



# 21DFP4

## PICTURE TUBE

Low-Voltage Electrostatic  
Focus  
110° Magnetic Deflection

Aluminized Screen  
Very Short Rectangular Glass Type  
Requires No Ion-Trap Magnet

19-1/16" x 15-1/16" Screen  
21-1/2" Max. Bulb Diagonal  
14-3/4" Max. Length

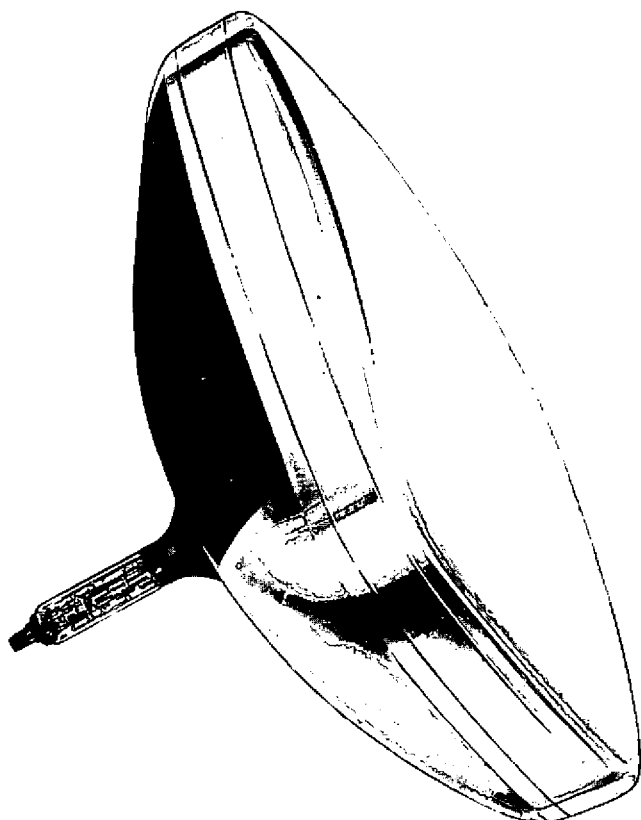
TENTATIVE DATA

RCA-21DFP4 is a very short, directly viewed, rectangular, glass picture tube of the low-voltage electrostatic-focus and magnetic-deflection

The 21DFP4 has a neck diameter of only 1-1/8" which not only makes possible the use of a deflecting yoke having high deflection sensitivity but also permits deflection of the beam through the wide deflection angle with only slightly more power than is required to scan a tube with 90° deflection angle.

The 21DFP4 utilizes an electron gun of the "straight" type designed to minimize deflection distortion. This electron gun eliminates the need for an ion-trap magnet.

Another design feature of the 21DFP4 is an integral glass-button base having straight-through leads fitted with an indexing plug. This basing arrangement eliminates any possibility of loose base-pin connections. In addition, the 21DFP4 has an external conductive bulb coating which with the internal conductive coating forms a supplementary filter capacitor.



type. It has a spherical filterglass faceplate, an aluminized screen 19-1/16" x 15-1/16" with slightly curved sides and rounded corners and a minimum projected screen area of 262 square inches.

Designed with a 110°-diagonal deflection angle, the 21DFP4 has very short length—a length approximately 5-1/2" shorter than types having the same size faceplate and 90° deflection. As a result, this tube establishes new concepts for cabinet styling and for the design of more compact TV receivers utilizing 21"-type picture tubes.

### DATA

#### General:

Heater, for Unipotential Cathode:		
Voltage (AC or DC) . . . . .	6.3	volts
Current . . . . .	0.6	amp
Direct Interelectrode Capacitances:		
Grid No. 1 to all other electrodes. . . . .	6	μmf
Cathode to all other electrodes. . . . .	5	μmf
External conductive coating to vitor •	{ 2200 max.	μmf
	{ 1500 min.	μmf
Faceplate, Spherical. . . . .	Filterglass	
Light transmission (Approx.). . . . .	73%	
Phosphor . . . . .	P4—Sulfide Type, Aluminized	
Fluorescence . . . . .	White	
Phosphorescence. . . . .	White	
Persistence. . . . .	Short	
Focusing Method. . . . .	Electrostatic	
Deflection Method. . . . .	Magnetic	
Deflection Angles (Approx.):		
Diagonal . . . . .	110°	
Horizontal . . . . .	105°	
Vertical . . . . .	87°	
Electron Gun . . . . .	Type Requiring No Ion-Trap Magnet	
Tube Dimensions:		
Overall length . . . . .	14-7/16" ± 5/16"	
Greatest width . . . . .	20-1/4" ± 1/8"	
Greatest height. . . . .	16-3/8" ± 1/8"	



Diagonal . . . . .	21-3/8" ± 1/8"
Neck length. . . . .	5-7/16" ± 1/8"
Screen Dimensions (Minimum):	
Greatest width . . . . .	19-1/16"
Greatest height. . . . .	15-1/16"
Diagonal . . . . .	20-1/4"
Projected area . . . . .	.262 sq. in.
Cap. . . . .	Recessed Small Cavity (JETEC No. J1-21)
Bulb . . . . .	J171 (110 <sup>0</sup> )
Base . . . . .	Small-Button Eightar 7-Pin, Arrangement 2, (JETEC No. B7-1B3)
Socket . . . . .	Ucinite Part No. 115446, or equivalent
Weight (Approx.) . . . . .	23 lbs
Mounting Position. . . . .	Any

### GRID-DRIVE<sup>▲</sup> SERVICE

Unless otherwise specified,  
voltage values are positive with respect to cathode

Maximum Ratings, Design-Center Values:

ULTOR <sup>●</sup> VOLTAGE . . . . .	{ 18000 max. volts 12000 <sup>Ⓢ</sup> min. volts
GRID-No. 4 VOLTAGE:	
Positive value . . . . .	1000 max. volts
Negative value . . . . .	500 max. volts
GRID-No. 2 VOLTAGE. . . . .	500 max. volts
GRID-No. 1 VOLTAGE:	
Negative peak value. . . . .	200 max. volts
Negative bias value. . . . .	140 max. volts
Positive bias value. . . . .	0 max. volts
Positive peak value. . . . .	2 max. volts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode . . . . .	180 max. volts
Heater positive with respect to cathode . . . . .	180 max. volts

#### Equipment Design Ranges:

With any ultor voltage ( $E_{c5k}$ ) between 12000 and 18000 volts and grid-No. 2 voltage ( $E_{c2k}$ ) between 300 and 500 volts

Grid-No. 4—Voltage for Focus <sup>§</sup> . . . . .	0 to 400	volts
Grid-No. 1 Voltage ( $E_{c1k}$ ) for Visual Extinction of Focused Raster . . . . .	See Raster-Cutoff-Range Chart for Grid-Drive Service	
Grid-No. 1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak positive). . . . .	Same value as determined for $E_{c1k}$ except video drive is a positive voltage	
Grid-No. 4 Current. . . . .	-25 to +25	μamp
Grid-No. 2 Current. . . . .	-15 to +15	μamp
Field Strength of Adjustable Centering Magnet*. . . . .	0 to 8	gausses

#### Examples of Use of Design Ranges:

With ultor voltage of . . . . .	14000	16000	volts
and grid-No. 2 voltage of . . . . .	300	400	volts
Grid-No. 4 Voltage for Focus. . . . .	0 to 400	0 to 400	volts
Grid-No. 1 Voltage for Visual Extinction of Focused Raster. . . . .	-28 to -72	-36 to -94	volts
Grid-No. 1 Video Drive from Raster Cutoff (Black Level):			
White-level value. . . . .	28 to 72	36 to 94	volts

#### Maximum Circuit Values:

Grid-No. 1—Circuit Resistance . . . . .	1.5 max.	megohms
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### CATHODE-DRIVE<sup>■</sup> SERVICE

Unless otherwise specified,  
voltage values are positive with respect to grid No. 1

#### Maximum Ratings, Design-Center Values:

ULTOR <sup>●</sup> -TO-GRID-No. 1 VOLTAGE. . . . .	{ 18000 max. volts 12000 <sup>Ⓢ</sup> min. volts
GRID-No. 4-TO-GRID-No. 1 VOLTAGE:	
Positive value . . . . .	1000 max. volts
Negative value . . . . .	500 max. volts
GRID-No. 2-TO-GRID-No. 1 VOLTAGE . . . . .	640 max. volts
GRID-No. 2-TO-CATHODE VOLTAGE . . . . .	500 max. volts
CATHODE-TO-GRID-No. 1 VOLTAGE:	
Positive peak value. . . . .	200 max. volts
Positive bias value. . . . .	140 max. volts
Negative bias value. . . . .	0 max. volts
Negative peak value. . . . .	2 max. volts
PEAK HEATER-CATHODE VOLTAGE:	
Heater negative with respect to cathode . . . . .	180 max. volts
Heater positive with respect to cathode . . . . .	180 max. volts

#### Equipment Design Ranges:

With any ultor-to-grid-No. 1 voltage ( $E_{c5g1}$ ) between 12000 and 18000 volts and grid-No. 2-to-grid-No. 1 voltage ( $E_{c2g1}$ ) between 225 and 640 volts

Grid-No. 4-to-Grid-No. 1 Voltage for Focus <sup>§</sup> . . . . .	0 to 400	volts
Cathode-to-Grid-No. 1 Voltage ( $E_{k1}$ ) for visual Extinction of Focused Raster. . . . .	See Raster-Cutoff-Range Chart for Cathode-Drive Service	
Cathode-to-Grid-No. 1 Video Drive from Raster Cutoff (Black Level):		
White-level value (Peak negative). . . . .	Same value as determined for $E_{k1}$ except video drive is a negative voltage	
Grid-No. 4 Current. . . . .	-25 to +25	μamp
Grid-No. 2 Current. . . . .	-15 to +15	μamp
Field Strength of Adjustable Centering Magnet*. . . . .	0 to 8	gausses

#### Examples of Use of Design Ranges:

With ultor-to-grid-No. 1 voltage of . . . . .	14000	16000	volts
and grid-No. 2-to-grid-No. 1 voltage of . . . . .	300	400	volts
Grid-No. 4-to-Grid-No. 1 Voltage for Focus. . . . .	0 to 400	0 to 400	volts
Cathode-to-Grid-No. 1 Voltage for Visual Extinction of Focused Raster. . . . .	28 to 60	36 to 78	volts
Cathode-to-Grid-No. 1 Video Drive from Raster Cutoff (Black Level):			
White-level value. . . . .	-28 to -60	-36 to -78	volts

#### Maximum Circuit Values:

Grid-No. 1—Circuit Resistance. . . . .	1.5 max.	megohms
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● The "ultor" in a cathode-ray tube is the electrode to which is applied the highest dc voltage for accelerating the electrons in the beam prior to its deflection. In the 21DFP4, the ultor function is performed by grid No. 5. Since grid No. 5, grid No. 3, and collector are connected together within the 21DFP4, they are collectively referred to simply as "ultor" for convenience in presenting data and curves.

▲ Grid drive is the operating condition in which the video signal varies the grid-No. 1 potential with respect to cathode.



- ⊕ This value is a working design-center minimum. The equivalent *absolute minimum* ultor, or ultor-to-grid-No.1 voltage is 11000 volts, below which the serviceability of the 21DFP4 will be impaired. The equipment designer has the responsibility of determining a minimum design value such that under the worst probable operating conditions involving supply-voltage variation and equipment variation the absolute minimum ultor, or ultor-to-grid-No.1 voltage is never less than 11000 volts.
- § The grid-No.4 voltage or grid-No.4-to-grid-No.1 voltage required for focus of any individual tube is independent of ultor current and will remain essentially constant for values of ultor voltage (or ultor-to-grid-No.1 voltage) or grid-No.2 voltage (or grid-No.2-to-grid-No.1 voltage) within design ranges shown for these items.
- \* Distance from *Reference Line* for suitable PM centering magnet should not exceed 2-1/4". Excluding extraneous fields, the center of the undeflected focused spot will fall within a circle having a 3/8-inch radius concentric with the center of the tube face. It is to be noted that the earth's magnetic field can cause as much as 1/2-inch deflection of the spot from the center of the tube face.
- Cathode drive is the operating condition in which the video signal varies the cathode potential with respect to grid No.1 and the other electrodes.

### OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data are working design-center maximums established according to the standard design-center system of rating electron tubes. Tubes so rated will give satisfactory performance in equipment designed so that these maximum ratings will not be exceeded when the equipment is operated from ac or dc power-

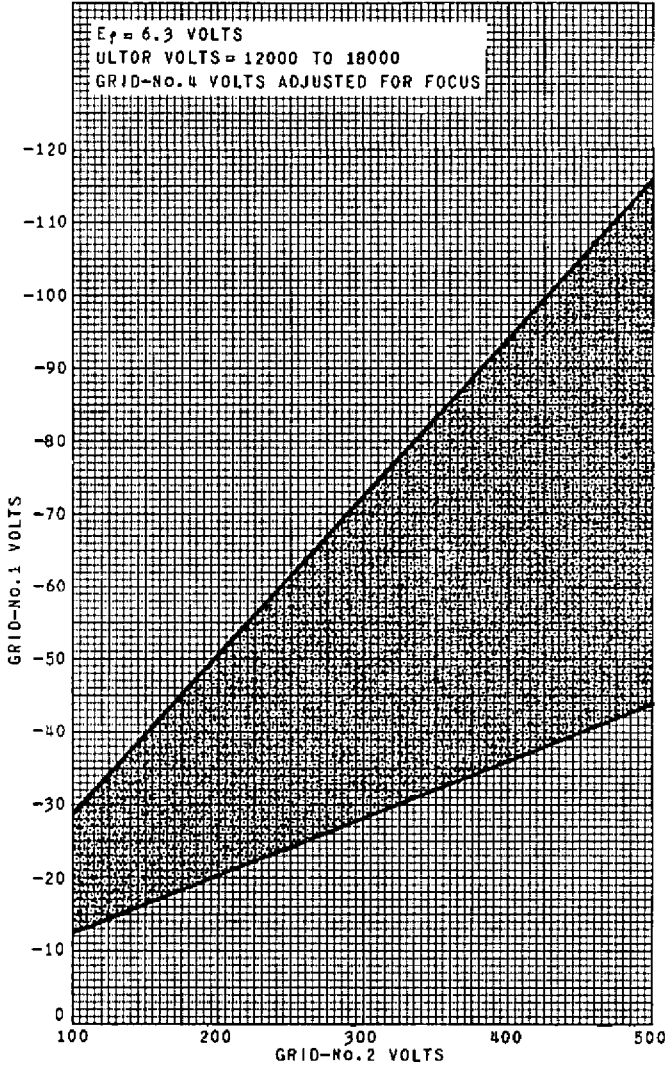
line supplies whose normal voltage including normal variations falls within  $\pm 10$  per cent of line-center voltage value of 117 volts.

*X-Ray Warning.* When operated at ultor voltages up to 16 kilovolts, the 21DFP4 does not produce any harmful X-ray radiation. However, because the rating of this type permits operation at voltages as high as 19.8 kilovolts (absolute maximum value), shielding of the 21DFP4 for X-ray radiation may be needed to protect against possible injury from prolonged exposure at close range whenever the operating conditions involve voltages in excess of 16 kilovolts.

*Shatter-Proof Cover Over the Tube Face.* Following conventional picture-tube practice, it is recommended that the cabinet be provided with a shatter-proof, glass cover over the face of the 21DFP4 to protect it from being struck accidentally and to protect against possible damage resulting from tube implosion under some abnormal condition. This safety cover can also provide X-ray protection when required.

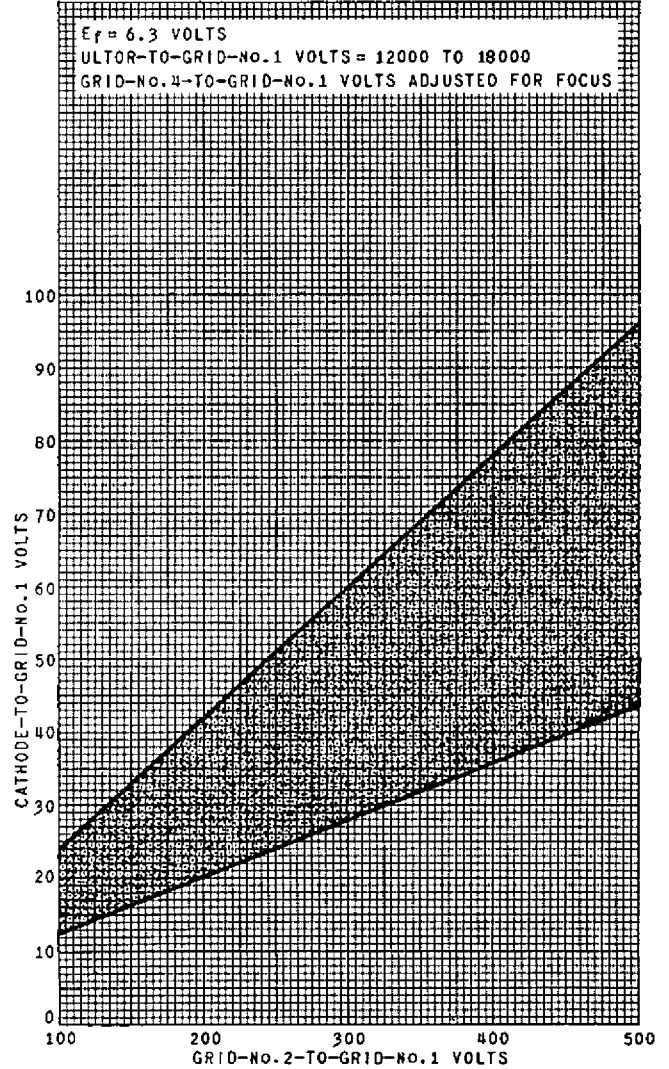
The *base pins* of the 21DFP4 fit the Eightar 8-contact socket, such as Ucinite Part No. 115446 or equivalent. The design of the socket should be such that the circuit wiring cannot impress lateral strains through the socket contacts on the base pins.

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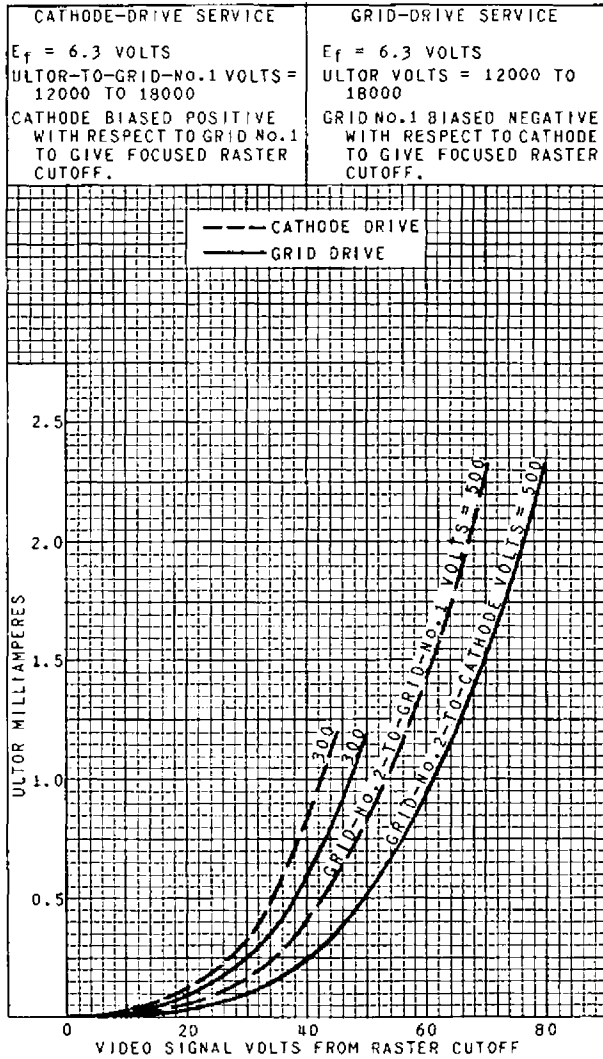
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Fig. 1 - Raster Cutoff Range for Type 21DFP<sub>4</sub> in Grid-Drive Service.



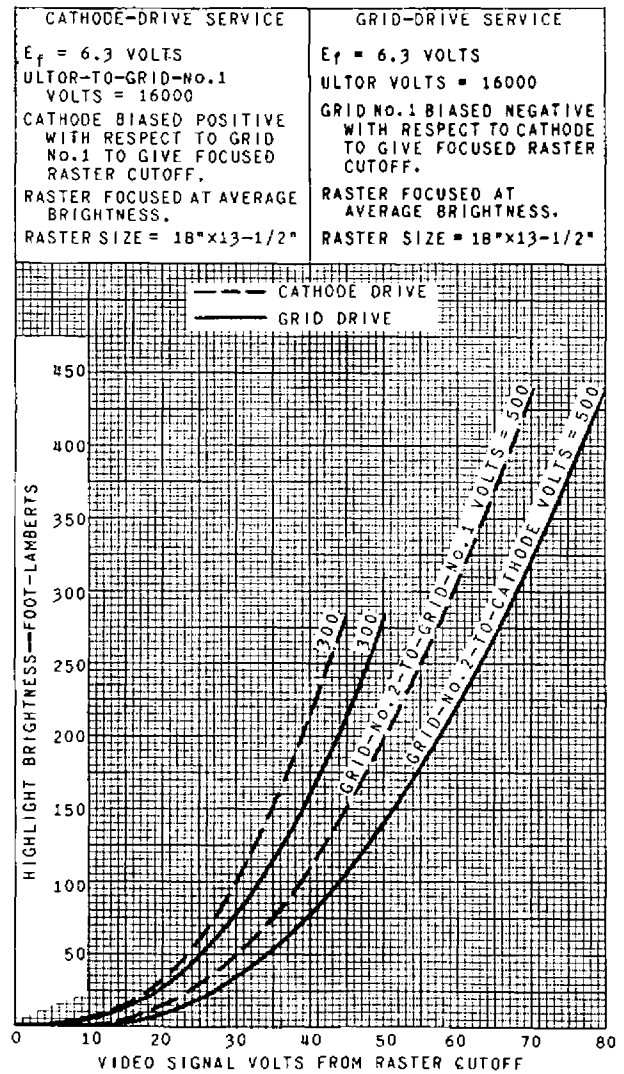
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Fig. 2 - Raster Cutoff Range for Type 21DFP<sub>4</sub> in Cathode-Drive Service.



92CS-9142

Fig. 3 - Average Drive Characteristics of Type 21DFP4.

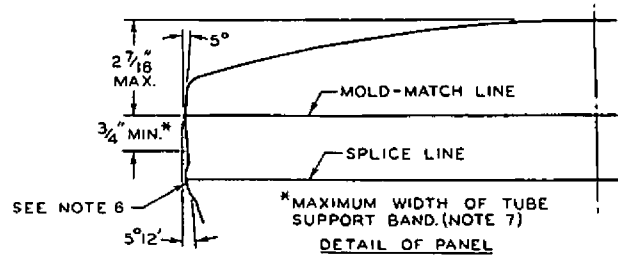
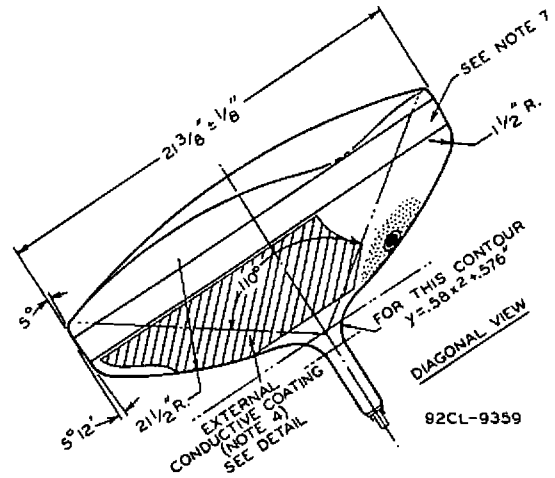
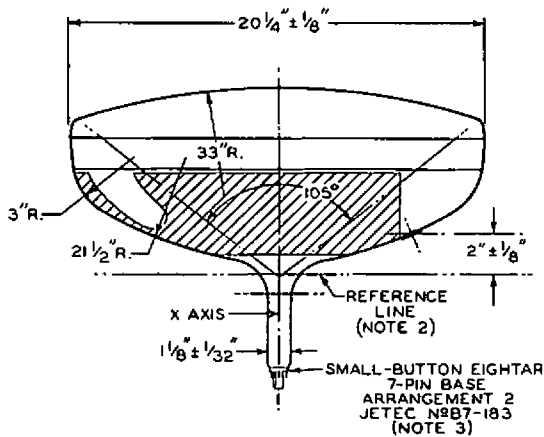
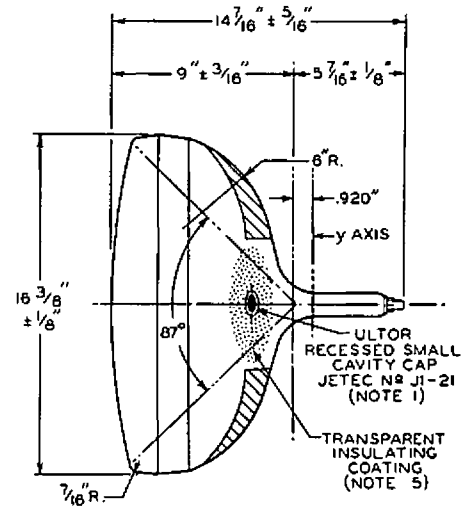
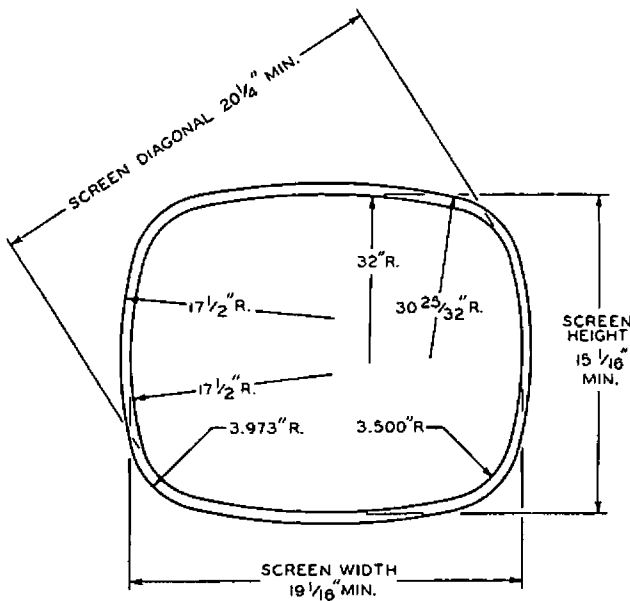


92CS-9143R1

Fig. 4 - Average Drive Characteristics of Type 21DFP4.



# DIMENSIONAL OUTLINE



**NOTE 1:** THE PLANE THROUGH THE TUBE AXIS AND PIN NO.4 MAY VARY FROM THE PLANE THROUGH THE TUBE AXIS AND ULTOR TERMINAL BY ANGULAR TOLERANCE (MEASURED ABOUT THE TUBE AXIS) OF  $\pm 30^\circ$ . ULTOR TERMINAL IS ON SAME SIDE AS PIN NO.4.

**NOTE 2:** WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC NO.126 AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY THE INTERSECTION OF THE PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

**NOTE 3:** SOCKET FOR THIS BASE SHOULD NOT BE RIGIDLY MOUNTED; IT SHOULD HAVE FLEXIBLE LEADS AND BE ALLOWED TO MOVE FREELY. THE DESIGN OF THE SOCKET SHOULD BE SUCH THAT THE CIRCUIT WIRING CANNOT IMPRESS LATERAL STRAINS THROUGH THE SOCKET CONTACTS ON THE BASE PINS. BOTTOM CIRCUMFERENCE OF BASE WAFER WILL FALL WITHIN A CIRCLE CONCENTRIC WITH BULB AXIS AND HAVING A DIAMETER OF  $1-3/4"$ .

**NOTE 4:** EXTERNAL CONDUCTIVE COATING MUST BE GROUNDED.

**NOTE 5:** TO CLEAN THIS AREA, WIPE ONLY WITH SOFT DRY LINT-LESS CLOTH.

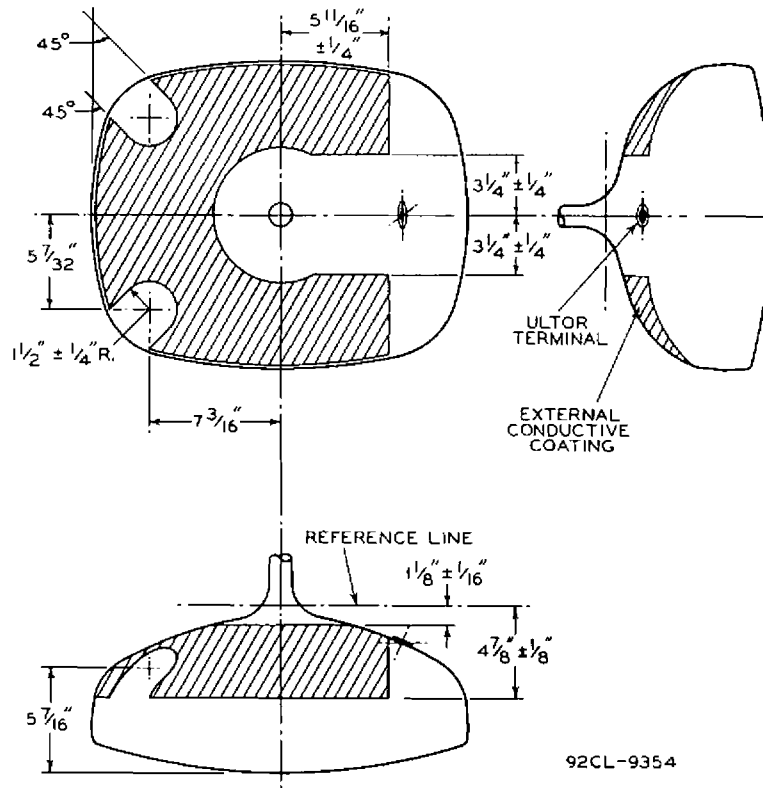
**NOTE 6:** BULGE AT SPLICE-LINE SEAL MAY INCREASE THE INDICATED

MAXIMUM VALUE FOR ENVELOPE WIDTH, DIAGONAL, AND HEIGHT BY NOT MORE THAN  $1/8"$ , BUT AT ANY POINT AROUND THE SEAL, THE BULGE WILL NOT PROTRUDE MORE THAN  $1/16"$  BEYOND THE ENVELOPE SURFACE AT THE MOLD-MATCH LINE.

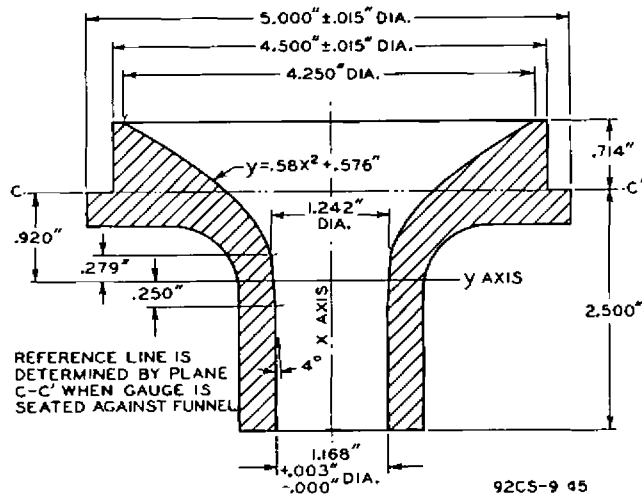
**NOTE 7:** UNDISTURBED AREA BETWEEN MOLD-MATCH LINE AND SPLICE LINE IS  $3/4"$  MINIMUM. THIS SHOULD BE THE MAXIMUM WIDTH OF TUBE SUPPORT BAND.



DETAIL SHOWING EXTERNAL CONDUCTIVE COATING

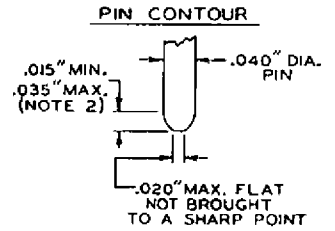
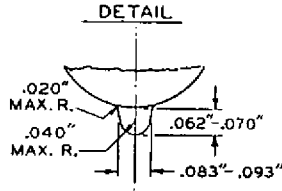
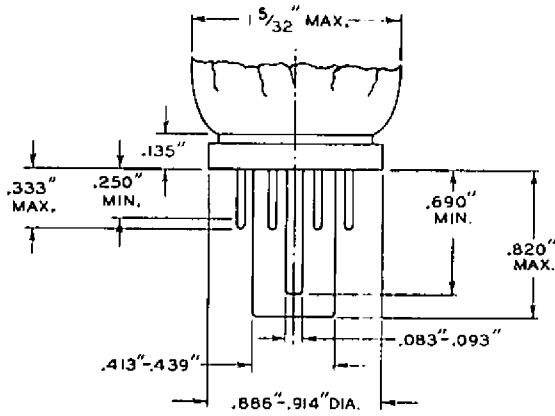


REFERENCE-LINE AND  
NECK-FUNNEL-CONTOUR GAUGE  
JETEC No. 126

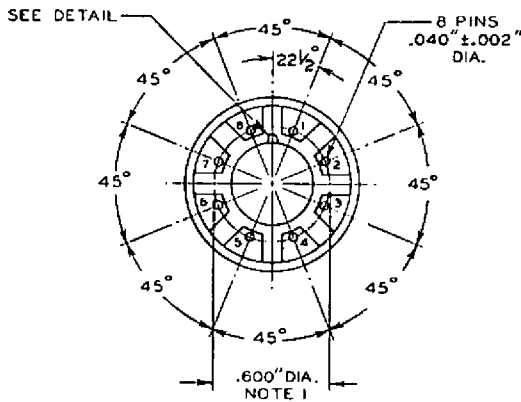




### SMALL-BUTTON EIGHTAR BASE



92CM-9146



NOTE 1: BASE-PIN POSITIONS ARE HELD TO TOLERANCES SUCH THAT THE BASE WILL FIT A FLAT-PLATE GAUGE HAVING A THICKNESS OF 3/8" AND EIGHT EQUALLY SPACED HOLES OF 0.0550" ± 0.0005" DIAMETER LOCATED ON A 0.6000" ± 0.0005" DIAMETER CIRCLE. THE GAUGE IS ALSO PROVIDED WITH A CENTER HOLE TO PROVIDE 0.010" DIAMETRIC CLEARANCE FOR THE LUG AND KEY. PIN FIT IN THE GAUGE WILL BE SUCH THAT THE ENTIRE LENGTH OF PINS WILL, WITHOUT UNDUE FORCE, ENTER INTO AND DISENGAGE FROM THE GAUGE.

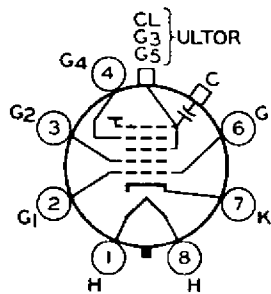
NOTE 2: THIS DIMENSION AROUND THE PERIPHERY OF ANY INDIVIDUAL PIN MAY VARY WITHIN THE LIMITS SHOWN.

JETEC No.	No. of PINS	PINS
B8-181	8-Pin	1, 2, 3, 4, 5, 6, 7, 8
B7-182	7-Pin ARRANGEMENT 1	2, 3, 4, 5, 6, 7, 8
B7-183	7-Pin ARRANGEMENT 2	1, 2, 3, 4, 6, 7, 8

### SOCKET CONNECTIONS

Bottom View

- PIN 1: HEATER
- PIN 2: GRID No. 1
- PIN 3: GRID No. 2
- PIN 4: GRID No. 4
- PIN 6: GRID No. 1



- PIN 7: CATHODE
- PIN 8: HEATER
- CAP: ULTOR (Grid No. 3, Grid No. 5, Collector)
- C: EXTERNAL CONDUCTIVE COATING

8HR