

# **DIMENSIONAL STANDARDS**

## **DISC PHONOGRAPH RECORDS FOR HOME USE**

**Bulletin No. E 4**

*Also Includes:*

## **STANDARD RECORDING AND REPRODUCING CHARACTERISTIC**

**Bulletin No. E 1**



**Revised: November 6, 1978**

These are dimensional standards to facilitate equipment design and assure interchangeability. They are not intended to indicate or imply quality or performance levels.

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# R. I. A. A. DIMENSIONAL CHARACTERISTICS

## 33<sup>1</sup>/<sub>3</sub> RPM PHONOGRAPH RECORDS FOR HOME USE

DESCRIPTION	7" Records		10" Records		12" Records	
	(millimeters)	inches	(millimeters)	inches	(millimeters)	inches
<b>Outside Diameter</b>	(174.6 ± .8mm)	6.875 ± 0.031"	(250.8 ± .8mm)	9.875 ± 0.031"	(301.6 ± .8mm)	11.875 ± 0.031"
<b>Thickness</b>						
a. Flush Design	(1.9 + .3mm - .4mm)	.075 + .010" - .015"	(1.9 ± .3mm)	.075" ± .010"	(1.9 ± .3mm)	.075" ± .010"
b. Contour Design (See drawings)	Fig. 2; Fig. 3		Figure 1		Figure 1	
<b>Center Hole Diameter</b>	(Same as 10")		(7.26 + .025mm - .05mm)	0.286 "+ 0.001" - 0.002"	(Same as 10")	
<b>Center of Gravity</b> Max. Balance Dia. Concentric with Hole	(11.1mm)	0.437"	(11.1mm)	0.437"	(11.1mm)	0.437"
<b>Lead-in Spiral</b>						
a. To start at record edge						
b. Grooves per inch	(Same as 10")		16 ± 2		(Same as 10")	
c. Contour to be same as recording grooves						
NOTE: In addition, there shall be at least one complete unmodulated groove at recording pitch.						
<b>Margin Diameter,</b> the outer set-down limit of reproducing stylus.	(172.2mm)	6.781"	(246.8mm)	9.719"	(297.6mm)	11.719"
<b>Diameter of Outermost Groove at Recording Pitch</b>	(168.3mm)	6.625" MAX	(241.3mm)	9.500" MAX	(292.1mm)	11.500" MAX
<b>Recording Groove Contour</b>						
a. Included Angle	(Same as 10")		90° ± 5°		(Same as 10")	
b. Bottom Radius	(Same as 10")		(0.006mm)	0.00025" max.	(Same as 10")	
c. Width—Monophonic	(Same as 10")		(0.056mm)	0.0022"	(Same as 10")	
d. Width—Stereophonic—Instantaneous	(Same as 10")		(0.025mm)	.0010" min.	(Same as 10")	
<b>Minimum Inside Diameter of Recording</b>	(108mm)	4.250"	(120.6mm)	4.750"	(Same as 10")	

# R. I. A. A. DIMENSIONAL CHARACTERISTICS

## 33 $\frac{1}{3}$ RPM PHONOGRAPH RECORDS FOR HOME USE

DESCRIPTION	7" Records		10" Records		12" Records		
	(millimeters)	inches	(millimeters)	inches	(millimeters)	inches	
<b>Runout of Recording Grooves Related to Center Hole</b>  Note: This TIR measurement is to be independent of recording pitch.	(Same as 10")		(0.41mm)	0.016" MAX TIR	(Same as 10")		
<b>Lead-out Spiral</b>  Note: The number of grooves per inch shall be so chosen that the spiral contains at least one complete revolution.	(Same as 10")		2 to 6 grooves/inch		(Same as 10")		
<b>Stopping Groove, Closed Concentric Circle</b>  a. Diameter	$\left( \begin{array}{c} 98.4+0\text{mm} \\ -2\text{mm} \end{array} \right)$	$3.875-0.000''$ $-0.078$	$(106.4\pm.8\text{mm})$	$4.187\pm0.031''$	(Same as 10")		
b. Width							
	(Same as 10")		(.08)	0.003"	(Same as 10")		
<b>Direction of Rotation—</b> Clockwise, when observer faces side of record being played.							
<b>Rotational Speed</b> with 60 Hz line freq. max speed error $\pm 0.5\%$	33-1/3 RPM		33-1/3 RPM		33-1/3 or 45RPM		
<b>Crossover Spiral</b> The number of grooves joining successive bands on a record shall not be less than 16 per inch.							

## CROSS SECTION 10" & 12" CONTOURED RECORDS

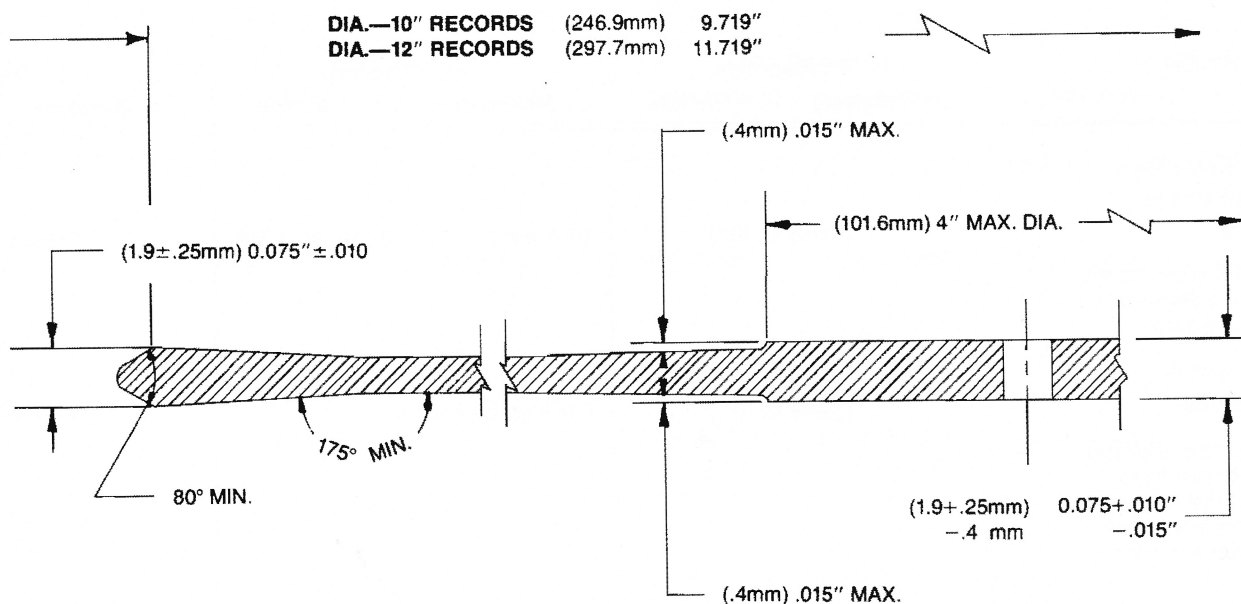


Figure 1

## ALTERNATE CROSS SECTION, 7"-33-1/3 RPM CONTOURED RECORDS

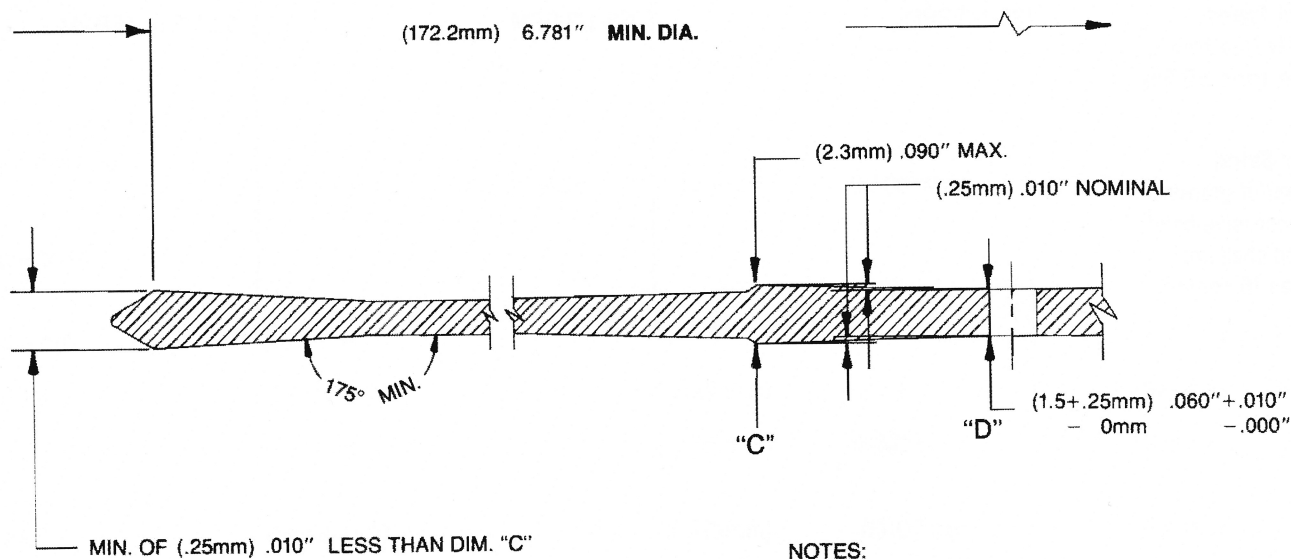


Figure 2

### NOTES:

Thickness D not greater than C.  
 Applicable dimensions not shown are same as Figure 3.  
 No portion of the label area inside its perimeter shall extend beyond a plane through the circle of the surface of the perimeter.



# 33-1/3 RPM 7" RECORD DIMENSIONS

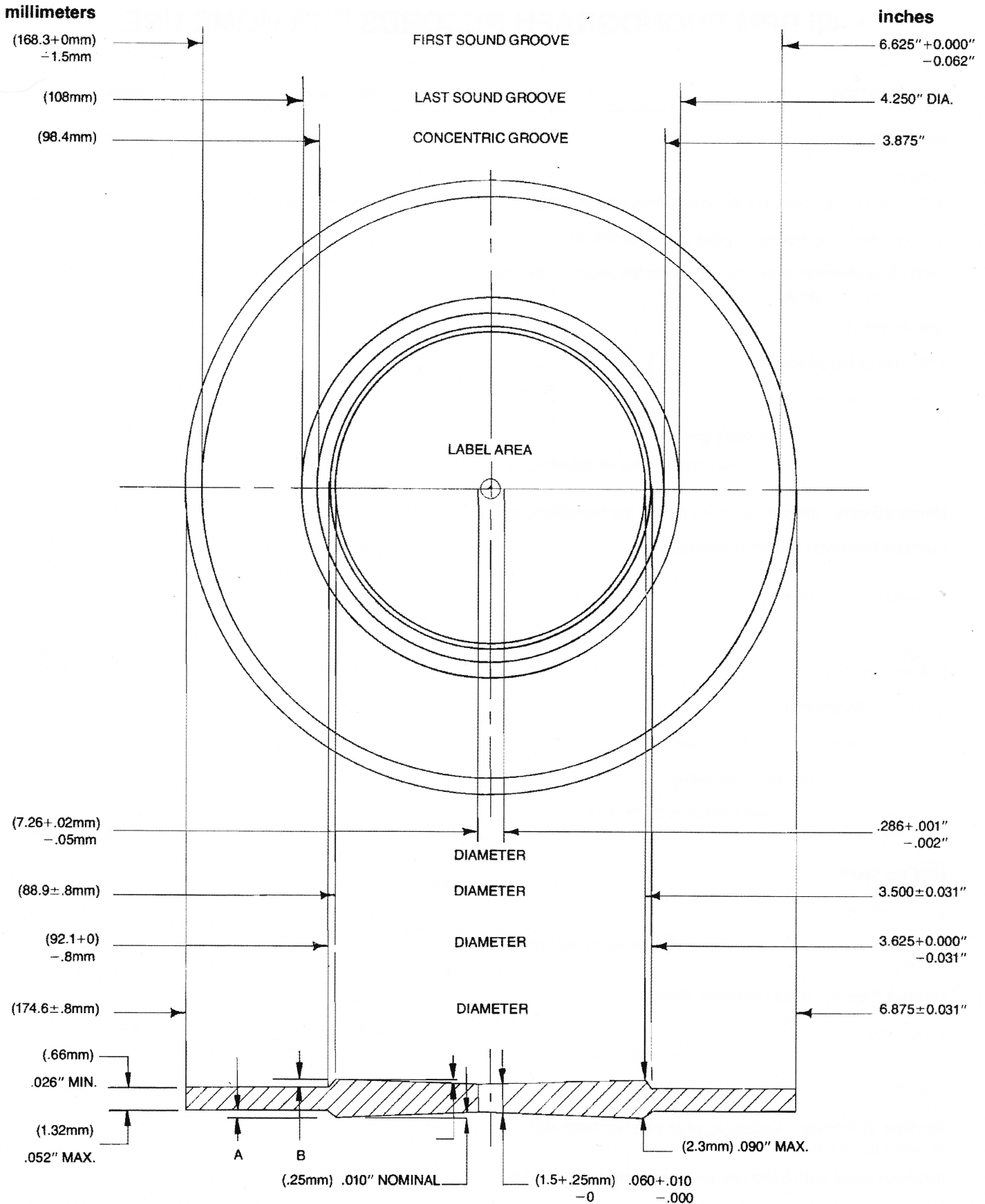


Figure 3

## NOTES:

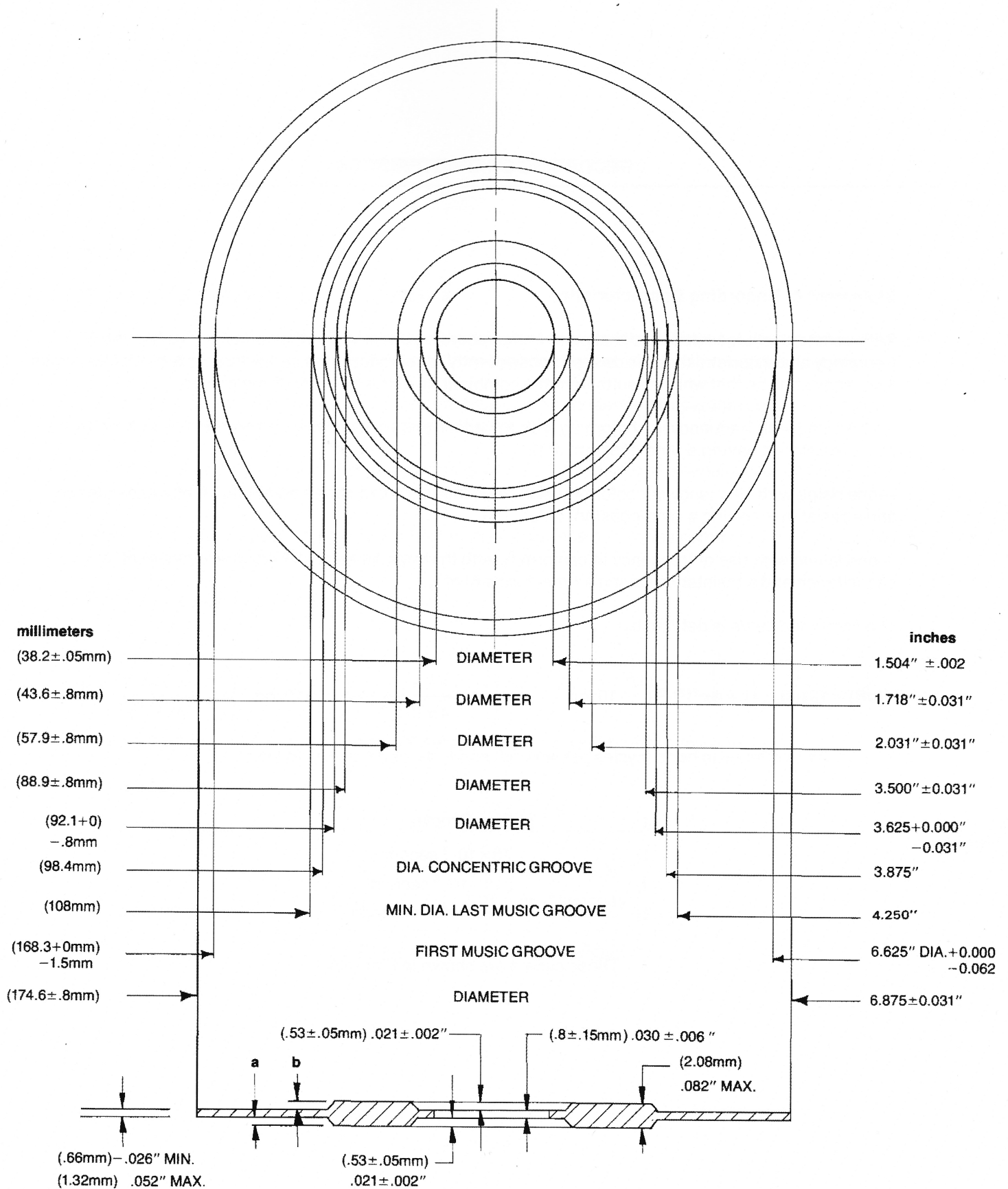
STEPS A AND B SHALL NOT DIFFER BY MORE THAN .010 (.25mm)  
No portion of the label area inside its perimeter shall extend beyond a plane through the circle of the surface at the perimeter.

# R. I. A. A. DIMENSIONAL CHARACTERISTICS

## 45 RPM PHONOGRAPH RECORDS FOR HOME USE

DESCRIPTION	(millimeters)	inches
<b>Outside Diameter</b>	(174.6 ± .8mm)	6.875 ± 0.031"
<b>Thickness</b>		
a. Recording area, measured at 4 points from edge 90° apart	(.66mm—1.32mm)	0.026"—0.052" max.
b. Label area—see drawing of cross section (attached)		
<b>Center hole diameter</b> to be measured under the weight of the record on a tapered plug gauge.	(38.2 ± .05mm)	1.504 ± 0.002"
<b>Lead-in Spiral</b>		
a. To start at record edge		
b. Grooves per inch		16±2
c. Shape to be same as recording grooves		
NOTE: In addition there shall be at least one complete unmodulated groove at recording pitch.		
<b>Margin diameter</b> , the outer set-down limit of the reproducing stylus	(172.2mm)	6.781"
<b>Diameter Outermost Groove</b> at Recording Pitch	$\left( \begin{array}{c} 168.3+0\text{mm} \\ -1.5\text{mm} \end{array} \right)$	$\begin{array}{c} 6.625+0.000" \\ -0.062" \end{array}$
<b>Recording Groove Contour</b>		
a. Included angle	90° ± 5°	
b. Bottom radius	(.006mm)	0.00025" max.
c. Width—Monophonic	(0.056mm)	.0022"
d. Width—Stereophonic, Instantaneous	(.025mm)	.001" min.
<b>Minimum Inside Diameter</b> of Recording	(108mm)	4.25"
<b>Runout of Recording Grooves</b> Relative to Center Hole (Total Indicated Runout)	(0.4mm)	0.016" MAXTIR
<b>Lead-out Spiral</b>		
a. Grooves per inch	2-5	
b. Contour, same as recording grooves except width may increase to 0.006"		
<b>Stopping Groove</b> , Closed Concentric Circle		
a. Diameter	$\left( \begin{array}{c} 98.4+0\text{mm} \\ -2\text{mm} \end{array} \right)$	$\begin{array}{c} 3.875+0.000" \\ -0.078" \end{array}$
b. Width	(.08mm)	0.003" MIN
<b>Direction of Rotation</b> —Clockwise, when observer faces side of record being played		
<b>Rotational Speed</b> with 60Hz line freq., max speed error ±0.5%	45 RPM	
<b>Crossover Spiral</b>		
The number of grooves joining successive bands on a record shall not be less than 16 per inch.		

# 45 RPM 7" RECORD DIMENSIONS



STEPS "a" AND "b" SHALL NOT DIFFER BY MORE THAN .010 (.25mm)

## RECORDING CHARACTERISTICS

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### Statement of Recording Characteristics

With constant voltage applied to that point in the recording chain where the normal signal has the frequency characteristic that it is desired subsequently to reproduce, the curve of recorded velocity versus frequency shall be that which results from the combination of the following three curves:

—one rising with frequency in conformity with the admittance of a parallel combination of a capacitance and a resistance having a time-constant of  $t_1$ ,

—one rising with frequency in conformity with the admittance of a series combination of a capacitance and a resistance having a time-constant of  $t_2$ ,

—one falling with rise of frequency in conformity with the impedance of a series combination of a capacitance and a resistance having a time-constant of  $t_3$ .

The combined curve is defined by:

$$N(\text{dB}) = 10 \log \left( 1 + 4\pi^2 f^2 t_1^2 \right) - 10 \log \left( 1 + \frac{1}{4\pi^2 f^2 t_2^2} \right) + 10 \log \left( 1 + \frac{1}{4\pi^2 f^2 t_3^2} \right)$$

where  $f$  is the frequency in hertz (cycles per second) and  $t_1$ ,  $t_2$ , and  $t_3$  are as follows:

$t$	Fine Groove
$t_1$	$75 \times 10^{-6}$ seconds
$t_2$	$318 \times 10^{-6}$ seconds
$t_3$	$3180 \times 10^{-6}$ seconds

These curves are shown in Figure A.

## REPRODUCING CHARACTERISTICS

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### Statement of Reproducing Characteristics

With constant velocity of the reproducing stylus tip, the curve of voltage output of the reproducing chain versus frequency shall be that which results from the combination of the following three curves:

- one falling with rise of frequency in conformity with the impedance of a parallel combination of a capacitance and a resistance having a time-constant of  $t_1$ ,
- one falling with rise of frequency in conformity with the impedance of a series combination of a capacitance and a resistance having a time-constant of  $t_2$ ,
- one rising with frequency in conformity with the admittance of a series combination of a capacitance and a resistance having a time-constant of  $t_3$ .

The combined curve is defined by:

$$N(\text{dB}) = 10 \log \left( 1 + \frac{1}{4\pi^2 f^2 t_2^2} \right) - 10 \log \left( 1 + 4\pi^2 f^2 t_1^2 \right) - 10 \log \left( 1 + \frac{1}{4\pi^2 f^2 t_3^2} \right)$$

where  $f$  is the frequency in hertz (cycles per second) and  $t_1$ ,  $t_2$ , and  $t_3$  are as follows:

$t$	Fine Groove
$t_1$	$75 \times 10^{-6}$ seconds
$t_2$	$318 \times 10^{-6}$ seconds
$t_3$	$3180 \times 10^{-6}$ seconds

These curves are shown in Figure A.

FREQUENCY	RECORDING CHARACTERISTIC	REPRODUCING CHARACTERISTIC
20000	+19.60	-19.60
18000	+18.70	-18.70
16000	+17.70	-17.70
15000	+17.17	-17.17
14000	+16.64	-16.64
13000	+15.95	-15.95
12000	+15.28	-15.28
11000	+14.55	-14.55
10000	+13.75	-13.75
9000	+12.88	-12.88
8000	+11.91	-11.91
7000	+10.85	-10.85
6000	+ 9.62	- 9.62
5000	+ 8.23	- 8.23
4000	+ 6.64	- 6.64
3000	+ 4.76	- 4.76
2000	+ 2.61	- 2.61
1000	0	0
700	- 1.23	+ 1.23
400	- 3.81	+ 3.81
300	- 5.53	+ 5.53
200	- 8.22	+ 8.22
100	-13.11	+13.11
70	-15.31	+15.31
50	-16.96	+16.96
30	-18.61	+18.61
20	-19.30	+19.30



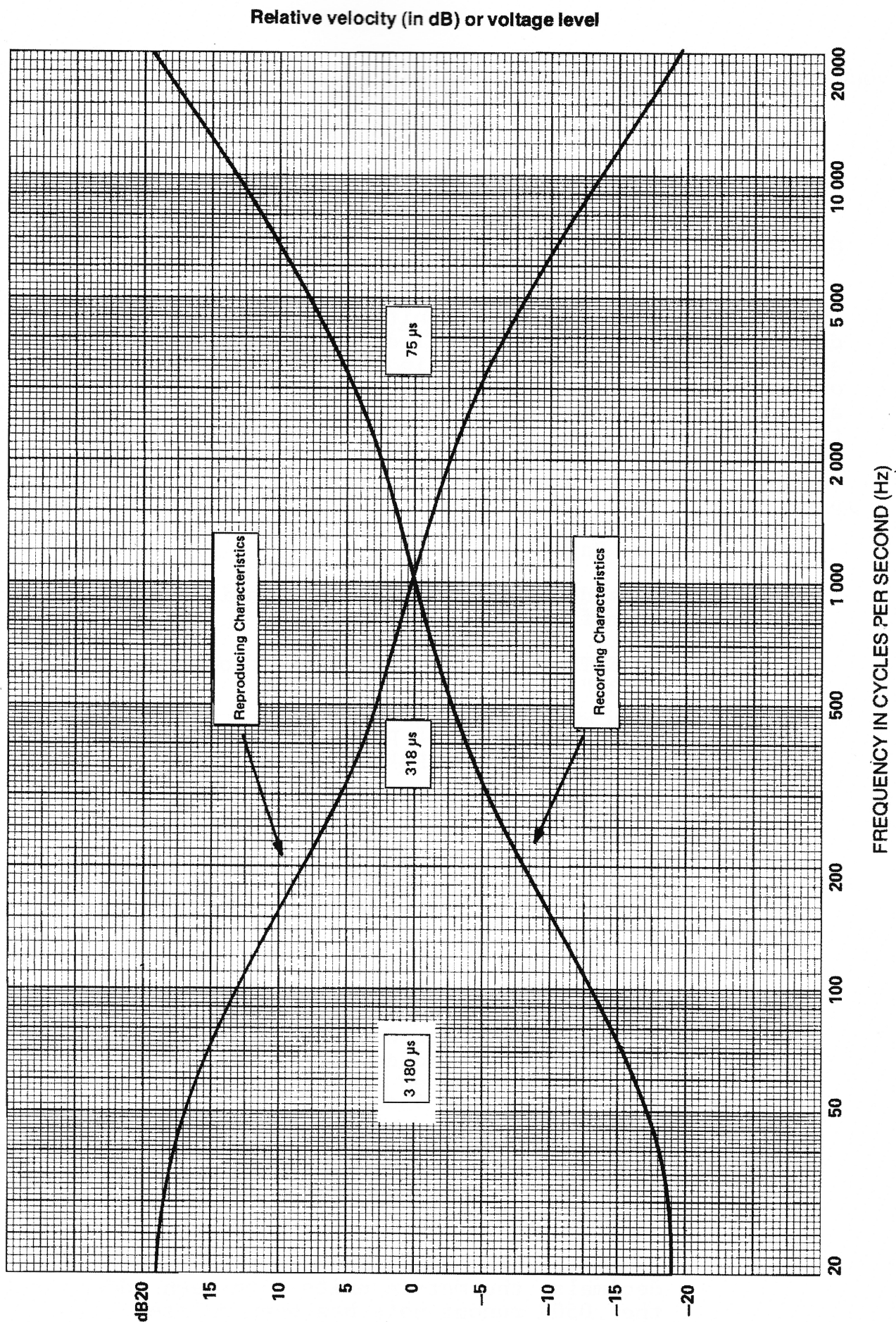


FIG. A—CHARACTERISTICS FOR FINE GROOVE DISC RECORDS.



## OUTLINE OF REVISIONS TO THE DIMENSIONAL STANDARD

### "DISC PHONOGRAPH RECORDS FOR HOME USE"

#### BULLETIN E-4

##### General:

The basic revision in this standard is the incorporation of metric as well as English units of measure, and the use of decimals rather than fractional dimensions. The practice of showing the metric dimensions in parenthesis is for clarity only, not to show any preference. Standards for 78-rpm discs and Serration standards for 45-rpm discs have been deleted from this bulletin. Also, the "Standard Recording And Reproducing Characteristic," Bulletin E-1, has been incorporated in this version. The following comments will identify the changes by page number:

##### Revisions on Page 1:

1. Outside Diameter: These dimensions were changed from fractions to decimals.
2. A CENTER OF GRAVITY specification was added at 0.437" diameter.
3. The LEAD-IN-SPIRAL pitch was revised from 16-32 LPI to  $16 \pm 2$  grooves per inch.
4. The Groove Width for monophonic recording was revised to .0022" and the .0032" maximum was deleted.

##### Revisions on Page 2:

1. The standard for groove run-out or eccentricity has been revised from the old limit of .050" to a Total Indicated Runout (TIR) of 0.016".
2. The Rotational Speed Specification has had the speed of 45-rpm added to the 12" Record, and a note has been added to show a speed error of  $\pm 0.5\%$  with a 60Hz line frequency.
3. The Serrations specifications and Figure #5 (the serration diagram) have been deleted.

##### Revisions on Page 3:

Generally, the dimensions have been changed to decimals, the metric units have been added, and the .050" runout note has been deleted.

Revisions on Page 4:

No major changes to actual dimensions.

Revisions on Page 5:

1. The lead-in pitch has been revised from 16-32 to to  $16 \pm 2$  grooves per inch.
2. The maximum width of the mono groove was .0032" and has been deleted.
3. The Runout of Recording Grooves has been revised from .050" maximum to 0.016" Total Indicated Runout (TIR).
4. The Stopping Groove width has been changed from .003" - .006" to a .003" minimum.
5. The Rotational Speed has had a tolerance note added.

Revisions on Page 6:

There are no changes other than decimal notations and metric dimensions.

Revisions on Page 7:

This page was previously devoted to 78-rpm standards, which have been deleted from the revised standard. Bulletin E-1, STANDARD RECORDING and REPRODUCING CHARACTERISTIC, with charts and curves extending to 20Hz and 20 Kilohertz, are now included on pages 7 thru 10 of this revised standard.