



ELECTRON TUBE DIVISION

BOX 100 EASTON, PA. 18043
INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

**F-8146
F-8146V
F-8147
POWER
TRIODES**

DESCRIPTION

The F-8146, F-8146V and F-8147 are general purpose metal and ceramic triodes for use as amplifiers, oscillators or Class B modulators under CW or pulsed conditions. The F-8146 has a water-cooled anode capable of dissipating 40 kilowatts. The F-8146V has an evaporative-cooled anode capable of 40 kilowatts plate dissipation. The F-8147 has a forced air-cooled, copper anode-radiator assembly of brazed construction capable of dissipating 20 kilowatts.

GENERAL CHARACTERISTICS

Electrical

Filament Voltage	11 volts
Filament Current	155 amperes
Filament Starting Current	500 amperes
Filament Cold Resistance	.008 ohms
Amplification Factor	17
$E_c = -50$ volts; $I_b = 3.0$ amperes	
Direct Inter-Electrode Capacitance	
Grid-Plate	55 $\mu\mu f$
Grid-Filament	58 $\mu\mu f$
Plate-Filament	3.0 $\mu\mu f$

Mechanical

Mounting Position

	F-8146			F-8146V	F-8147			Vertical, anode up or down
Plate Dissipation	40	30	20	40	20	15	10	kilowatts
Water Flow	20	15	10	-	-	-	-	gpm
Water Jacket Pressure Drop	18	10	5	-	-	-	-	psi
Air Flow (Note 1)	-	-	-	-	1000	600	300	cfm
Static Air Pressure	-	-	-	-	8	3	1	inches of water
Max. Outgoing Water Temp.	70	-	-	-	-	-	-	$^{\circ}C$
Max. Water Pressure	80	-	-	-	-	-	-	psi
Max. Incoming Air Temp.	-	-	-	-	-	45	-	$^{\circ}C$
Max. Ceramic & Seal Temp. (Note 2 & 3)	250	-	-	250	-	250	-	$^{\circ}C$
Evaporation Rate, approx.	-	-	-	.3	-	-	-	gpm
Volume of Vapor	-	-	-	67	-	-	-	cfm
Net Weight, approx.	8.5	-	-	20	-	22	-	lbs.

Note 1: Maximum incoming air temperature, $45^{\circ}C$.

Note 2: Auxiliary air flow of up to 120 cfm may be required to limit the ceramic and seal temperature to less than the $250^{\circ}C$ max.

Note 3: A temperature sensitive lacquer manufactured by the Tempil Corporation, 132 W. 22nd St., New York 11, N. Y. is convenient for this measurement.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

Audio-Frequency Power Amplifier and Modulator - Class B

Maximum Ratings, Absolute Values

D-C Plate Voltage	11,000 volts
Maximum Signal D-C Plate Current §	8 amperes
Maximum Signal Plate Input §	80 kilowatts
	F-8146 & F-8146V
	F-8147
	F-8146 & F-8146V
Plate Dissipation §	40 kilowatts
	F-8147
	20 kilowatts

§ Averaged over any audio-frequency cycle of sine-wave form.

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MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS (Cont'd)

Typical Operation

(Unless otherwise specified, values are for two tubes)

	F-8146 & F-8146V		
D-C Plate Voltage	10,500	8,500	volts
D-C Grid Voltage	-600	-520	volts
Peak A-F Grid-to-Grid Voltage	1,800	1,740	volts
Peak A-F Plate-to-Plate Voltage	16,000	14,000	volts
Zero Signal D-C Plate Current	1.8	1.2	amperes
Maximum Signal D-C Plate Current	15.2	12.8	amperes
Effective Load Resistance, Plate-to-Plate	1,330	1,400	ohms
Maximum Signal Driving Power, approx.	50	110	watts
Maximum Signal Power Output, approx.	95	70	kilowatts

Radio-Frequency Power Amplifier - Class B

(Carrier conditions per tube for use with a maximum modulator factor of 1.0)

Maximum Ratings, Absolute Values

D-C Plate Voltage		11,000	volts
D-C Plate Current		6	amperes
Plate Input	F-8146 & F-8146V	60	kilowatts
	F-8147	30	kilowatts
Plate Dissipation	F-8146 & F-8146V	40	kilowatts
	F-8147	20	kilowatts

Typical Operation

	F-8146 & F-8146V		
D-C Plate Voltage	10,500	8,500	volts
D-C Grid Voltage	-550	-460	volts
Peak R-F Grid Voltage	600	520	volts
Peak R-F Plate Voltage	4,000	3,500	volts
D-C Plate Current	4.5	5.7	amperes
D-C Grid Current	0	0	amperes
R-F Load Resistance	550	380	ohms
Driving Power, approx. †	200	575	watts
Power Output, approx.	14.5	16	kilowatts

† At crest of audio frequency cycle with modulation factor of 1.0.

Plate-Modulated Radio-Frequency Power Amplifier - Class C Telephony

(Carrier conditions per tube for use with a maximum modulation factor of 1.0)

Maximum Ratings, Absolute Values

D-C Plate Voltage		8,500	volts
D-C Grid Voltage		-2,000	volts
D-C Plate Current		6	amperes
D-C Grid Current		.8	amperes
Plate Input		55	kilowatts
Plate Dissipation	F-8146 & F-8146V	26	kilowatts
	F-8147	13	kilowatts

Typical Operation

D-C Plate Voltage		8,000	volts
D-C Grid Voltage		-1,400	volts
Peak R-F Grid Voltage		2,120	volts
Peak R-F Plate Voltage		7,000	volts
D-C Plate Current		5.6	amperes
D-C Grid Current		.6	amperes
R-F Load Resistance		680	ohms
Driving Power, approx.		1,250	watts
Power Output, approx.		36	kilowatts

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MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS (Cont'd)

Radio-Frequency Power Amplifier and Oscillator - Class C Telegraphy
(Key down conditions per tube without amplitude modulation ‡)

Maximum Ratings, Absolute Values

D-C Plate Voltage	11,000	volts
D-C Grid Voltage	-2,000	volts
D-C Plate Current	8	amperes
D-C Grid Current	.8	amperes
Plate Input	80	kilowatts
Plate Dissipation	40	kilowatts
	20	kilowatts

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Typical Operation

	Cathode Drive	Grid Drive			
D-C Plate Voltage	7,500	10,500	9,500	7,500	volts
D-C Grid Voltage	-800	-1,500	-1,200	-800	volts
Peak R-F Grid Voltage	1,300	2,050	1,750	1,300	volts
Peak R-F Plate Voltage	6,000	9,000	8,000	6,000	volts
D-C Plate Current	7.5	6.7	7.8	7.5	amperes
D-C Grid Current	.45	.40	.45	.45	amperes
R-F Load Resistance	460	735	570	460	ohms
Driving Power, approx.	9,000	770	760	545	watts
Power Output, approx.	47	55	55	38	kilowatts

RATINGS VERSUS FREQUENCY

Maximum ratings apply up to 50 megacycles. The tube may be operated at higher frequencies provided the maximum values of plate voltage and power input are reduced according to the tabulation below (other maximum ratings are the same above). Special attention should be given to adequate ventilation of the ceramics and seals at these frequencies.

Frequency	50	110	megacycles
Percentage of Maximum Rated Plate Voltage and Plate Input	100	70	per cent

PULSE SERVICE OPERATIONS

In pulse r-f amplifier service, it is possible to operate the tube under conditions not permissible in CW operation. Because of the wide variety of operating conditions, it is advisable that tube operation recommendations be obtained from our Engineering Department for specific conditions.

Modulator Tube - Pulsed Operation

Maximum Ratings, Absolute Values

D-C Plate Voltage	18	kilovolts
Peak Plate Voltage (instantaneous)	20	kilovolts
D-C Grid Voltage	-2500	volts
Peak Positive Grid Voltage	4000	volts
Pulse Cathode Current	220	amperes
Grid Dissipation	800	watts
Pulse Length	2000	μ sec.
Plate Dissipation	40	kilowatts
	20	kilowatts

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‡ Modulation essentially negative may be used if the position peak of the envelope does not exceed 115 per cent of the carrier conditions.

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PULSE SERVICE OPERATIONS (Cont'd)

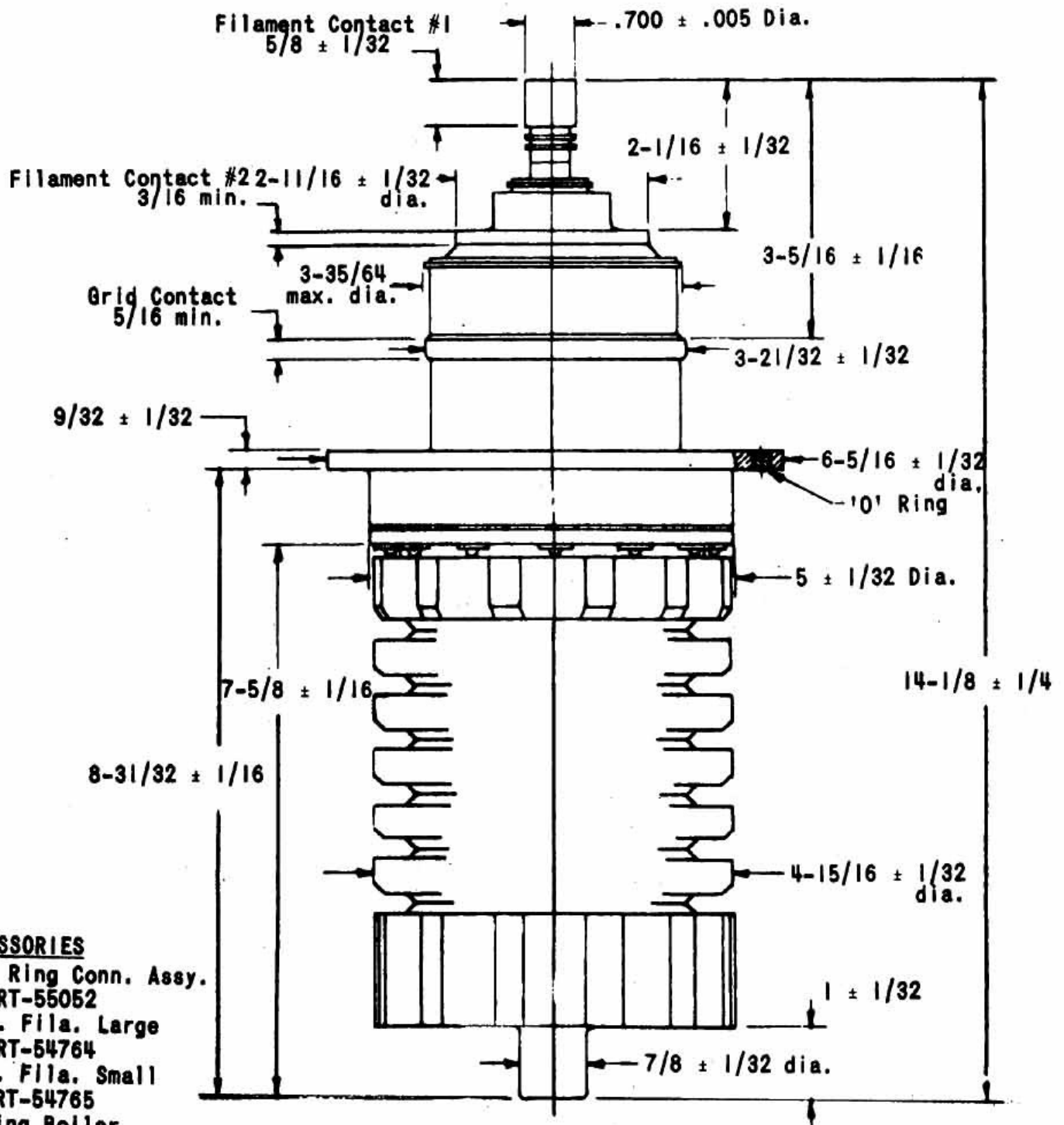
Typical Operation

D-C Plate Voltage	16 kilovolts
Pulse Plate Current	120 amperes
D-C Grid Voltage	-1500 volts
Pulse Grid Current	20 amperes
Pulse Positive Grid Voltage	+1500 volts
Duty Factor	.003
Pulse Length	10 μ sec.
Plate Output Voltage	13.5 kilovolts
Pulse Output Power	1.6 mw

Additional information for specific applications can be obtained from the:

ITT Electron Tube Division
Applications Section
P. O. Box 100
Easton, Pennsylvania 18043

NOTE: Contact areas are to be concentric within .025".



ACCESSORIES

Grid Ring Conn. Assy.

- RT-55052

Conn. Fila. Large

- RT-54764

Conn. Fila. Small

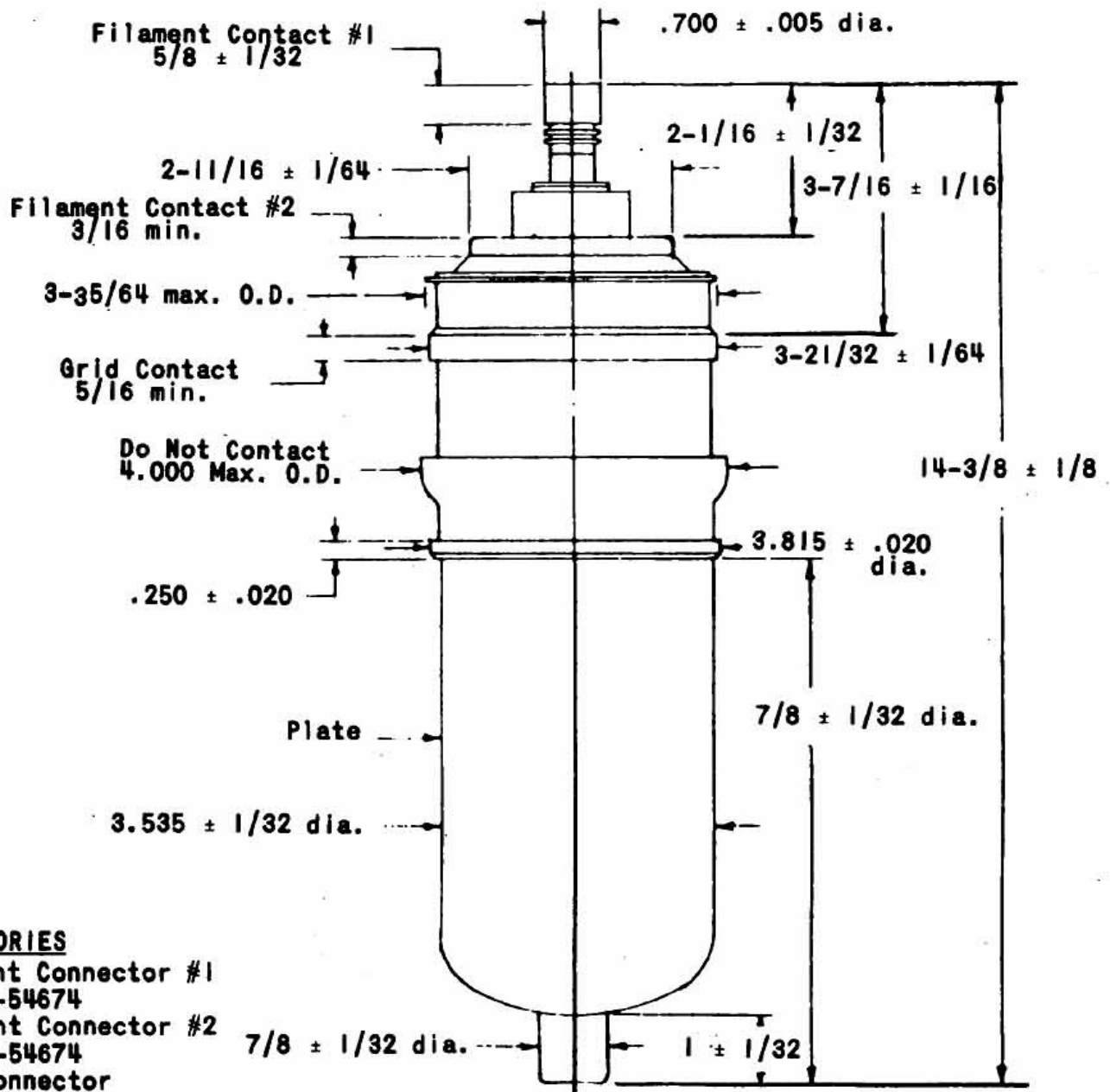
- RT-54765

Cooling Boiler

- RT-55166 or RT-55384

OUTLINE F-8146V

NOTE: Contact areas are to be concentric within .025".



ACCESSORIES

- Filament Connector #1
 - RT-54674
- Filament Connector #2
 - RT-54674
- Grid Connector
 - RT-55052
- Water Jacket
 - RT-55070

OUTLINE F-8146

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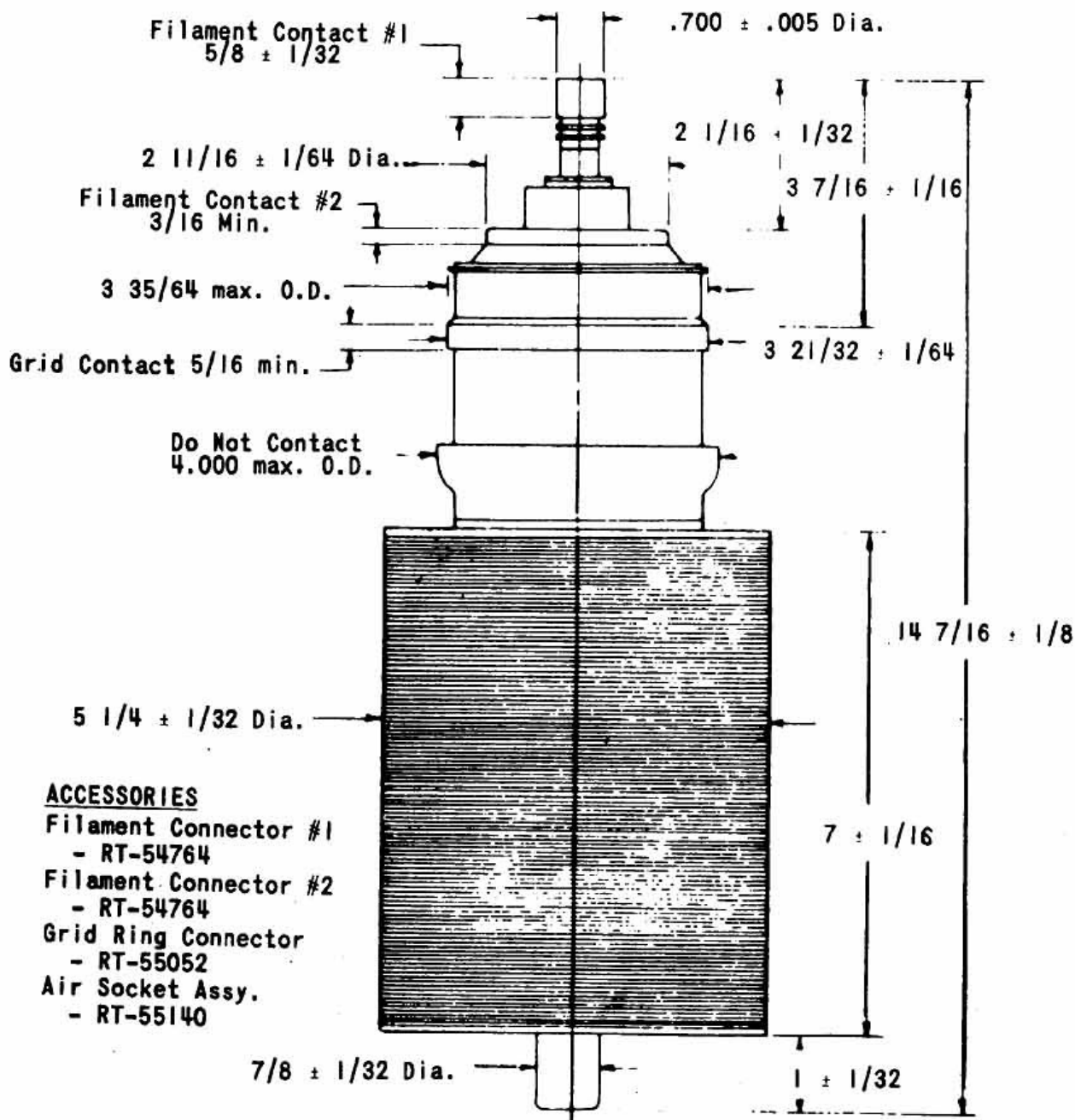
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ACCESSORIES

- Filament Connector #1
- RT-54764
- Filament Connector #2
- RT-54764
- Grid Ring Connector
- RT-55052
- Air Socket Assy.
- RT-55140

OUTLINE F-8147

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