

# FD-2200

## Integral-Cavity, 1030-Mc/s TRF Amplifier & Preselector

3-SECTION FILTER, LOW LOSS  
3-STAGE INTEGRAL CAVITY TRF AMPLIFIER<sup>a</sup>  
(Interchangeable in field without realignment)

For Use in Class 2 (MIL-E-5400G) Airborne Transponder  
Equipment and Other Fixed-Cavity Applications

### MECHANICAL

Operating Position. . . . .	Any
Weight (Approx.). . . . .	7 oz
Length (Without connectors)	
Filter. . . . .	8.70 ± 0.05 in
Amplifier . . . . .	7.70 ± 0.10 in
Diameter. . . . .	See accompanying <i>Dimensional Outline</i>
Connectors. . . . .	Subminiature Screw-on Types, See <i>Operating Considerations</i>
Tuning-Screw Locknut. . . . .	Hexagonal, 1/4 in

### ABSOLUTE-MAXIMUM RATINGS

Values For Each Stage

For Operation at Any Altitude

Heater Voltage (AC or DC) . . . . .	E <sub>f</sub>	6.3 ± 5%	V
Heater-Cathode Voltage (Peak) . . . . .	e <sub>hkm</sub>	±150	V
Cathode Supply Voltage. . . . .	E <sub>kkp</sub>	-150	V
Cathode Voltage . . . . .	E <sub>kp</sub>	-110	V
Cathode Current . . . . .	I <sub>k</sub>	20	mA
Grid Voltage			
Positive value. . . . .	E <sub>gk</sub>	0	V
Negative value. . . . .	E <sub>gk</sub>	-100	V
RF Input Voltage (Peak) . . . . .		10	V
At 1030 Mc/s with average power = -20 dBm			
Plate Dissipation . . . . .	P <sub>b</sub>	2	W
Shell Temperature . . . . .		115	°C

### MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance . . . . .	R <sub>g</sub>	0.1	MΩ
Common to all three stages			

### INITIAL CHARACTERISTICS LIMITS AT 1030 Mc/s<sup>b</sup>

Gain at 25° C . . . . .	45 ± 2	dB
Noise Figure (Including filter) . . . . .	14 max	dB
Bandpass Characteristics <sup>c</sup>		
Bandwidth:		
At -6 dB points . . . . .	7.5 min	Mc/s
At -40 dB points. . . . .	25 max	Mc/s
Attenuation:		
At 1005 Mc/s. . . . .	60 min	dB
At 1055 Mc/s. . . . .	60 min	dB



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## Stability (Over Temperature Range -54 to 95°C)

Center frequency shift (Average of -6 dB pts.)	±1 max	Mc/s
Gain variation (From value at 25°C)	±2 max	dB
RF Input VSWR	1.5 max	

## SPECIAL TESTS

<b>Receiver Protection — RF Input Voltage (Peak)</b>	10 max	V
1030-Mc/s Input Pulse having an average power of -20 dBm, for a period of 15 minutes		
<b>Thermal Shock</b>	-62 to 115	°C
For MIL-E-5400G (ASG)—Class 2		
<b>Long Duration Shock (11 ms)</b>	15	g
<b>Sweep Frequency Vibration</b>	10	g
Ref. Curve IV MIL-T-5422E (ASG)		

## TYPICAL OPERATION AS A 1030-Mc/s TRF AMPLIFIER

For the following typical operation, see Conditions

<b>Total Cathode Current</b>	I <sub>k</sub>	34	mA
<b>Grid-to-Cathode Voltage (Approx.)</b>	E <sub>gk(co)</sub>	-5	V
For cathode current = 10 μA per stage			
<b>Gain at 25°C</b>	A <sub>o</sub>	45.5	dB
<b>Noise Figure (Including filter)</b>	NF	11.5	dB
<b>Bandwidth Characteristics</b>			
Bandwidth:			
At -6 dB level		8	Mc/s
At -40 dB level		22.3	Mc/s
Attenuation:			
At 1005 Mc/s		70	dB
At 1055 Mc/s		77	dB

## Conditions

<b>Heater Voltage</b>	E <sub>f</sub>	6.3	V
<b>Heater Current (Total)</b>	I <sub>f</sub>	405	mA
<b>Heater Dissipation (Total)</b>	P <sub>f</sub>	2.55	W
<b>Cathode Supply Voltage (Per stage)</b>	E <sub>kkp</sub>	-100	V
<b>Cathode Resistor</b>			
First stage (Input)	R <sub>1k</sub>	3.9	Ω
Second stage	R <sub>2k</sub>	22	Ω
Third stage (Output)	R <sub>3k</sub>	47	Ω
<b>Grid-Circuit Resistance</b>	R <sub>g</sub>	1500	Ω
Common to all three stages			
<b>Plate Voltage</b>	Plate connected to system ground		

<sup>a</sup> A mechanically-modified Type 8058 nuvistor tube is utilized in each amplifier stage. The plate and one end of the heater of each tube are connected to a common dc-ground terminal (tab) on the metal shell of the amplifier; the cathode and other end of the heater are brought out to separate terminals through 470-pF feed-thru capacitors; the grid has a separate terminal and is bypassed with a 1000-pF capacitor. Each amplifier or amplifier-filter combination has an input impedance of 50 ohms, and is designed for use with a load having an impedance of 50 ohms.

<sup>b</sup> Data apply for an average temperature rise of 20°C above the specified equipment temperatures as shown in MIL-E-5400G (ASG) — Class 2, with conditions the same as those shown under *Typical Operation*.

<sup>c</sup> The bandpass characteristic of the FD-2200 is essentially gaussian. These data apply for an equipment ambient temperature range of -54°C to +95°C.



## OPERATING CONSIDERATIONS

**Connectors:** The preselector and amplifier sections may be connected to each other using RG-188/U cable with UG-1465/U (Sealectro 50-007-0000 or equivalent) connectors. The overall length of the cable and connectors must be  $4.9 \pm 0.1$  inch to avoid altering the bandpass characteristics of the FD-2200. Where rigid-type interconnections are preferred, the Sealectro 50-073-0000 or 50-073-0029 connectors, or equivalents, may be used.

The rf input-and-output terminals of the FD-2200 fit the UG-1465/U (Sealectro 50-007-0000, or equivalent) connectors.

**DC Connections:** Connections to the cathode, and one end of the heater of each 8058 nuvistor are made through separate integral 470-pF-feed-through capacitors. The plate and the other end of the heater of each nuvistor are internally connected to a common dc-ground terminal on the shell of the amplifier unit. Connection to the grid is made through a separate internally bypassed terminal. The input capacitance of the grid circuit is approximately 1000-pF per stage.

**Mounting:** The FD-2200 is designed to be conduction cooled and should be clamped to the mounting surface of the equipment. The recommended locations for the clamps are shown as shaded areas in the dimensional outlines.

Provision must be made to allow for the differential expansion of the FD-2200 and the equipment chassis. For example: With an aluminum chassis, the differential expansion between room temperature ( $25^{\circ}\text{C}$ ) and the cold-shock temperature ( $-62^{\circ}\text{C}$ ) over the 7.7 inch length of the amplifier, is 0.015 inch.

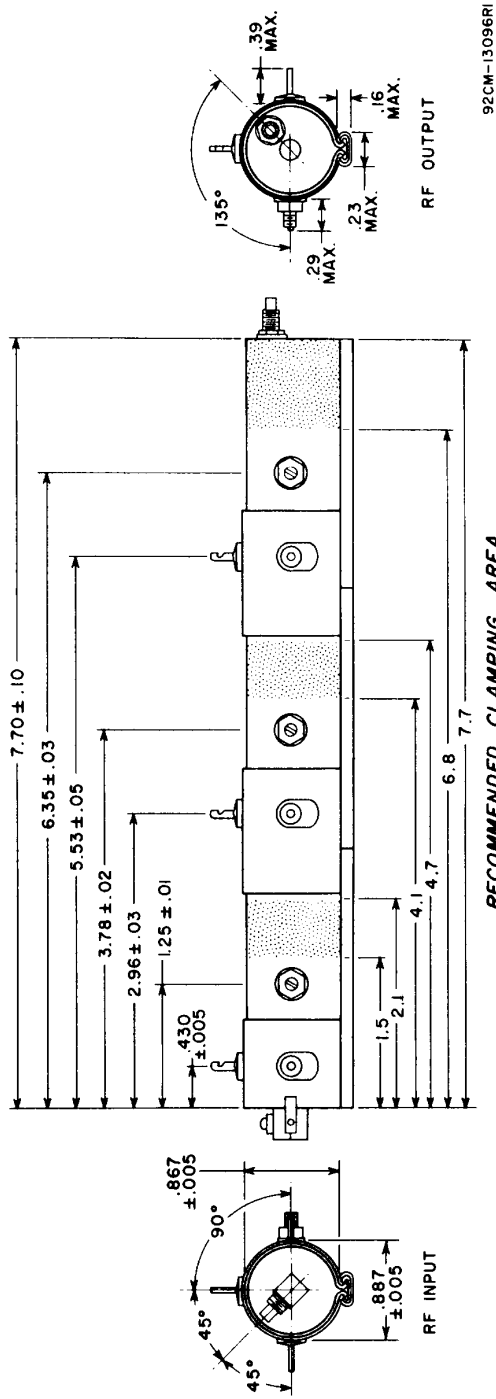
Simple mounting arrangements, which also facilitate conduction cooling, can be designed by casting the transponder case with contoured brackets to seat the FD-2200 in the desired position. The FD-2200 may be held in the brackets with a leaf spring or strap. When fixed (rigid) clamps are used, the end clamps should be designed with either a silicon rubber insert, a fingered spring, or similar spacer to permit axial differential expansion without undue stress on the filter and amplifier.

When a rigid filter-to-amplifier connection is used, provision must be made to accommodate a 0.010 inch center-to-center variation between different units of the FD-2200. In addition, differences between center-to-center spacing of the rigid connectors should be considered. The center-to-center spacing with the Sealectro connector 50-073-0000 is approximately 1.26 inches; with the Sealectro connector 50-073-0029, approximately 1.19 inches.



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## DIMENSIONAL OUTLINE Amplifier FD-2200



92CM-13096RI

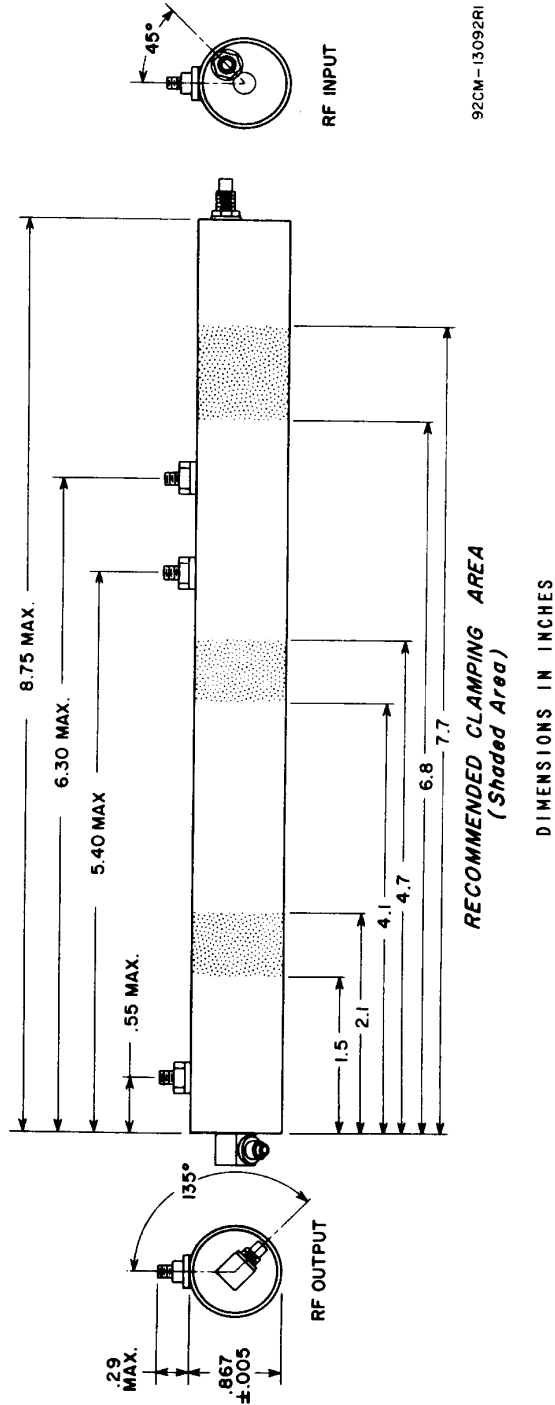
RECOMMENDED CLAMPING AREA  
(Shaded Area)

DIMENSIONS IN INCHES



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DIMENSIONAL OUTLINE (Cont'd.)  
Preselector (Filter) FD-2200



RADIO CORPORATION OF AMERICA  
Electronic Components and Devices  
Harrison, N. J.

DATA 3  
9-65

# FD-2200

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DIMENSIONAL OUTLINE (Cont'd.)  
DC Input Connection to FD-2200

