

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

33½ RPM PHONOGRAPH RECORDS FOR HOME USE

DESCRIPTION	7" Records		10" Records		12" Records	
	(millimeters)	inches	(millimeters)	inches	(millimeters)	inches
Outside Diameter	(174.6 ± .8mm)	6.875 ± 0.031"	(250.8 ± .8mm)	9.875 ± 0.031"	(301.6 ± .8mm)	11.875 ± 0.031"
Thickness						
a. Flush Design	$(1.9 + .3\text{mm})$ - .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
Center Hole Diameter	(Same as 10")		$(7.26 + .025\text{mm})$ - .05mm	0.286 " + 0.001" - 0.002"	(Same as 10")	
Center of Gravity						
Max. Balance Dia. Concentric with Hole	(11.1mm)	0.437"	(11.1mm)	0.437"	(11.1mm)	0.437"
Lead-in Spiral						
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.						
Margin Diameter, the outer set-down limit of reproducing stylus.	(172.2mm)	6.781"	(246.8mm)	9.719"	(297.6mm)	11.719"
Diameter of Outermost Groove at Recording Pitch	(168.3mm)	6.625" MAX	(241.3mm)	9.500" MAX	(292.1mm)	11.500" MAX
Recording Groove Contour						
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")	
Minimum Inside Diameter of Recording	(108mm)	4.250"	(120.6mm)	4.750"	(Same as 10")	

R. I. A. DIMENSIONAL CHARACTERISTICS

33½ RPM PHONOGRAPH RECORDS FOR HOME USE

DESCRIPTION	7" Records (millimeters) inches	10" Records (millimeters) inches	12" Records (millimeters) inches
Runout of Recording Grooves Related to Center Hole Note: This TIR measurement is to be independent of recording pitch.	(Same as 10")	(0.41mm) 0.016" MAX TIR	(Same as 10")
Lead-out Spiral 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")
Stopping Groove, Closed Concentric Circle a. Diameter $(98.4 + 0\text{mm}) \quad 3.875 - 0.000"$ $-2\text{mm} \quad -0.078$ b. Width Direction of Rotation— Clockwise, when observer faces side of record being played.	(Same as 10")	(106.4 \pm .8mm) 4.187 \pm 0.031" .08 0.003"	(Same as 10") (Same as 10")
Rotational Speed with 60 Hz line freq. max speed error $\pm 0.5\%$	33-1/3 RPM	33-1/3 RPM	33-1/3 or 45 RPM
Crossover Spiral The number of grooves joining successive bands on a record shall not be less than 16 per inch.			

CROSS SECTION 10" & 12" CONTOURED RECORDS

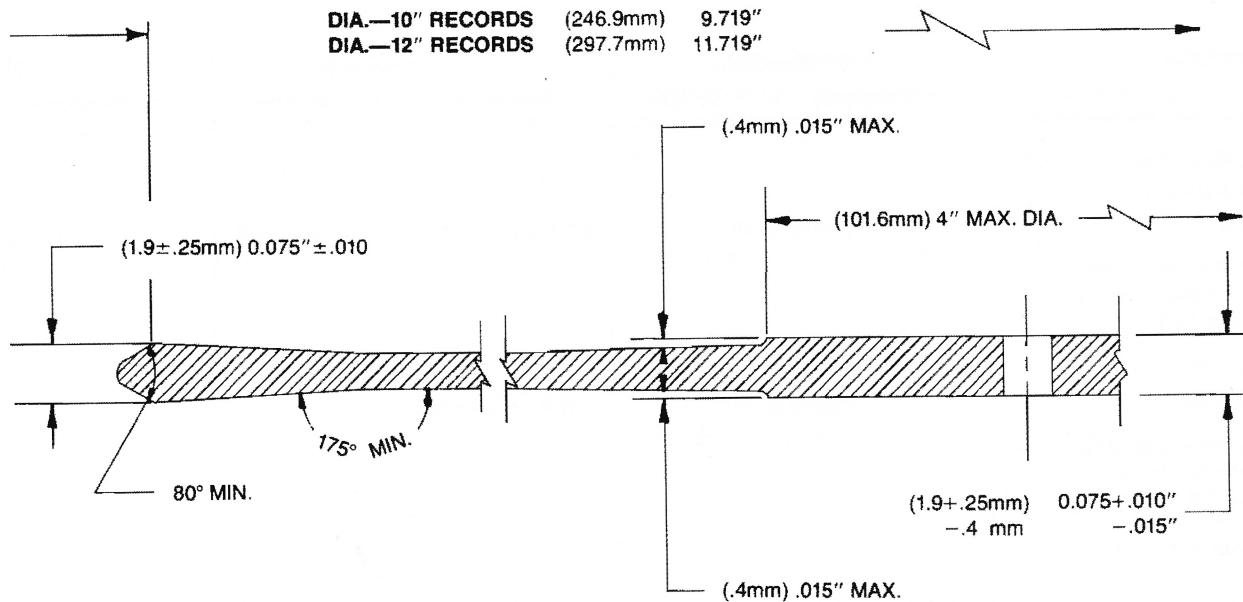


Figure 1

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

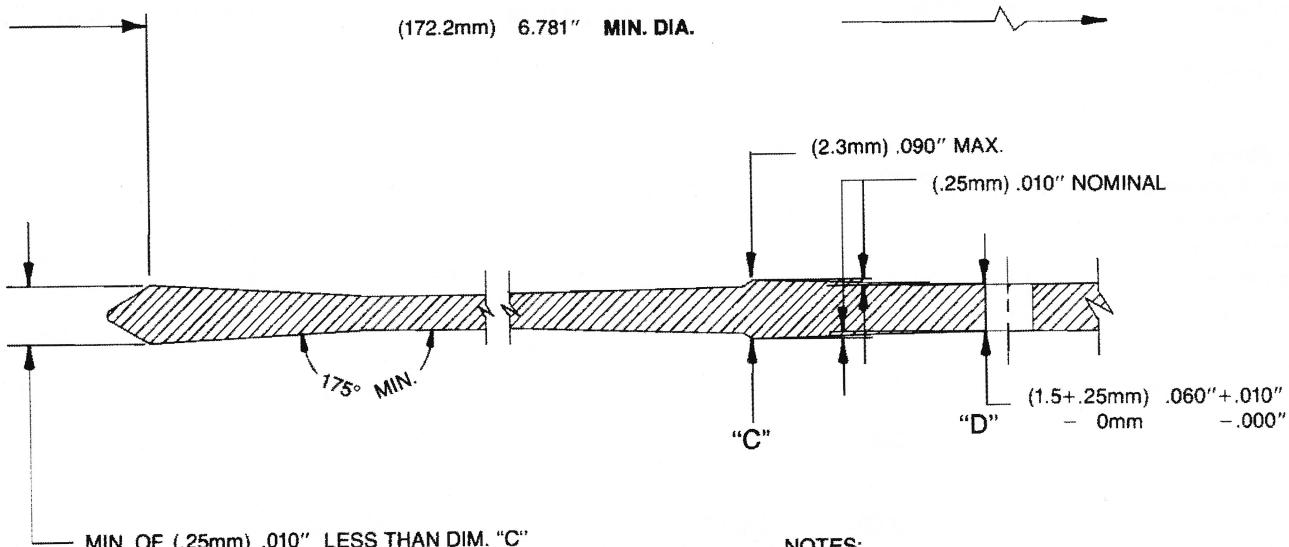


Figure 2

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

millimeters

inches

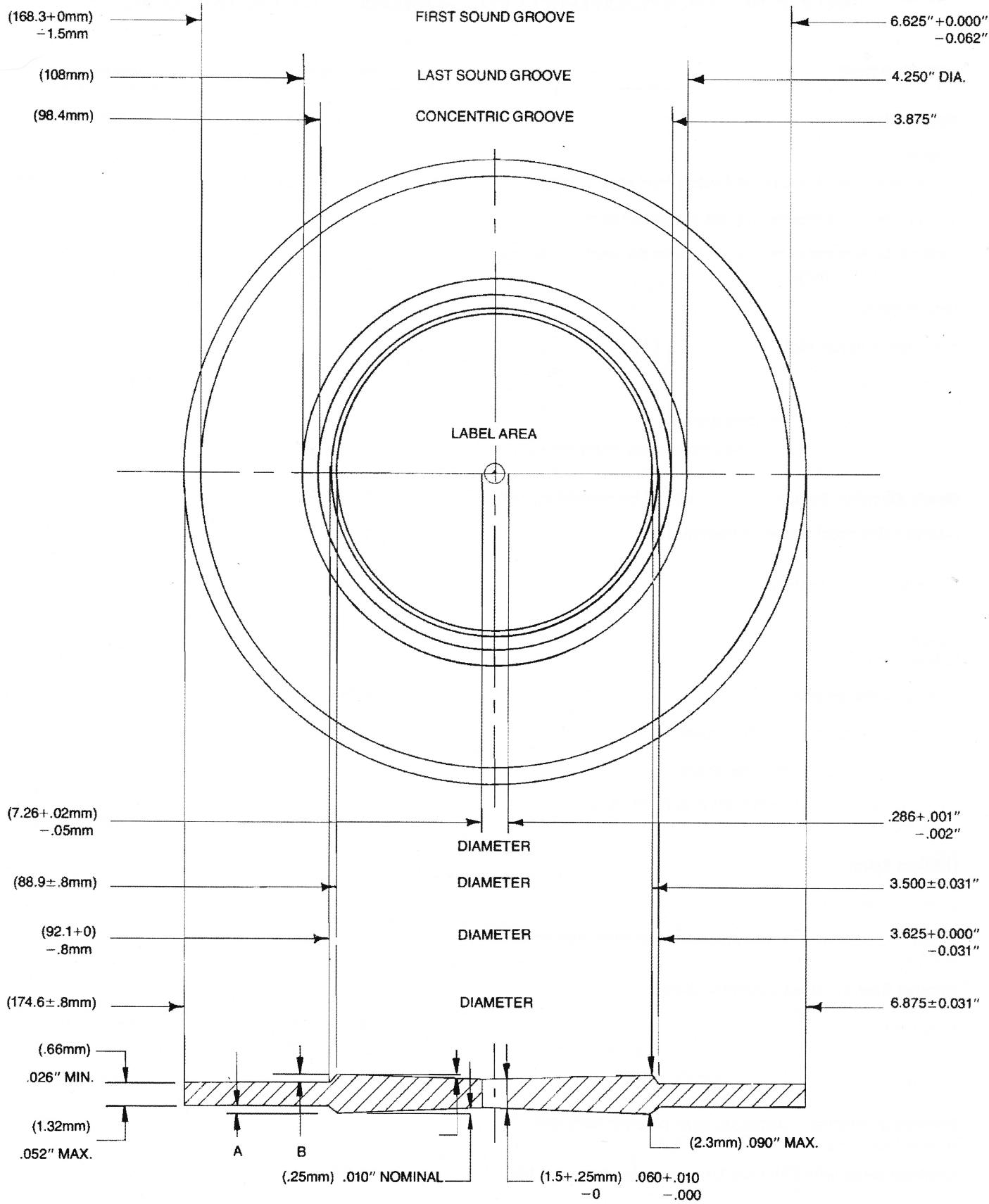


Figure 3

NOTES:

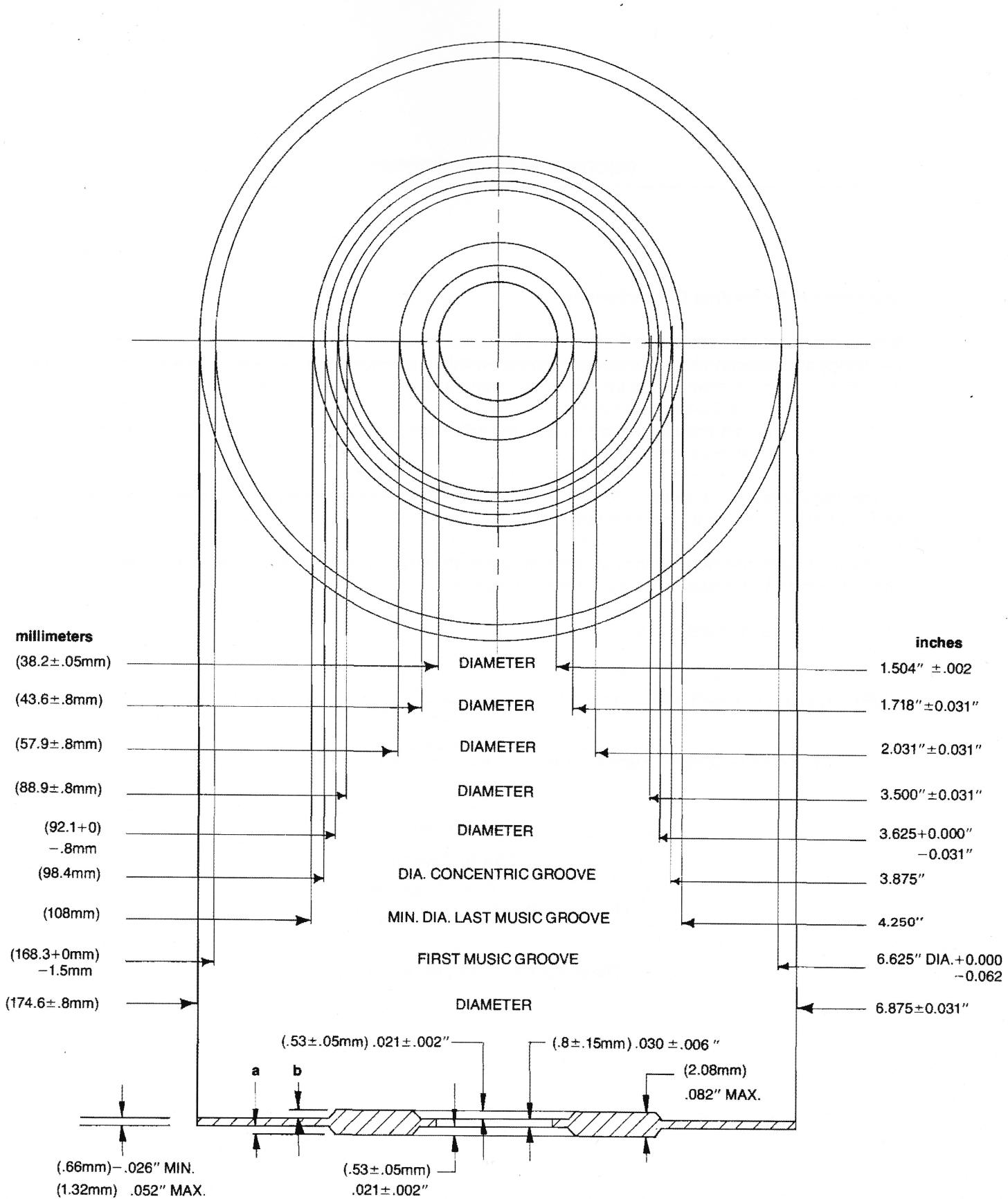
STEPS A AND B SHALL NOT DIFFER BY MORE THAN .010 (.25mm)
No portion of the label area inside its perimeter shall extend beyond
a plane through the circle of the surface at the perimeter.

R. I. A. DIMENSIONAL CHARACTERISTICS

45 RPM PHONOGRAPH RECORDS FOR HOME USE

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

45 RPM 7" RECORD DIMENSIONS



RECORDING CHARACTERISTICS

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	75×10^{-6} seconds
t_2	318×10^{-6} seconds
t_3	3180×10^{-6} seconds

These curves are shown in Figure A.

REPRODUCING CHARACTERISTICS

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	75×10^{-6} seconds
t_2	318×10^{-6} seconds
t_3	3180×10^{-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

Relative velocity (in dB) or voltage level

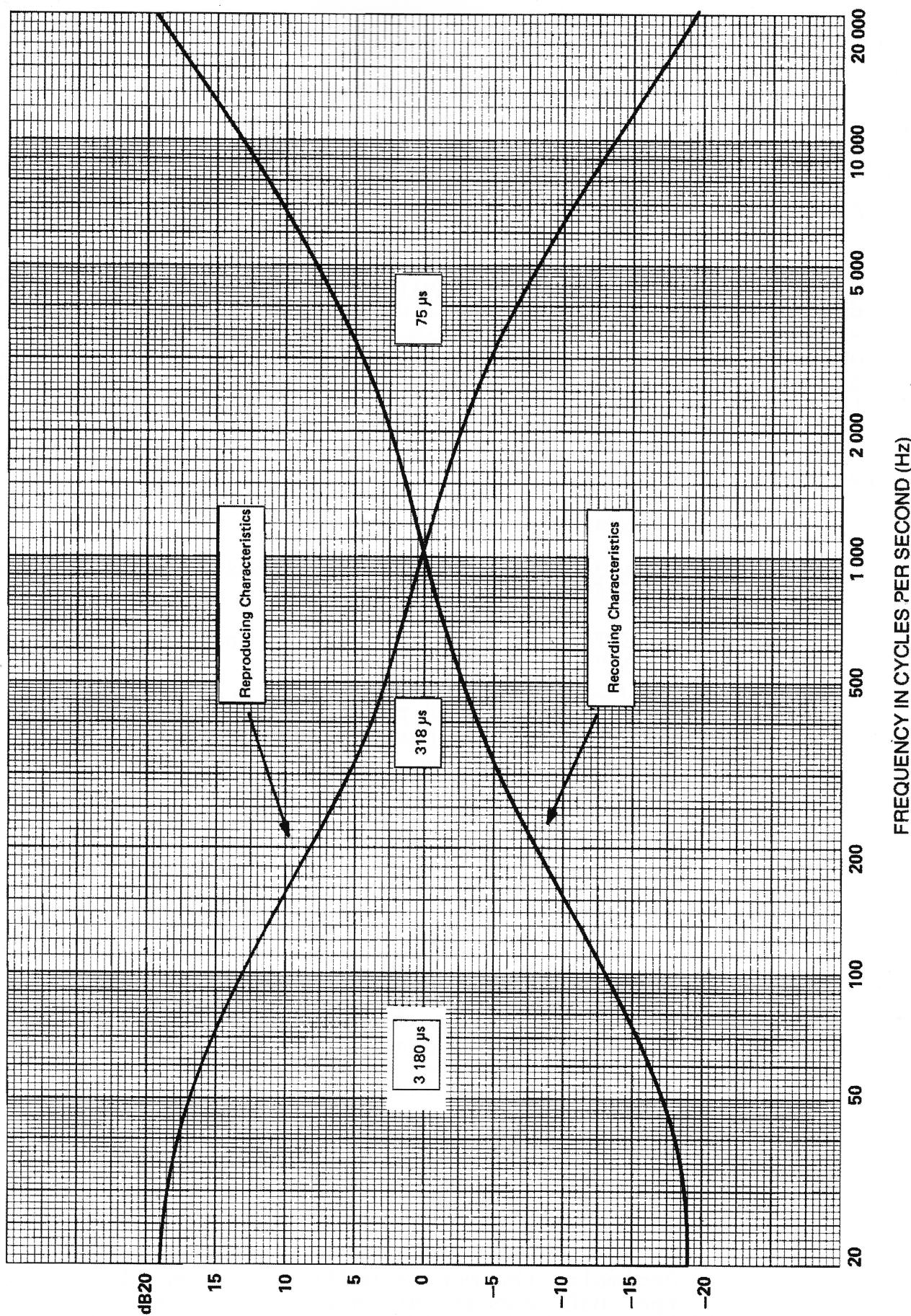


FIG. A—CHARACTERISTICS FOR FINE GROOVE DISC RECORDS.

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 ± 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 ± 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.