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Program BLANKS on the IBM-PC

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Abstract

Describes a computer program that allows a company to determine the number of edge-glued, standard-size blanks needed to satisfy the rough-part needs specified in a given cutting bill. Program BLANKS has been written in FORTRAN using 80 column card input for use on a mainframe computer. The program has been translated to BASICA for use on the IBM-PC. Also described are rough-part cutting bill input file creation and sorting programs. A sample rough-part cutting bill and a blanks analysis are included.

Introduction

Blanks are standard-size, edge-glued, solid hardwood panels used to make rough-dimension parts. The blanks concept and standard sizes have been developed at the Forestry Sciences Laboratory in Princeton, West Virginia (Araman et al. 1982). Blanks can be made from small-diameter, low-grade hardwoods using System 6, by gang ripping low-grade hardwood lumber, and with No. 2 Common and Better hardwood lumber (Araman and Hansen 1983, Gatchell et al. 1983, Reynolds and Gatchell 1982). Standard blank sizes, thickness, and quality specifications are shown in Table 1.

This paper is a step-by-step instruction manual on the use of the IBM-PC microcomputer to determine the quantity of blanks required to make a cutting bill of rough-dimension parts. Microcomputers with IBM-PC compatibility may be used. We present four computer programs:

CBMAKE: To record and sort the rough-dimension parts cutting bill data.

BLANKS: To calculate the blanks needed to make the rough-dimension parts from cutting bills (Araman 1983).

CBPRINT: To print the rough-dimension parts cutting bills from the permanent record.

CBIPRINT: To print the rough-dimension parts cutting bill permanent record index.

We suggest that the user of these instructions run the examples given in this paper. Using the same input and getting the same output will assure the user that the programs have been correctly entered and used.

We assume that the person using these programs has and is familiar with an IBM-PC with MS DOS 2.0 that includes the BASICA option. A 256K memory, two disk drives, and a matrix printer are also assumed. We do not include the normal PC operating instructions in this paper, just those instructions pertaining to the blanks programs.

Users of the programs should format a diskette using the /S option. Then copy the MSDOS diskette files onto this diskette. We use COMMAND.COM, ANSI.SYS, SYS.COM, PRINT.COM, ASSIGN.COM, FIND.EXE, and BASICA.COM. These files use 58K bytes of diskette space leaving 258K bytes of space available. The CBMAKE.BAS, CBPRINT.BAS, BLANKS.BAS, and CBIPRINT.BAS should then be entered into the computer and saved on this same diskette. A second diskette formatted without the /S option should be used in drive B to store the cutting bill files.

Table 1.—Hardwood blank standard sizes for furniture and cabinet manufacturers (inches)

Nominal thickness	Intended product finish thickness	Actual blank thickness	Blank length												
			Clear Quality/26-Inch-Wide Blanks												
5/8	3/8	1/2	13	15	17	18	22	26	31	36	42				
3/4	1/2	5/8	14	17	19	22	25	29	31	35	41	47	58	86	
1	3/4	7/8	15	18	21	25	29	33	38	45	50	60	75	100	
1-1/4	1	1-1/8	15	18	21	25	29	33	38	45	50	60	75	100	
1-1/2	1-1/4	1-3/8	15	18	21	25	28	32	35	40	45	50	60	70	85
2	1-5/8	1-3/4	15	18	21	25	28	32	35	40	45	50	60	70	90
			Core Quality/26-Inch-Wide Blanks												
1	3/4	7/8	15	18	21	23	26	29	34	40	50	60	70	95	
1-1/4	1	1-1/8	15	18	21	23	26	29	34	40	50	60	70	85	
			Sound Quality/20-Inch-Wide Blanks[a]												
1	3/4	7/8	13	17	19	22	24	27	29	33	44	54	70	80	100
1-1/4	1	1-1/8	15	18	20	23	25	28	33	45	55	65	80	90	100
1-1/2	1-1/4	1-3/8	14	18	21	24	28	31	34	40					
2	1-5/8	1-3/4	12	16	19	21	24	28	30	34					
			Sound Quality/20-Inch-Wide Blanks[b]												
1	3/4	7/8	15	18	21	25	29	34	40	50	60	70	95		

[a] For upholstery frames.
[b] For case goods.

The Complete Rough-Dimension Parts Cutting Bill

Rough-dimension parts are pieces of solid or edge-glued wood used to make the fully machined parts needed for furniture assembly. Rough-dimension part sizes are normallly specified by the nominal thickness of lumber from which they are cut, and by adding 1 inch to the finished part length and 1/4 to 1/2 inch to the finished part width. Consider that furniture company ABC Enterprises buys enough blanks from XYZ Corporation to make 100 dining room buffet cupboards. The cupboards consist of a top, No. 1317, and a base, No. 1315. The cutting bill for the No. 1317 top is shown in Table 2, and the cutting bill for the No. 1315 base is shown in Table 3. Since tops and bases are to be made at one time, we combined the two cutting bills.

Blanks are made in only one species, thickness, and quality at a time. Therefore, program BLANKS is set up to consider only one species, thickness, and quality of rough-dimension parts at a time. The first step is to subdivide the cutting bill. Red oak and yellow-poplar are the only two species used, as shown in the species column of Tables 2 and 3. Three red oak thicknesses (4/4, 5/4, and 6/4) are needed in clear grade. But only 4/4 yellow-poplar sound (interior) grade parts are needed. Altogether four program BLANKS runs are required. We demonstrate the 4/4 red oak run in step-by-step detail and include the results of the other three runs.

Table 2.—ABC Enterprises, Inc.—Bill of Materials for Buffet Top #1317

Quantity	Part Name	Rough size			Net size			Species
		Length	Width	Thickness	Length	Width	Thickness	
200	End Panel (2)	38	10-7/8	4/4	37	10-3/8		Red Oak
100	Top Front Brace (1)	38-1/4	2-1/4	4/4	37-1/4	2	13/16	Red Oak
100	Bottom Bandsawed Brace (1)	38-1/4	2-3/4	4/4	37-1/4	2-1/2	13/16	Red Oak
100	Top Back Brace (1)	39-1/2	1-3/4	4/4	38-1/2	1-1/2	13/16	Yellow-Poplar
100	Bottom Back Brace (1)	38-1/4	2-1/4	4/4	37-1/4	2	13/16	Red Oak
100	Top Shelf (1)	39	9-5/8	4/4	38	9-1/8	3/4	Red Oak
100	Center Shelf (1)	39	10-5/8	4/4	38	10-3/16	3/4	Red Oak
100	Front Upright (1)	23	2-1/8	4/4	22	1-5/8	13/16	Red Oak
100	End Foot (2)	23-5/8	2-1/4	4/4	11-1/4	2	13/16	Red Oak
100	Top Front Moulding (1)	43-1/4	3-3/4	6/4	41-3/4	3-1/2	1-1/4	Red Oak
200	Top End Moulding (2)	26	3-3/4	6/4	12	3-1/2	1-1/4	Red Oak
200	Door Header (2)	17	4-7/8	5/4	16	4-5/8	1	Red Oak
200	Door Rail (2)	17	2-3/8	5/4	16	2-1/8	1	Red Oak
400	Door Stile (4)	24-1/8	2-1/4	5/4	23-3/16	2	1	Red Oak
100	Horizontal Door Strip (1)	16	1-5/8	4/4	15	1/2	3/4	Red Oak
100	Vertical Door Strip (1)	18-1/8	1-5/8	4/4	17-3/16	1/2	3/4	Red Oak
50	Front Bead Moulding (1/2)	40-3/4	1-5/8	4/4	39-3/4	1/2	1/2	Red Oak
100	End Bead Moulding (1)	11-7/8	1-5/8	4/4	10-1/10	1/2	1/2	Red Oak

Table 3.—ABC Enterprises, Inc.—Bill of Materials for Buffet Base #1315

Quantity	Part Name	Rough size			Net size			Species
		Length	Width	Thickness	Length	Width	Thickness	
100	Top (1)	43	18-1/2	4/4	42	18	3/4	Red Oak
200	End Panel (2)	33	16-7/8	4/4	32	16-3/8	3/4	Red Oak
100	Top Front Brace (1)	37-7/8	1-3/4	4/4	36-7/8	1-7/16	3/4	Red Oak
100	Center Front Brace (1)	39-7/8	2-1/4	4/4	38-7/8	2	13/16	Red Oak
100	Bottom Front Brace (1)	39-7/8	2-1/4	4/4	38-7/8	2	13/16	Red Oak
100	Top Back Brace (1)	39-7/8	2-1/4	4/4	38-7/8	2	13/16	Yellow-Poplar
100	Center Back Brace (1)	39-7/8	2-1/4	4/4	38-7/8	2	13/16	Yellow-Poplar
100	Bottom Back Brace (1)	39-7/8	2-1/4	4/4	38-7/8	2	13/16	Yellow-Poplar
200	End Upright (2)	33	2-1/4	4/4	32	2	3/4	Red Oak
100	Bottom Upright (1)	21-3/8	1-3/4	4/4	20-3/8	1-1/2	13/16	Red Oak
100	Front Foot (1)	42-3/8	5-1/8	4/4	41-3/8	4-7/8	3/4	Red Oak
200	End Foot (2)	17-3/4	5-1/8	4/4	16-3/4	4-7/8	3/4	Red Oak
100	Shelf (1)	39-3/4	8-1/2	4/4	38-3/4	8	11/16	Yellow-Poplar
100	Drawer Front (1)	37-1/2	5-1/8	4/4	36-1/2	4-7/8	3/4	Red Oak
200	Drawer Guide (2)	14-3/4	2-3/8	4/4	13-3/4	2-1/8	1/2	Yellow-Poplar
200	Drawer Guide (2)	16-7/8	1-1/4	4/4	15-7/8	1	1/2	Yellow-Poplar
100	Door Lipped Stile (1)	21-3/8	3-1/8	4/4	20-3/8	2-7/8	13/16	Red Oak
500	Door Stile (5)	21-3/8	2-1/4	4/4	20-3/8	2	13/16	Red Oak
300	Door Header (3)	10-3/8	3-7/8	4/4	9-3/8	3-5/8	13/16	Red Oak
300	Door Rail (3)	10-3/8	2-1/4	4/4	9-3/8	2	13/16	Red Oak
300	Door Panel (3)	17-3/8	9-1/4	4/4	16-3/8	8-3/4	9/16	Red Oak

The 4/4 C1F Red Oak Parts Cutting Bill: Program CBMAKE

The 4/4 red oak parts data must be arranged in a specific way to be used as input for the BLANKS program. The parts data cannot be fed directly into program BLANKS. The parts data must be entered as requested by the CBMAKE program. When the data input is complete, the CBMAKE program will perform the necessary sorting and control data calculations. The sorted data are saved and can be used as input to program BLANKS.

With the program diskette in drive A, bring up BASICA and then the CBMAKE program using LOAD "A:CBMAKE.BAS" (Appendix I). The second formatted diskette must be put in drive B. This diskette will be used to store cutting bill data and should be labeled accordingly. Two hundred part sizes are the maximum number allowed. The dimension statements in CBMAKE (lines 10 to 120) and in BLANKS (lines 60 to 100) must be changed if more than 200 part sizes are needed.

The first prompt will ask if a new cutting bill is to be started, or if the cutting bill in the CBX file is to be added to or to be corrected. CBX is a temporary file to hold unsorted data. We follow the program through the "new cutting bill" option and then through the "add and correct" option as shown in Figure 1. Enter 1 to this prompt to create a new cutting bill. When starting a new cutting bill the previous cutting bill in the temporary (CBX) file will be erased. When you start a cutting bill, complete the entire data entry—addition, correction, and sorting sequence—before starting another new cutting bill.

The first program prompt asks for "our" order number, which is the blank maker's order number. Now the prompt asks for the buyer's (customers) company name and address. The next prompt asks for the buyer's order number. We have assumed that the blank maker will be selling blanks but a maker using his blanks will use CBMAKE in the same way. Finally, the prompt asks for the cutting bill file number. In this example, we use our order number 999999. The ABC Enterprises, Inc., at 345 Wistfull Vista, Gastonia, NC 28052 is the buyer. Their order number is 987987. The cutting bill number assigned is CB1.

Following this last entry, the heading data entered are stored in diskette B under the "B:CBINDEX.DAT" label. When using a new diskette to store the cutting bill data, statement 360 will cause an error condition. Temporarily, change statement 360 to read OPEN "B.CBINDEX.DAT" for OUTPUT as #1. With the statement in this form, the CB index file will be opened. Normally, statement 360 reads OPEN "B:CBINDEX.DAT" for APPEND as #1, and the additional cutting bill heading data will be added to the CBINDEX file.

By using program CBIPRINT (Appendix IV), the CBINDEX file (the list of cutting bills stored on the cutting bill diskette) can be read. Use LOAD "A:CBIPRINT.BAS" and hit F2 to print the CBINDEX file.

Now the program prompts call for the parts data. The 4/4 red oak parts data in Tables 2 and 3 are used. The line number is entered. Then the parts length is entered. The blank length used to make this part, as found in Table 1, is entered next. If the parts length is 1/2 inch or less longer than the closest blank length, then enter the parts length as the blank length. Rough part sizes are generally made 1 inch longer than finished part sizes. But, with parts being made from blanks, a 1/2 inch length allowance on the rough part is sufficient.

When the last cutting data have been entered or if you want to stop entering data for any reason, enter 999 instead of the next line number. The data are listed on the screen 10 data lines at a time.

Following the listing of all the data lines, the number of cuttings (same as data lines) is given. A prompt follows asking for the correct number of cuttings. Under certain circumstances, this number of cuttings could change and require correction. Now the cutting data can be printed if required. Line corrections can be made at this time. The data as shown are saved in the CBX file.

To add to this data or to correct this data, run the program again. Now enter 2 for the first prompt. The data stored in the CBX file are read. The program proceeds in the same fashion as before. The last line of the data in the CBX file is shown so that the additional data entry line numbers can be started from that line. The customer name, and so on, need not be re-entered as this was read from the CBX file.

The unsorted data are temporarily stored on the B drive diskette as file CBX.DAT as shown in Figure 2. *Remember*, the next time CBMAKE is used to make a new set of data, the new data will be stored in the CBX file and the previous data will be lost. Therefore, you should continue with the sorting program before entering a new cutting bill.

The sorting and control data determinations will now proceed. Since this is a simple bubble sort routine, the process is slow. Messages showing the progress appear on the screen. After sorting is complete, the sorted data appear on the screen 10 lines at a time. The sorted data can then be printed as shown in Figure 3.

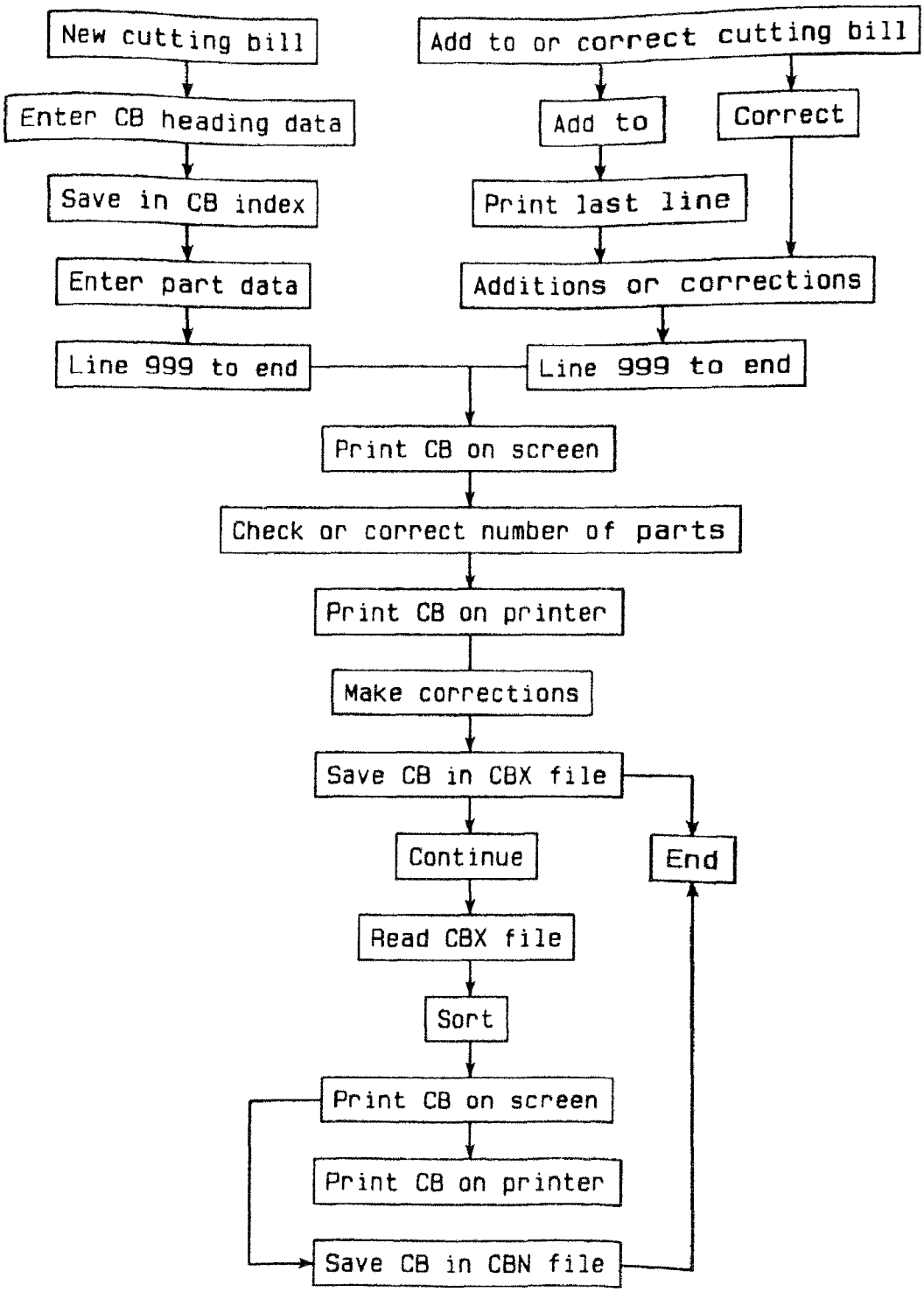

Figure 1.—Program CBMAKE flowchart.

B L A N K S B Y X Y Z C O R P O R A T I O N

Date 01-14-1985 Order No. 999999

Customer Name: ABC Enterprises Order No. 987987
Street: 345 Wistfull Vista CB Number: CB1
City: Gastonia NC 28052

Blank Specifications: Red Oak 4/4 C1F Standard

Line No.	Blank Length (in)	Part Length (in)	Part Width (in)	Part Quantity (number)	Case Number	Part Name
1	38.000	38.000	10.875	200	1317	End panel
2	38.000	38.000	2.250	100	1317	Top front brace
3	38.000	38.000	2.750	100	1317	Bottom bandsawed brace
4	38.000	38.000	2.250	100	1317	Bottom back brace
5	45.000	39.000	9.625	100	1317	Top shelf
6	45.000	39.000	10.625	100	1317	Center shelf
7	25.000	23.000	2.125	100	1317	Front upright
8	25.000	23.625	2.250	200	1317	End foot
9	18.000	16.000	1.625	100	1317	Horizontal door strip
10	18.000	18.000	1.625	100	1317	Vertical door strip
11	45.000	40.750	1.625	50	1317	Front door moulding
12	15.000	11.875	1.625	100	1317	End bead moulding
13	45.000	43.000	18.500	100	1315	Top
14	33.000	33.000	16.875	200	1315	End panel
15	38.000	37.875	1.750	100	1315	Top front brace
16	45.000	39.875	2.250	100	1315	Center front brace
17	45.000	39.875	2.250	100	1315	Bottom front brace
18	33.000	33.000	2.250	200	1315	End upright
19	25.000	21.375	1.750	100	1315	Bottom upright
20	45.000	42.375	5.125	100	1315	Front foot
21	18.000	17.750	5.125	200	1315	End foot
22	38.000	37.500	5.125	100	1315	Drawer front
23	25.000	21.375	3.125	100	1315	P. door lipped stile
24	25.000	21.375	2.250	500	1315	P. door stile
25	15.000	10.375	3.875	300	1315	P. door header
26	15.000	10.375	2.250	300	1315	P. door rail
27	18.000	17.375	9.250	300	1315	P. door panel

Number of Different Blank Lengths 0
Line No. Blank Length Start Line no. Blank Length End

Figure 2.—4/4 C1F red oak cutting bill—unsorted.

B L A N K S B Y X Y Z C O R P O R A T I O N

Date 01-14-1985 Order No. 999999

Customer Name: ABC Enterprises Order No. 987987
Street: 345 Wistfull Vista CB Number: CB1
City: Gastonia NC 28052

Blank Specifications: Red Oak 4/4 C1F Standard

Line No.	Blank Length (in)	Part Length (in)	Part Width (in)	Part Quantity (number)	Case Number	Part Name
1	15.000	10.375	3.875	300	1315	P. door header
2	15.000	10.375	2.250	300	1315	P. door rail
3	15.000	11.875	1.625	100	1317	End bead moulding
4	18.000	17.375	9.250	300	1315	P. door panel
5	18.000	17.750	5.125	200	1315	End foot
6	18.000	16.000	1.625	100	1317	Horizontal door strip
7	18.000	18.000	1.625	100	1317	Vertical door strip
8	25.000	21.375	3.125	100	1315	P. door lipped stile
9	25.000	23.625	2.250	200	1317	End foot
10	25.000	21.375	2.250	500	1315	P. door stile
11	25.000	23.000	2.125	100	1317	Front upright
12	25.000	21.375	1.750	100	1315	Bottom upright
13	33.000	33.000	16.875	200	1315	End panel
14	33.000	33.000	2.250	200	1315	End upright
15	38.000	38.000	10.875	200	1317	End panel
16	38.000	37.500	5.125	100	1315	Drawer front
17	38.000	38.000	2.750	100	1317	Bottom bandsawed brace
18	38.000	38.000	2.250	100	1317	Top front brace
19	38.000	38.000	2.250	100	1317	Bottom back brace
20	38.000	37.875	1.750	100	1315	Top front brace
21	45.000	43.000	18.500	100	1315	Top
22	45.000	39.000	10.625	100	1317	Center shelf
23	45.000	39.000	9.625	100	1317	Top shelf
24	45.000	42.375	5.125	100	1315	Front foot
25	45.000	39.875	2.250	100	1315	Center front brace
26	45.000	39.875	2.250	100	1315	Bottom front brace
27	45.000	40.750	1.625	50	1317	Front door moulding

Number of Different Blank Lengths 6

Line No. Blank Length Start	Line no. Blank Length End
1	3
4	7
8	12
13	14
15	20
21	27

Figure 3.—4/4 C1F red oak cutting bill—sorted.

The sorted data, complete with header and index control data, are stored in the drive B diskette. It is stored under the cutting bill number as given in the first part of the CBMAKE program use. If the cutting bill number used is the same as a cutting bill number previously used, the previous data will be erased. The sorted data will be used to run the BLANKS program and therefore *must be saved.*

The completed cutting bills can be shown on the screen and printed from the B drive diskette using program CBPRINT (Appendix III). Use LOAD "A:CBPRINT.BAS" and then enter the correct cutting bill by following the prompts. Hit F2 to print the selected cutting bill.

The 4/4 C1F red oak rough-dimension parts cutting bill is now completed and is stored as CB1. Other rough-dimension parts cutting bills can now be entered, corrected, sorted, and saved. The CB1 rough-dimension parts can be run through program BLANKS at any time.

The 4/4 C1F Red Oak Blanks Cutting Bill: Program BLANKS

The sorted parts data are fed into program BLANKS. The blanks necessary to make the required parts are calculated one blank length at a time. Then the total blank quantity in all lengths is found.

With the sorted cutting bill complete with index controls stored in the B drive diskette, program BLANKS can be run. With the program diskette in drive A and the cutting bill data diskette in drive B, bring up BASICA. Then use LOAD "A:BLANKS.BAS" to bring up program BLANKS (Appendix II). Hit key F2 to start the program. The prompt will ask for the cutting bill number. For this example, enter CB1.

The next set of program prompts calls for the blanks width and blanks price data. For the first prompt in this example, 15-inch blanks data are requested, a 26-inch-width, followed by a comma, and a 1 price are entered. The blank widths are taken from table 1. The blanks prices are arbitrarily set in this paper. A discussion of blanks price allocation is beyond the scope of this paper. For this example, we have assumed values of $1 per square foot for 15-inch blanks, $1.50 per square foot for 18-inch blanks, and $2 per square foot for all other blanks. A prompt for each blank length will appear.

Now a statement appears stating that the program is being run. The program will be controlled by line control values on the rough-dimension parts cutting bill (Fig. 3). Do not be impatient. The 27-line cutting bill used in this example takes about 20 seconds to run.

The results showing blank size, blank quality, blank and parts footage, and yield and blanks price will appear. The heading data were read from the cutting bill data file. Hitting F5, as prompted shows the remainder of the data. Then a prompt appears asking if a printed copy of the results is needed. Such a copy is shown in Figure 4. Entering 2 to this prompt erases these results and a new run can be made. After a printed copy has been made hit F2 to start another run.

A 1/8-inch saw kerf is added to the parts width for ripping the parts from blanks. If another saw kerf is to be used, statements 560, 580, 700, 830, 900, 1080, and 1130 must be changed. The values of 0.125 must be changed to the new kerf value.

The sorted cutting bill (Fig. 3) and the BLANKS output (Fig. 4) should be made available to the people ripping the parts from the blanks. They will follow the part width specification in the order given in the sorted cutting bill. For example, when ripping the 81 blanks 15 inches long to the 700 parts, they will first rip the 3.875-inch-wide parts. There will be six pieces made from each blank, and 50 blanks will be used to make the 300 parts. The 2-inch-wide remainder from each blank will be made to one 1.625-inch-wide piece for a total of 50 pieces. Then the 2.25-inch parts will be ripped from 27 blanks without any remainder. These blanks yield 11 parts per blank, for a total of 297 parts. One blank is used to make the last three parts 2.25 inches wide. The 18.875-inch remainder is ripped to 10 parts 1.625 inches wide. Three blanks are ripped to 40 parts 1.625 inches wide with a 5-inch remainder from the last blank. This piece can be reglued for future use.

Completing the Parts and Blanks Cutting Bills

In addition to the 4/4 C1F red oak parts, there are 5/4 and 6/4 C1F red oak parts; and 4/4 sound (interior) yellow-poplar parts required to make the 1317 top and 1315 base. The reader should run programs CBMAKE and BLANKS for these parts. The same techniques used to determine the 4/4 C1F red oak parts cutting bill and blank requirements should be used for the other three cutting bills.

B L A N K S B Y X Y Z C O R P O R A T I O N

Date 01-14-1985 Order No. 999999

CUSTOMER: Name: ABC Enterprises Order No. 987987
Street: 345 Wistfull Vista CB Number: CB1
City. Gastonia NC 28052

Blank Specifications: Red Oak 4/4 C1F Standard

Blank Size (inches)	Blanks (number)	Blanks (sqft)	Parts (sqft)	Yield (%)	Price (dollars)	Price ($/sqft)
15.000x26	81	219	146	66.46	219.38	1.00
18.000x26	165	536	500	93.16	804.38	1.50
25.000x26	93	420	347	82.69	839.58	2.00
33.000x26	200	1,192	877	73.56	2,383.33	2.00
38.000x26	147	1,009	945	93.67	2,017.17	2.00
45.000x26	205	1,666	1,399	84.01	3,331.25	2.00
Totals	891	5,041	4,213	83.57	9,595.08	

Blank Size (inches)	Reglue (%)	Reglue Value($)	End Waste (%)	Edge Waste (%)	Total Waste(%)
15.000x26	0.46	1.02	28.51	4.57	33.08
18.000x26	0.91	7.36	3.00	2.93	5.93
25.000x26	0.98	8.19	11.40	4.94	16.33
33.000x26	23.08	550.00	0.00	3.37	3.37
38.000x26	3.73	75.14	0.19	2.41	2.60
45.000x26	5.03	167.54	8.27	2.69	10.96
Totals	8.06	809.25	5.28	3.09	8.37

Figure 4.—4/4 C1F red oak blanks.

The 5/4 C1F red oak parts cutting bill (all for the 1317 top, Table 2) is shown in Figure 5 as cutting bill 2. The 5/4 C1F red oak blank prices were found by increasing the 4/4 C1F red oak blank prices by 25 percent as 5/4 blanks require 25 percent more board footage than 4/4 blanks. The 5/4 C1F red oak blanks required to make the cutting bill 2 parts are shown in Figure 6.

B L A N K S B Y X Y Z C O R P O R A T I O N

Date 01-14-1985 Order No. 999999

Customer Name: ABC Enterprises Inc Order No. 987987
Street: 345 Wistfull Vista CB Number: CB2
City: Gastonia NC 28052

Blank Specifications: Red Oak C1F 5/4 Standard

Line No.	Blank Length (in)	Part Length (in)	Part Width (in)	Part Quantity (number)	Case Number	Part Name
1	18.000	17.000	4.875	200	1317	G. door header
2	18.000	17.000	2.375	200	1317	G. door rail
3	25.000	24.125	2.250	400	1317	G. door stile

Number of Different Blank Lengths 2

Line No. Blank Length Start	Line no. Blank Length End
1	2
3	3

Figure 5.—5/4 C1F red oak cutting bill—sorted.

B L A N K S B Y X Y Z C O R P O R A T I O N

Date 01-14-1985 Order No. 999999

CUSTOMER: Name: ABC Enterprises Inc Order No. 987987
Street: 345 Wistfull Vista CB Number: CB2
City. Gastonia NC 28052

Blank Specifications: Red Oak C1F 5/4 Standard

Blank Size (inches)	Blanks (number)	Blanks (sqft)	Parts (sqft)	Yield (%)	Price (dollars)	Price ($/sqft)
18.000x26	60	195	171	87.78	366.60	1.88
25.000x26	37	167	151	90.28	417.53	2.50
Totals	97	362	322	88.94	784.13	

Blank Size (inches)	Reglue (%)	Reglue Value($)	End Waste (%)	Edge Waste (%)	Total Waste(%)
18.000x26	3.85	14.10	5.16	3.21	8.37
25.000x26	1.72	7.18	3.27	4.73	8.00
Totals	2.87	21.28	4.29	3.91	8.20

Figure 6.—5/4 C1F red oak blanks.

The 6/4 C1F red oak parts cutting bill (all for the 1317 top, Table 2) is shown in Figure 7 as cutting bill 3. The 6/4 C1F red oak blank prices were found by increasing the 4/4 C1F red oak blank prices by 50 percent. The 6/4 C1F red oak blanks required to make the cutting bill 3 parts are shown in Figure 8.

B L A N K S B Y X Y Z C O R P O R A T I O N

Date 01-14-1985 Order No. 999999

Customer Name: ABC Enterprises Inc Order No. 987987
Street: 345 Wistfull Vista CB Number: CB3
City: Gastonia NC 28052

Blank Specifications: Red Oak C1F 6/4 Standard

Line No.	Blank Length (in)	Part Length (in)	Part Width (in)	Part Quantity (number)	Case Number	Part Name
1	29.000	26.000	3.750	200	1317	Top end moulding
2	45.000	43.250	3.750	100	1317	Top front moulding

Number of Different Blank Lengths 2

Line No. Blank Length Start	Line no. Blank Length End
1	1
2	2

Figure 7.—6/4 C1F red oak cutting bill—sorted.

B L A N K S B Y X Y Z C O R P O R A T I O N

Date 01-14-1985 Order No. 999999

CUSTOMER: Name: ABC Enterprises Inc Order No. 987987
Street: 345 Wistfull Vista CB Number: CB3
City. Gastonia NC 28052

Blank Specifications: Red Oak C1F 6/4 Standard

Blank Size (inches)	Blanks (number)	Blanks (sqft)	Parts (sqft)	Yield (%)	Price (dollars)	Price ($/sqft)
29.000x26	34	178	135	76.06	534.08	3.00
45.000x26	17	138	113	81.54	414.38	3.00
Totals	51	316	248	78.46	948.46	

Blank Size (inches)	Reglue (%)	Reglue Value($)	End Waste (%)	Edge Waste (%)	Total Waste(%)
29.000x26	12.33	65.85	8.78	2.83	11.60
45.000x26	12.33	51.09	3.30	2.83	6.13
Totals	12.33	116.95	6.38	2.83	9.21

Figure 8.—6/4 C1F red oak blanks.

There were 4/4 yellow-poplar parts of sound (interior) grade needed for both furniture pieces as shown in Tables 2 and 3. The cutting bill for these parts is shown in Figure 9 as cutting bill 4. The 4/4 sound (interior) yellow-poplar blank prices were estimated by considering the differences in red oak and yellow-poplar lumber prices. The 4/4 sound (interior) yellow-poplar blanks required to make the cutting bill 4 parts are shown in Figure 10.

The complete list of blanks needed to make 100 sets of china hutch base and tops is shown in Table 4. These data were compiled manually from Figures 4, 6, 8, and 10.

B L A N K S B Y X Y Z C O R P O R A T I O N

Date 01-14-1985 Order No. 999999

Customer Name: ABC Enterprises Inc Order No. 987987
Street: 345 Wistfull Vista CB Number: CB4
City: Gastonia NC 28052

Blank Specifications: Yellow poplar Sound(int)
4/4 Standard

Line No.	Blank Length (in)	Part Length (in)	Part Width (in)	Part Quantity (number)	Case Number	Part Name
1	15.000	14.750	2.375	200	1315	Drawer guide-F
2	18.000	16.875	1.250	200	1315	Drawer guide-M
3	40.000	39.750	8.500	100	1315	Shelf
4	40.000	39.875	2.250	100	1315	Top back brace
5	40.000	39.875	2.250	100	1315	Center back brace
6	40.000	39.875	2.250	100	1315	Bottom back brace
7	40.000	39.500	1.750	100	1317	Top back brace

Number of Different Blank Lengths 3

Line No. Blank Length Start	Line no. Blank Length End
1	1
2	2
3	7

Figure 9.—4/4 sound (int.) yellow-poplar cutting bill—sorted.

B L A N K S B Y X Y Z C O R P O R A T I O N

Date 01-14-1985 Order No. 999999

CUSTOMER: Name: ABC Enterprises Inc Order No. 987987
Street: 345 Wistfull Vista CB Number: CB4
City. Gastonia NC 28052

Blank Specifications: Yellow poplar Sound(int)
4/4 Standard

Blank Size (inches)	Blanks (number)	Blanks (sqft)	Parts (sqft)	Yield (%)	Price (dollars)	Price ($/sqft)
15.000x20	25	52	49	93.42	39.06	0.75
18.000x20	15	38	29	78.13	37.50	1.00
40.000x20	92	511	470	91.87	638.89	1.25
Totals	132	601	548	91.15	715.45	

Blank Size (inches)	Reglue (%)	Reglue Value($)	End Waste (%)	Edge Waste (%)	Total Waste(%)
15.000x20	0.00	0.00	1.58	5.00	6.58
18.000x20	4.76	1.79	5.21	11.90	17.11
40.000x20	3.14	20.05	0.52	4.47	4.99
Totals	2.97	21.84	0.91	4.98	5.89

Figure 10.—4/4 sound (int.) yellow-poplar blanks.

Table 4.—*Blanks to rough-dimension parts*
(Blanks needed to make 100 sets of 1315 base and 1317 top)

Length (in)	Red oak clear 26″ width			Length (in)	Yellow-poplar sound (int.) 20″ width
	4/4	5/4	6/4		4/4
			BLANK QUANTITIES		
15	81	*	*	15	25
18	165	60	*	18	15
21	*	*	*	21	*
25	93	37	*	25	*
29	*	*	34	29	*
33	200	*	*	34	*
38	147	*	*	40	92
45	205	*	17		—
Total	891	97	51		132
			BLANK PRICES ($/ft²)		
15	1.00	*	*	15	0.75
18	1.50	1.88	*	18	1.00
21	*	*	*	21	*
25	2.00	2.50	*	25	*
29	*	*	3.00	29	*
33	2.00	*	*	34	*
38	2.00	*	*	40	1.25
45	2.00	*	3.00		

* No blanks required.

1,171 blanks required to make the 5,450 parts needed.

6,320 ft² of blanks to make 5,331 ft² parts 84.4% yield
plus 474 ft² reglue 7.5% yield

91.9% yield

$12,079.13 blanks to $11,145.07 parts + $934.06 reglue = $2.09/ft² parts + reglue
$12,079.13 blanks to $12,079.13 parts + $0.0 reglue = $2.27/ft² parts
$2.09/ft² parts = $111/base and top set – blanks cost
$2.27/ft² parts = $121/base and top set – blanks cost

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APPENDIX I: Program CBMAKE

```
10 REM This program is used to make and sort cutting bill (CB) files
20 REM This program is saved as "A:CBMAKE.BAS"; written in BASICA
30 REM The cutting bill data is saved in two files on drive B:
40 REM The cutting bill heading data is stored in "B:CBINDEX.DAT".
50 REM The unsorted cutting bill heading & parts data is temporarily stored in B
:CBX.DAT".
60 REM (1) Unsorted data is sorted by blank length (ascending).
70 REM (2) Program Blanks iteration control values are found.
80 REM (3) The data is sorted by cutting width per blank length (descending).
90 REM The sorted cutting bill heading & parts data is stored in "B:CBn.DAT"
100 REM There can be 999,999 cutting bill files, ie, "B:CB999999.DAT" is max.
110 DIM PL(200),PW(200),PQ(200),CA(200),PN$(200),BL(200),LN(200),ITS(25),ITE(25)

120 DIM SPL(200),SPW(200),SPQ(200),SCA(200),SPN$(200),SBL(200),SLN(200)
130 OD1$="### ###.### ###.### ##.### ###,###  ####  \
      \"
140 NC=0: X2=0
150 CLS
160 INPUT "Enter 1 for new cutting bill. 2 to add to or correct cutting bill in
CBX file";X3
170 IF X3=1 THEN 300 ELSE 180
180 OPEN "B:CBX.DAT" FOR INPUT AS #1
190 INPUT #1, BMO$,BBN$,BBS$,BBC$,BBST$,BBZ$,BBO$,S$,Q$,TH$,STD$,CBN$,D$,NC
200 FOR I=1 TO NC STEP 1
210 INPUT #1, I,PL(I),BL(I),PW(I),PQ(I),CA(I),PN$(I)
220 NEXT I
230 CLOSE #1
240 INPUT "Enter 1 to add to cutting bill. 2 for corrections";X4
250 IF X4=1 THEN 260 ELSE 390
260 PRINT "This is the last line in the cutting bill file"
270 II=NC
280 PRINT USING OD1$;II;PL(II);BL(II);PW(II);PQ(II);CA(II);PN$(II)
290 GOTO 390
300 INPUT "Enter Our Order Number. Date will enter automatically";BMO$
310 INPUT "Enter blank buyer's name, street address, city,state, zip code";BBN$,
BBS$,BBC$,BBST$,BBZ$
320 INPUT "Enter blank buyer's order no. ";BBO$
330 INPUT "Blank Species, Quality, Thickness, Standard or Non-Standard";S$,Q$,TH
$,STD$
340 D$=DATE$
350 INPUT "Enter Cutting Bill File Number. CBnnnnnn six digits maximum";CBN$
360 OPEN "B:CBINDEX.DAT" FOR APPEND AS #1
370 WRITE #1, BMO$;BBN$;BBS$;BBC$;BBST$;BBZ$;BBO$;S$;Q$;TH$;STD$;CBN$;D$;NC
380 CLOSE #1
390 PRINT "Enter Part Data"
400 INPUT "Enter line number. Enter 999 to end data entry"; I
410 IF I=999 THEN 470 ELSE 420
420 INPUT  "Enter Part Length, Blank Length, Width, Quantity, Case, Name";PL(I),
BL(I),PW(I),PQ(I),CA(I),PN$(I)
430 LN(I)=I
440 IF X2=1 THEN 400 ELSE 450
450 NC=NC+1
460 GOTO 400
470 GOSUB 1290
480 PRINT "The number of different cuttings in this bill=";
490 PRINT TAB(55) NC
500 INPUT "Enter the correct number of different cuttings"; NC
```

```
510 INPUT "Enter 1 to print the cutting bill. 2 to continue";X8
520 IF X8=1 THEN 530 ELSE 540
530 GOSUB 1770
540 INPUT "Enter 1 to make  line corrections. 2 to end.";X2
550 IF X2=1 THEN 390 ELSE 560
560 OPEN "B:CBX.DAT" FOR OUTPUT AS #1
570 WRITE #1, BMO$,BBN$,BBS$,BBC$,BBST$,BBZ$,BBO$,S$,Q$;TH$,STD$,CBN$,D$,NC
580 FOR I=1 TO NC STEP 1
590 WRITE #1, I,PL(I),BL(I),PW(I),PQ(I),CA(I),PN$(I)
600 NEXT I
610 CLOSE #1
620 INPUT "Enter 1 to stop with unsorted data in temporary storage. 2 to continu
e"; X10
630 IF X10=1 THEN END ELSE 650
640 ITT=1: ITS(1)=0: ITE(1)=0
650 OPEN "I",#1,"B:CBX.DAT"
660 INPUT #1, BMO$,BBN$,BBS$,BBC$,BBST$,BBZ$,BBO$,S$,Q$,TH$,STD$,CBN$,D$,NC
670 FOR I=1 TO NC STEP 1
680 INPUT #1, I,PL(I),BL(I),PW(I),PQ(I),CA(I),PN$(I)
690 NEXT I
700 CLOSE #1
710 CBNA$="B:"+CBN$+CHR$(46)+"DAT"
720 OD1$="### ###.### ###.### ##.### ###,###  ####  \
      \"
730 REM First Sort: Ascending order on BL(I).
740 PRINT "Allow time for sorting"
750 XNC=NC
760 FOR I=1 TO NC-1 STEP 1
770 PRINT "First Sort Iteration."
780 J=0
790 XNC=XNC-1
800 J=J+1
810 IF BL(J+1)<BL(J) THEN 820 ELSE 850
820 SPL=PL(J+1): SBL=BL(J+1): SPW=PW(J+1): SPQ=PQ(J+1): SCA=CA(J+1): SPN$=PN$(J+
1)
830 PL(J+1)=PL(J): BL(J+1)=BL(J): PW(J+1)=PW(J): PQ(J+1)=PQ(J): CA(J+1)=CA(J): P
N$(J+1)=PN$(J)
840 PL(J)=SPL: BL(J)=SBL: PW(J)=SPW: PQ(J)=SPQ: CA(J)=SCA: PN$(J)=SPN$
850 IF J=XNC THEN 860 ELSE 800
860 NEXT I
870 REM Find Program Blanks iteration control values.
880 J=1
890 ITS(J)=1: ITT=1
900 FOR I=1 TO NC STEP 1
910 PRINT "Control values iteration"
920 IF BL(I)=BL(I+1) THEN 970 ELSE 930
930 ITT=ITT+1
940 ITE(J)=I
950 ITS(J)=ITE(J-1)+1
960 J=J+1
970 NEXT I
980 ITE(J)=NC: ITT=ITT-1
990 REM Second Sort: Descending order on PW(I) within same blank length.
000 FOR J=1 TO ITT STEP 1
```

```
1010 PRINT "Second sort iteration"
1020 K1=ITE(J)-ITS(J)
1021 IF K1=0 THEN 1130 ELSE 1030
1030 I=ITS(J)
1040 FOR K=1 TO K1 STEP 1
1050 IF PW(I+1)>PW(I) THEN 1060 ELSE 1090
1060 SPL=PL(I+1): SBL=BL(I+1): SPW=PW(I+1): SPQ=PQ(I+1): SCA=CA(I+1): SPN$=PN$(I
+1)
1070 PL(I+1)=PL(I): BL(I+1)=BL(I): PW(I+1)=PW(I): PQ(I+1)=PQ(I): CA(I+1)=CA(I):
PN$(I+1)=PN$(I)
1080 PL(I)=SPL: BL(I)=SBL: PW(I)=SPW: PQ(I)=SPQ: CA(I)=SCA: PN$(I)=SPN$
1090 I=I+1
1100 NEXT K
1110 K1=K1-1: I=ITS(J)
1120 IF K1=0 THEN 1130 ELSE 1040
1130 NEXT J
1140 GOSUB 1290
1150 INPUT "Enter 1 to print a hard copy & save cutting blank. 2 to save only";X1
3
1160 IF X13=1 THEN 1170 ELSE 1180
1170 GOSUB 1770
1180 OPEN "O",#1,CBNA$
1190 WRITE #1,BMO$,BBN$,BBS$,BBC$,BBST$,BBZ$,BBO$,S$,Q$,TH$,STD$,CBN$,D$,NC
1200 FOR I=1 TO NC STEP 1
1210 WRITE #1,PL(I),BL(I),PW(I),PQ(I),CA(I),PN$(I)
1220 NEXT I
1230 PRINT #1, ITT
1240 FOR I=1 TO ITT STEP 1
1250 WRITE #1, ITS(I),ITE(I)
1260 NEXT I
1270 CLOSE #1
1280 END
1290 CLS
1300 PRINT TAB(10) CHR$(14); "BLANKS BY XYZ CORPORATION"
1310 PRINT
1320 PRINT TAB(10) "Date";
1330 PRINT TAB(16) D$;
1340 PRINT TAB(45) "Order No.";
1350 PRINT TAB(55) BMO$
1360 PRINT
1370 PRINT "Customer Name:";
1380 PRINT TAB(20) BBN$;
1390 PRINT TAB(55) "Order No.";
1400 PRINT TAB(65) BBO$
1410 PRINT TAB(8) "Street:";
1420 PRINT TAB(20) BBS$;
1430 PRINT TAB(55) "CB Number:";
1440 PRINT TAB(66) CBN$
1450 PRINT TAB(10) "City:";
1460 PRINT TAB(20) BBC$;
1470 PRINT TAB(30) BBST$;
1480 PRINT TAB(35) BBZ$
1490 PRINT
1500 PRINT " Blank Specifications:";
```

```
1510 PRINT TAB(25) S$;
1520 PRINT TAB(45) Q$;
1530 PRINT TAB(55) TH$;
1540 PRINT TAB(60) STD$
1550 PRINT
1560 PRINT "Line Blank  Part    Part   Part     Case        Part"
1570 PRINT "No.  Length Length  Width  Quantity Number      Name"
1580 PRINT "      (in)   (in)    (in)  (number)"
1590 FOR I=1 TO NC STEP 1
1600 PRINT USING OD1$;I;BL(I);PL(I);PW(I);PQ(I);CA(I);PN$(I)
1610 X7=X7+1
1620 IF X7=10 THEN 1630 ELSE 1660
1630 PRINT "Hit F5 to continue"
1640 STOP
1650 X7=0
1660 NEXT I
1670 PRINT
1680 PRINT TAB(5) "Number of Different Blank Lengths";
1690 PRINT TAB(41) ITT
1700 FOR I=1 TO ITT STEP 1
1710 PRINT TAB(5) "Line No. Blank Length Start";
1720 PRINT TAB(32) ITS(I);
1730 PRINT TAB(40) "Line no. Blank Length End";
1740 PRINT TAB(66) ITE(I)
1750 NEXT I
1760 RETURN
1770 LPRINT: LPRINT: LPRINT
1780 LPRINT TAB(10) CHR$(14);"BLANKS BY XYZ CORPORATION"
1790 LPRINT
1800 LPRINT TAB(10) "Date";
1810 LPRINT TAB(16) D$;
1820 LPRINT TAB(45) "Order No.";
1830 LPRINT TAB(55) BMO$
1840 LPRINT
1850 LPRINT "Customer Name:";
1860 LPRINT TAB(20) BBN$;
1870 LPRINT TAB(55) "Order No.";
1880 LPRINT TAB(65) BBO$
1890 LPRINT TAB(8) "Street:";
1900 LPRINT TAB(20) BBS$;
1910 LPRINT TAB(55) "CB Number:";
1920 LPRINT TAB(66) CBN$
1930 LPRINT TAB(10) "City:";
1940 LPRINT TAB(20) BBC$;
1950 LPRINT TAB(30) BBST$;
1960 LPRINT TAB(35) BBZ$
1970 LPRINT
1980 LPRINT " Blank Specifications:";
1990 LPRINT TAB(25) S$;
2000 LPRINT TAB(45) Q$;
```

```
2010 LPRINT TAB(50) TH$;
2020 LPRINT TAB(55) STD$
2030 LPRINT
2040 LPRINT "Line Blank  Part    Part   Part     Case          Part"
2050 LPRINT "No.  Length Length  Width  Quantity Number        Name"
2060 LPRINT "      (in)   (in)    (in)  (number)"
2070 FOR I=1 TO NC STEP 1
2080 LPRINT USING OD1$;I;BL(I);PL(I);PW(I);PQ(I);CA(I);PN$(I)
2090 NEXT I
2100 LPRINT
2110 LPRINT TAB(5) "Number of Different Blank Lengths";
2120 LPRINT TAB(41) ITT
2130 LPRINT TAB(5) "Line No. Blank Length Start";
2140 LPRINT TAB(40) "Line no. Blank Length End"
2150 FOR I=1 TO ITT STEP 1
2160 LPRINT TAB(32) ITS(I);
2170 LPRINT TAB(66) ITE(I)
2180 NEXT I
2190 LPRINT CHR$(12)
2200 RETURN
```

```
1010 REM Use fraction of last blank
1020 IF BN1=0 THEN 1160 ELSE 1030
1030 II=I+1
1040 IF II>N THEN 990 ELSE 1050
1050 IF NNE(II)>0 THEN 1080 ELSE 1060
1060 II=II+1
1070 GOTO 1040
1080 LPC=(BN1*BWT)/(WT(II)+.125)
1090 IF LPC>NNE(II) THEN 1130 ELSE 1100
1100 NNE(II)=NNE(II)-LPC
1110 BN1=0!
1120 GOTO 1160
1130 BN1=((BN1*BWT)-(WT(II)+.125)*NNE(II))/BWT
1140 NNE(II)=0
1150 GOTO 990
1160 NEXT I
1170 TCOST=BLANKS*BPRICE*BLT*BWT/144
1180 BVOL=BLANKS*BLT*BWT/144
1190 REGP=REGLUE/144!/BVOL
1200 REGLUE=REGLUE/144
1210 UTILP=CSQFT/BVOL
1220 I5=I5+1
1230 SBLT(I5)=BLT
1240 SBWT(I5)=BWT
1250 SBSQFT(I5)=BVOL
1260 SCSQFT(I5)=CSQFT
1270 SUTILP(I5)=UTILP*100
1280 BBLANK(I5)=BLANKS
1290 STCOST(I5)=TCOST
1300 SREGP(I5)=REGP*100
1310 SRGVAL(I5)=TCOST*REGP
1320 SETRIM(I5)=(ETRIM/BVOL)*100
1330 SWASTP(I5)=(1!-UTILP-REGP)*100
1340 SKERFE(I5)=SWASTP(I5)-SETRIM(I5)
1350 S1=S1+SBSQFT(I5)
1360 S2=S2+SCSQFT(I5)
1370 S3=S3+REGLUE
1380 S4=S4+TCOST
1390 S5=S5+TCOST*REGP
1400 B1=B1+BLANKS
1410 W1=W1+ETRIM
1420 N10=0
1430 CYIELD=S2/S1*100
1440 RYIELD=S3/S1*100
1450 WYIELD=100-CYIELD-RYIELD
1460 W12=W1/S1*100
1470 W13=WYIELD-W12
1480 NEXT XX
1490 CLS
1500 N10=N10+1
```

```
1510 OD1$="       ###.###x##    #,####    ##,###.    ##,###.   ##.##   ##,###.##
   ##.##"
1520 OD2$="      ###.###x##    ##.##   ##,###.##    ##.##     ##.##      ##.##"
1530 OD3$="      ###.###  ##.###   ###,###"
1540 OD4$="##.##"
1550 OD5$="       Totals        #,####    ##,###.    ##,###.   ##.##  ###,###.##
"
1560 OD6$="       Totals       ##.##   ##,###.##    ##.##     ##.##      ##.##"
1570 PRINT:
1580 PRINT "          BLANKS BY XYZ CORPORATION"
1590 PRINT
1600 PRINT TAB(10) "Date";
1610 PRINT TAB(16) D$;
1620 PRINT TAB(45) "Order No";
1630 PRINT TAB(55) BMO$
1640 PRINT
1650 PRINT "CUSTOMER: Name:";
1660 PRINT TAB(20) BBN$;
1670 PRINT TAB(45) "Order No.";
1680 PRINT TAB(65) BBO$
1690 PRINT TAB(8) "Street:";
1700 PRINT TAB(20) BBS$;
1710 PRINT TAB(55) "CB Number:";
1720 PRINT TAB(62) CBN$
1730 PRINT TAB(10) "City.";
1740 PRINT TAB(20) BBC$;
1750 PRINT TAB(30) BBST$;
1760 PRINT TAB(35) BBZ$
1770 PRINT
1780 PRINT " Blank Specifications:";
1790 PRINT TAB(25) S$;
1800 PRINT TAB(45) Q$;
1810 PRINT TAB(55) TH$;
1820 PRINT TAB(60) STD$
1830 IF N10=1 THEN 1840 ELSE 1960
1840 PRINT
1850 PRINT TAB(8) " Blank Size   Blanks    Blanks    Parts     Yield     Price
 Price"
1860 PRINT TAB(8) "  (inches)   (number)   (sqft)    (sqft)     (%)     (dollars
)  ($/sqft)"
1870 PRINT
1880 FOR I6=1 TO I5 STEP 1
1890 PRINT USING OD1$;SBLT(I6);SBWT(I6);BBLANK(I6);SBSQFT(I6);SCSQFT(I6);SUTILP(
I6);STCOST(I6);BPRICEX(I6)
1900 NEXT I6
1910 PRINT
1920 PRINT USING OD5$;B1;S1;S2;CYIELD;S4
1930 PRINT "Hit F5 to see page 2"
1940 STOP
1950 GOTO 1490
1960 PRINT: PRINT: PRINT
1970 PRINT TAB(8) "Blank Size   Reglue    Reglue   End Waste Edge Waste Total"
1980 PRINT TAB(8) " (inches)      (%)     Value($)    (%)        (%)    Waste(%)
"
1990 PRINT
2000 FOR I6=1 TO I5 STEP 1
```

```
2010 PRINT USING OD2$;SBLT(I6);SBWT(I6);SREGP(I6);SRGVAL(I6);SETRIM(I6);SKERFE(I
6);SWASTP(I6)
2020 NEXT I6
2030 PRINT
2040 PRINT USING OD6$;RYIELD;S5;W12;W13;WYIELD
2050 INPUT "Enter 1 to print the results. Enter 2 for another run";XJ
2060 IF XJ=1 THEN 2070 ELSE END
2070 LPRINT: LPRINT: LPRINT
2080 LPRINT TAB(10) CHR$(14);" BLANKS BY XYZ CORPORATION"
2090 LPRINT
2100 LPRINT TAB(10) "Date";
2110 LPRINT TAB(16) D$;
2120 LPRINT TAB(45) "Order No.";
2130 LPRINT TAB(55) BMO$
2140 LPRINT
2150 LPRINT "CUSTOMER: Name:";
2160 LPRINT TAB(20) BBN$;
2170 LPRINT TAB(55) "Order No.";
2180 LPRINT TAB(65) BBO$
2190 LPRINT TAB(8) "Street:";
2200 LPRINT TAB(20) BBS$;
2210 LPRINT TAB(55) "CB Number:";
2220 LPRINT TAB(66) CBN$
2230 LPRINT TAB(10) "City.";
2240 LPRINT TAB(20) BBC$;
2250 LPRINT TAB(30) BBST$;
2260 LPRINT TAB(35) BBZ$
2270 LPRINT
2280 LPRINT " Blank Specifications:";
2290 LPRINT TAB(25) S$;
2300 LPRINT TAB(45) Q$;
2310 LPRINT TAB(50) TH$;
2320 LPRINT TAB(55) STD$
2330 LPRINT
2340 LPRINT TAB(8) " Blank Size   Blanks    Blanks    Parts     Yield     Price
  Price"
2350 LPRINT TAB(8) "  (inches)   (number)   (sqft)    (sqft)     (%)     (dollar
s)  ($/sqft)"
2360 LPRINT
2370 FOR I6=1 TO I5 STEP 1
2380 LPRINT USING OD1$;SBLT(I6);SBWT(I6);BBLANK(I6);SBSQFT(I6);SCSQFT(I6);SUTILP
(I6);STCOST(I6);BPRICEX(I6)
2390 NEXT I6
2400 LPRINT
2410 LPRINT USING OD5$;B1;S1;S2;CYIELD;S4
2420 LPRINT: LPRINT: LPRINT
2430 LPRINT TAB(8) "Blank Size   Reglue    Reglue   End Waste Edge Waste Total"
2440 LPRINT TAB(8) " (inches)      (%)     Value($)    (%)        (%)    Waste(%
)"
2450 LPRINT
2460 FOR I6=1 TO I5 STEP 1
2470 LPRINT USING OD2$;SBLT(I6);SBWT(I6);SREGP(I6);SRGVAL(I6);SETRIM(I6);SKERFE(
I6);SWASTP(I6)
2480 NEXT I6
2490 LPRINT
2500 LPRINT USING OD6$;RYIELD;S5;W12;W13;WYIELD
2510 LPRINT CHR$(12)
2520 END
```

APPENDIX III: Program CBPRINT

```
10 REM This program is used to print sorted CB files with iteration controls
20 REM This program is saved as "A:CBPRINT.BAS"; written in BASICA
30 DIM PL(100),PW(100),PQ(100),CA(100),PN$(100),BL(100),LN(100),ITS(13),ITE(13)
40 DIM SPL(100),SPW(100),SPQ(100),SCA(100),SPN$(100),SBL(100),SLN(100)
50 ITT=1: ITS(1)=0: ITE(1)=0
60 INPUT "Enter cutting bill name. Example CB1"; CBN$
70 CBNA$="B:"+CBN$+CHR$(46)+"DAT"
80 CLS
90 OPEN "I",#1,CBNA$
100 INPUT #1, BMO$,BBN$,BBS$,BBC$,BBST$,BBZ$,BBO$,S$,Q$,TH$,STD$,CBN$,D$,NC
110 FOR I=1 TO NC STEP 1
120 INPUT #1, PL(I),BL(I),PW(I),PQ(I),CA(I),PN$(I)
130 NEXT I
140 INPUT #1, ITT
150 FOR I=1 TO ITT STEP 1
160 INPUT #1, ITS(I),ITE(I)
170 NEXT I
180 CLOSE #1
190 OD1$="### ###.### ###.### ##.### ###,###  ####  \
      \"
200 CLS
210 PRINT TAB(10) CHR$(14); "BLANKS BY XYZ CORPORATION";
220 PRINT
230 PRINT TAB(10) "Date";
240 PRINT TAB(16) D$;
250 PRINT TAB(45) "Order No.";
260 PRINT TAB(55) BMO$
270 PRINT
280 PRINT "Customer Name:";
290 PRINT TAB(20) BBN$;
300 PRINT TAB(55) "Order No.";
310 PRINT TAB(65) BBO$
320 PRINT TAB(8) "Street:";
330 PRINT TAB(20) BBS$;
340 PRINT TAB(55) "CB Number:";
350 PRINT TAB(66) CBN$
360 PRINT TAB(10) "City:";
370 PRINT TAB(20) BBC$;
380 PRINT TAB(30) BBST$;
390 PRINT TAB(35) BBZ$
400 PRINT
410 PRINT " Blank Specifications:";
420 PRINT TAB(25) S$;
430 PRINT TAB(45) Q$;
440 PRINT TAB(55) TH$;
450 PRINT TAB(60) STD$
460 PRINT
470 PRINT "Line Blank  Part    Part   Part     Case       Part"
480 PRINT "No.  Length Length  Width  Quantity Number     Name"
490 PRINT "      (in)   (in)    (in)  (number)"
500 FOR I=1 TO NC STEP 1
510 PRINT USING OD1$;I;BL(I);PL(I);PW(I);PQ(I);CA(I);PN$(I)
520 NEXT I
530 PRINT
540 PRINT TAB(5) "Number of Different Blank Lengths";
```

```
550 PRINT TAB(41) ITT
560 FOR I=1 TO ITT STEP 1
570 PRINT TAB(5) "Line No. Blank Length Start";
580 PRINT TAB(32) ITS(I);
590 PRINT TAB(40) "Line no. Blank Length End";
600 PRINT TAB(66) ITE(I)
610 NEXT I
620 INPUT "Enter 1 to print cutting bill. Enter 2 to end program";X2
630 IF X2=1 THEN 640 ELSE END
640 LPRINT: LPRINT: LPRINT
650 LPRINT TAB(10) CHR$(14);"BLANKS BY XYZ CORPORATION"
660 LPRINT
670 LPRINT TAB(10) "Date";
680 LPRINT TAB(16) D$;
690 LPRINT TAB(45) "Order No.";
700 LPRINT TAB(55) BMO$
710 LPRINT
720 LPRINT "Customer Name:";
730 LPRINT TAB(20) BBN$;
740 LPRINT TAB(55) "Order No.";
750 LPRINT TAB(65) BBO$
760 LPRINT TAB(8) "Street:";
770 LPRINT TAB(20) BBS$;
780 LPRINT TAB(55) "CB Number:";
790 LPRINT TAB(66) CBN$
800 LPRINT TAB(10) "City:";
810 LPRINT TAB(20) BBC$;
820 LPRINT TAB(30) BBST$;
830 LPRINT TAB(35) BBZ$
840 LPRINT
850 LPRINT " Blank Specifications:";
860 LPRINT TAB(25) S$;
870 LPRINT TAB(45) Q$;
880 LPRINT TAB(50) TH$;
890 LPRINT TAB(55) STD$
900 LPRINT
910 LPRINT "Line Blank  Part    Part   Part     Case       Part"
920 LPRINT "No.  Length Length  Width  Quantity Number     Name"
930 LPRINT "      (in)   (in)    (in)  (number)"
940 FOR I=1 TO NC STEP 1
950 LPRINT USING OD1$;I;BL(I);PL(I);PW(I);PQ(I);CA(I);PN$(I)
960 NEXT I
970 LPRINT
980 LPRINT TAB(5) "Number of Different Blank Lengths";
990 LPRINT TAB(41) ITT
1000 LPRINT TAB(5) "Line No. Blank Length Start";
1010 LPRINT TAB(40) "Line no. Blank Length End"
1020 FOR I=1 TO ITT STEP 1
1030 LPRINT TAB(32) ITS(I);
1040 LPRINT TAB(66) ITE(I)
1050 NEXT I
1060 LPRINT CHR$(12)
1070 END
```

APPENDIX IV: Program CBIPRINT

```
10 REM This program is used to print CBINDEX file
20 REM This program is saved as "A:CBIPRINT.BAS"; written in BASICA
30 DIM BMO$(100),BBN$(100),BBS$(100),BBC$(100),BBST$(100),BBZ$(100)
40 DIM BBO$(100),S$(100),Q$(100),TH$(100),STD$(100),CBN$(100),D$(100),NC(100)
50 N=0
60 OPEN "I",#1,"B:CBINDEX.DAT"
70 FOR I=1 TO 100 STEP 1
80 INPUT #1, BMO$(I),BBN$(I),BBS$(I),BBC$(I),BBST$(I),BBZ$(I),BBO$(I),S$(I),Q$(I
),TH$(I),STD$(I),CBN$(I),D$(I),NC(I)
90 N=N+1
100 IF EOF(1) THEN 130
110 NEXT I
120 CLOSE #1
130 CLS
140 FOR I=1 TO N STEP 1
150 PRINT TAB(10) CHR$(14); "BLANKS BY XYZ CORPORATION";
160 PRINT
170 PRINT TAB(10) "Date";
180 PRINT TAB(16) D$(I);
190 PRINT TAB(45) "Order No.";
200 PRINT TAB(55) BMO$(I)
210 PRINT
220 PRINT "Customer Name:";
230 PRINT TAB(20) BBN$(I);
240 PRINT TAB(55) "Order No.";
250 PRINT TAB(65) BBO$(I)
260 PRINT TAB(8) "Street:";
270 PRINT TAB(20) BBS$(I);
280 PRINT TAB(55) "CB Number:";
290 PRINT TAB(66) CBN$(I)
300 PRINT TAB(10) "City:";
310 PRINT TAB(20) BBC$(I);
320 PRINT TAB(30) BBST$(I);
330 PRINT TAB(35) BBZ$(I)
340 PRINT
350 PRINT " Blank Specifications:";
360 PRINT TAB(25) S$(I);
370 PRINT TAB(45) Q$(I);
380 PRINT TAB(55) TH$(I);
390 PRINT TAB(60) STD$(I)
400 PRINT: PRINT
410 NEXT I
420 INPUT "Enter 1 to print cutting billindex. Enter 2 to end program";X2
430 IF X2=1 THEN 440 ELSE END
440 FOR I=1 TO N STEP 1
450 LPRINT: LPRINT: LPRINT
460 LPRINT TAB(10) CHR$(14);"BLANKS BY XYZ CORPORATION"
470 LPRINT
480 LPRINT TAB(10) "Date";
490 LPRINT TAB(16) D$(I);
500 LPRINT TAB(45) "Order No.";
```

```
510 LPRINT TAB(55) BMO$(I)
520 LPRINT
530 LPRINT "Customer Name:";
540 LPRINT TAB(20) BBN$(I);
550 LPRINT TAB(55) "Order No.";
560 LPRINT TAB(65) BBO$(I)
570 LPRINT TAB(8) "Street:";
580 LPRINT TAB(20) BBS$(I);
590 LPRINT TAB(55) "CB Number:";
600 LPRINT TAB(66) CBN$(I)
610 LPRINT TAB(10) "City:";
620 LPRINT TAB(20) BBC$(I);
630 LPRINT TAB(30) BBST$(I);
640 LPRINT TAB(35) BBZ$(I)
650 LPRINT
660 LPRINT " Blank Specifications:";
670 LPRINT TAB(25) S$(I);
680 LPRINT TAB(45) Q$(I);
690 LPRINT TAB(50) TH$(I);
700 LPRINT TAB(55) STD$(I)
710 LPRINT: LPRINT
720 NEXT I
730 END
```

Reynolds, Hugh W.; Araman; Philip A. Program BLANKS on the IBM-PC. Gen. Tech. Rep. NE-107. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1986. 28 p.

Describes a computer program that allows a company to determine the number of edge-glued, standard-size blanks needed to satisfy the rough-part needs specified in a given cutting bill. Program BLANKS has been written in FORTRAN using 80 column card input for use on a mainframe computer. The program has been translated to BASICA for use on the IBM-PC. Also described are rough-part cutting bill input file creation and manual sorting programs. A sample rough-part cutting bill and a blanks analysis are included.

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