shows the existing values for the options and asks if you want to change them. If you enter "Y" for yes, you are then prompted for the new value(s).

If the code "3" is entered, the program repeats Steps 9 through 24, allowing you to create an entirely new setup data file.

Step 25. The video screen shows:

```
********** LAST BOARD PROCESSED **********

INSERT DISK WITH BATCH FILE
AND PRESS ANY KEY WHEN READY
```

If you are running the system from a diskette, this message will appear on the screen when the GR-1ST program finishes processing a group of boards.

You must then remove the data diskette from the drive and insert the GR-1ST system diskette. This completes the run and returns the screen to the drive prompt.

If you are running from the hard drive, only the "LAST BOARD PROCESSED" line along with the hard disk prompt will be shown on the screen to indicate that the run is complete.

At the completion of the run, two data files are written to the data diskette if you are running from a disk drive or to the current directory if you are running from the hard drive. These files will have the same file name as the input board-defect data file. However, they will have extensions of ".SAS" and ".PLT". These output files are discussed in the section that follows.

Description of Output Data Files

In addition to the printed output, two output data files are provided by the GR-1ST program. These data files can be used to gain additional information about the gang-rip-first results and to obtain pen-plotter graphics of the boards, defects, and resulting processed parts.

Statistical Data File

This data file (filename.SAS) provides the lengths and widths of each board and the resulting parts. The parts also are identified as to whether they are primary or salvage parts. This file can be processed through computer statistical packages to provide additional information about the parts yields provided by the gang-rip-first procedure being evaluated. The following is an example of this data file:

```
B 169.00     5.50
P  55.00     2.50
.
.
.
S  55.00     2.00
.
.
.
```

The format for each line of this data file is (A1,2F7.2). The capital letter provided in column 1 of each line has an "A1" format and identifies the data in the line as belonging to a board (B), a primary part (P), or a salvage part (S). The next seven columns have a "F7.2" format and provide the length (inches) of the board or part. The last seven columns of the line also have a "F7.2" format and provide the width (inches) of the board or part. This information is repeated for each board processed during the computer run.

Plot Data File

Some users may want to plot the board outlines, their defects, and the parts cut from them on a pen plotter rather than on the printer. This data file provides the information necessary to obtain these pen plots. The following is an example of this data file:

```
GRADE    1C                                                    (Line 1)
1129    23                                                     (Line 2)
   0.  676.    0.   25.                                       (Line 3)
   0.  103.   22.   24.                                       (Line 4)
         .                                                        .
         .                                                        .
         .                                                        .
 25                                                            (Line 5)
   0.  676.    0.    1.                                       (Line 6)
         .                                                        .
         .                                                        .
         .                                                        .
 20                                                            (Line 7)
419.  639.    3.   11. P                                       (Line 8)
         .                                                        .
         .                                                        .
         .                                                        .
```

Line 1: This line contains the lumber-grade designation read from the input board-defect data file using the GR-1ST computer run. It has a format of (1X,6A3). In other words, the designation may have up to 18 characters.

Line 2: This line contains the board number and the number of defects in the board. It has a format of (1X,A4,I4). The board numbers may have up to four digits in columns 2 through 5. The number of defects will have up to three digits in columns 7 through 9 (maximum of 200 defects).

Line 3: This line contains the coordinates for the lower left and upper right corners of a rectangle enclosing the board. It has a format of (1X,4F5.0). The lower left X value is provided in columns 2 through 6. The upper right X value is provided in columns 7 through 11. The lower left Y value is provided in columns 12 through 16. The upper right Y value is provided in columns 17 through 21. All of these values are in increments of one-quarter inch.

Line 4: This line contains the coordinates for the lower left and upper right corners of a rectangle that encloses a defect. It has a format of (1X,4F5.0). The lower left X value is provided in columns 2 through 6. The upper right X value is provided in columns 7 through 11. The lower left Y value is provided in columns 12 through 16. The upper right Y value is provided in columns 17 through 21. All of these values are in increments of one-quarter inch. This line is repeated for each defect in the board.

Line 5: This line contains the number of saw cuts made in the board during the computer processing of the board. It has a format of (2X,I3). Thus, the number of saw cuts is located in columns 3 through 5.

Line 6: This line contains the coordinates for the lower left and upper right corners of a rectangle that represent a saw cut. It has a format of (1X,4F5.0). The lower left X value is provided in columns 2 through 6. The upper right X value is provided in columns 7 through 11. The lower left Y value is provided in columns 12 through 16. The upper right Y value is provided in columns 17

through 21. All of these values are in increments of one-quarter inch. This line is repeated for each saw cut in the board.

Line 7: This line contains the total number of parts (primary and salvage) produced from the board. It has a format of (2X,I3). Thus, the total number of parts is located in columns 3 through 5.

Line 8: This line contains the coordinates for the lower left and upper right corners of a rectangle that represent a processed part along with a letter indicating whether it is a primary or salvage part. It has a format of (1X,4F5.0,5X,A1). The lower left X value is provided in columns 2 through 6. The upper right X value is provided in columns 7 through 11. The lower left Y value is provided in columns 12 through 16. The upper right Y value is provided in columns 17 through 21. All of these values are in increments of one-quarter inch. The letter indicating whether the part is primary (P) or salvage (S) is provided in column 27. This entire line is repeated for each part produced from the board.

This information is repeated for each board processed during the computer run.

Literature Cited

Hoff, Kristen G.; Adams, Edward L.; Walker, Elizabeth S. 1991. **GR-1ST: PC program for evaluating gang-rip-first board cut-up procedures.** Gen. Tech. Rep. NE-150, Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 16 p.

Appendix

Instructions for Developing Board-Defect Data File

The GR-1ST system requires an input data file describing the boards that are to be used to evaluate different gang-rip-first procedures. This data file must have an eight-digit name plus an extension of ".DAT" (example: SAMPLEDF.DAT). To obtain the information needed in the data file, rectangles that enclose the boards and the individual defects on each board must be digitized manually or by using an electronic digitizing table.

Before starting the digitizing process you must establish a set of codes (1 to 25) representing the different types of defects that will be identified on the boards. The appropriate code will be included with the information for each defect entered in the data file. The information for each defect also will include the side (grading face or back face) of the board containing the defect.

To digitize a board, place it on the digitizing table grading side up with the length of the board along the X-axis and the width along the Y-axis. Locate the origin (0,0) at the lower left corner of a rectangle enclosing the board. From this point, all coordinates are measured in quarter-inch increments to points at the lower left and upper right corners of rectangles enclosing the board and the defects in the board. A point that is 5 inches from the origin will be recorded as 20 quarter-inch increments.

The following is an example of a board-defect data file along with a discussion

of each line type:

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GRADE  1C BOARD NUMBER 1129 TOTAL NUMBER OF DEFECTS 23     (Line 1)
MEASURED BOARD WIDTH 22 GRADING: 67-2                      (Line 2)
 0-    0    25-676                                         (Line 3)
22-    0    25-103    1    2                               (Line 4)
  .    .     .  .     .    .
  .    .     .  .     .    .
  .    .     .  .     .    .
```

Line 1: This line contains the board-grade designation and board number that will be used in the GR-1ST output along with the number of defects on the board. It has a format of:

(6A3,' BOARD NUMBER',2X,A4,8X,'TOTAL NUMBER OF DEFECTS',I4)

In the example, "BOARD NUMBER" and "TOTAL NUMBER OF DEFECTS" have been added for readability. This is not necessary so long as the other information is in the right columns. The board-grade designation must be in columns 1 through 18. The board number must be in columns 34 through 37. And the total number of defects must be right-justified in columns 70 through 72.

Line 2: This line contains the board width in quarter-inch increments and board-grading information. It has a format of:

(' MEASURED BOARD WIDTH ',I2,5X,'GRADING: ',I3,'-',I2)

Again, "MEASURED BOARD WIDTH and GRADING" has been added for readability and is not necessary so long as the width is entered in columns 23 and 24. Board width is the only piece of information in this line used by the GR-1ST program. The board-grading information has been added to allow the user to sort the data file by percent grading surface area and number of grading cuttings if desired. The percent surface area is recorded in columns 39 through 41 (right-justified). The number of cuttings is recorded in column 43.

Line 3: This line contains the coordinates for the lower left and upper right corners of a rectangle enclosing the board. It has a format of:

(I3,'-',I3,5X,I3,'-',I3)

The lower left Y value is provided in columns 1 through 3. The lower left X value is provided in columns 5 through 7. The upper right Y value is provided in columns 13 through 15. The upper right X value is provided in columns 17 through 19. All of these values are in increments of one-quarter inch.

Line 4: This line contains the coordinates for the lower left and upper right corners of a rectangle that encloses a defect plus a code designating the side of the board on which the defect occurs and a code to indicate the type of defect. It has a format of:

(I3,'-',I3,5X,I3,'-',I3,3X,I1,2X,I2).

The lower left Y value is provided in columns 1 through 3. The lower left X value is provided in columns 5 through 7. The upper right Y value is provided in columns 13 through 15. The upper right X value is provided in columns 17 through 19. All of these values are in increments of one-quarter inch. The board side code (1 = grading side; 2 = back side) is entered in column 23. The defect type code (developed by user) is entered in columns 26 and 27. All values are right-justified. This line is repeated for each defect and void on the grading face

of the board.

Once all of the defects have been recorded on the grading face of the board, it is turned over so that the back face is up. The origin is then located at the upper left corner of the rectangle enclosing the board. This procedure is then repeated for the defects on this side of the board. The only difference is that the Y-axis values will be measured from the top down. They will still be recorded as positive values.

The entire procedure is repeated for each board that is to be included in the data file.

Adams, Edward L.; Hoff, Kristen G.; Walker, Elizabeth S. 1991. **GR-1ST user's manual.** Gen. Tech. Rep. NE-156. Radnor, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 14 p.

A procedural guide for using the GR-1ST microcomputer system to evaluate different gang-rip-first procedures for processing boards into solid-wood parts. Step-by-step instructions are provided to set up the processing procedure to be evaluated. This procedure is then used to simulate the processing of digitized boards provided by a board-defect data file. The output from the simulated cut-up procedure consists of: (1) parts yield information for individual boards; (2) printer plots of each board, its defects, and the resulting parts; (3) summary tables of surface-area yields and number of parts by part sizes; (4) a data file that can be used to obtain plots of the boards, defects, and parts on a pen plotter; and (5) a data file that can be used with any statistical package to obtain additional information on the parts produced from a group of boards.

Keywords: Computer program; wood processing; simulation

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