Medium-Mu Triode

GLASS-METAL PENCIL TYPE

FAST WARM-UP TIME | INTEGRAL PLATE RADIATOR

For Mobile or Aircraft Applications as a RF-Power Amplifier or Oscillator Tube with Full Input up to 500 Mc and with Reduced Input up to 1700 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC):		
Under transmitting conditions	6.0 ± 10%	volts
Under standby conditions.	6.3 max.	volts
Current at 6 volts.	0.280	amp
Amplification Factor.	27	
Transconductance, for dc plate ma. = 27 and dc plate volts = 200.	7000	μmhos

Direct Interelectrode Capacitances:

	Without External Shield	*With External Shield*[a]	
Grid to plate	1.7	1.5	μμf
Grid to cathode	2.8	–	μμf
Plate to cathode.	0.08 max.	–	μμf

Mechanical:

Operating Position. . . . . Any

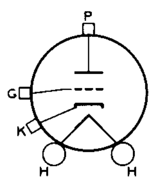
Dimensions and Terminal Connections . . . . See *Dimensional Outline*

Radiator. Integral part of tube

Terminal Connections (See *Dimensional Outline*):

H - Heater

K - Cathode



G - Grid

P - Plate

Cooling:

In many applications, the 6263A does not require forced-air cooling. The radiator in combination with a connector having adequate heat conduction capability will generally provide adequate cooling under conditions of free circulation of air. The cooling must be sufficient to limit the plate-seal temperature to 175° C. When conditions do not provide adequate circulation of air, provision should be made to direct a blast of cooling air from a small blower through the radiator fins. The quantity of air should be sufficient to limit the plate-seal temperature to 175° C. See *Curves*.

Incoming-Air Temperature.	40 max.	°C
Plate-Seal Temperature (Measured on plate seal)	175 max.	°C
Weight (Approx.).	24 grams (0.85 oz)	

Socket for Heater Pins. .Grayhill No.22-3[b], Cinch No.54A16325[c], or equivalent

RF POWER AMPLIFIER AND OSCILLATOR — Class C Telegraphy

Key-down conditions per tube without amplitude modulation[d]

Maximum Ratings, *Absolute-Maximum Values:*

For altitudes up to 60,000 feet

	CCS[e]	ICAS[f]	
DC PLATE VOLTAGE.	330 max.	400 max.	volts
DC GRID VOLTAGE	-100 max.	-100 max.	volts
DC PLATE CURRENT.	40 max.	55 max.	ma
DC GRID CURRENT	25 max.	25 max.	ma
DC CATHODE CURRENT.	55 max.	70 max.	ma
PLATE INPUT	13.2 max.	22 max.	watts
PLATE DISSIPATION	8 max.	13 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode. . . .	50 max.	50 max.	volts
Heater positive with respect to cathode. . . .	50 max.	50 max.	volts

Typical Operation as Oscillator in Cathode-Drive Circuit:

At 500 Mc

	CCS[e]	ICAS[f]	
DC Plate-to-Grid Voltage. . .	330	385	volts
DC Cathode-to-Grid Voltage[g] .	30	35	volts
DC Plate Current.	35	40	ma
DC Grid Current (Approx.) . .	11	14	ma
Useful Power Output (Approx.)	5[h]	7[h]	watts

At 1700 Mc

	CCS[e]	
DC Plate-to-Grid Voltage. . .	270	volts
DC Cathode-to-Grid Voltage[g] .	20	volts
DC Plate Current.	40	ma
DC Grid Current (Approx.) . .	9	ma
Useful Power Output (Approx.)	0.9[h]	watt

Typical Operation as RF Power Amplifier in Cathode-Drive Circuit at 500 Mc:

	CCS[e]	ICAS[f]	
DC Plate-to-Grid Voltage. . .	348	408	volts
DC Cathode-to-Grid Voltage[g] .	48	58	volts
DC Plate Current.	35	40	ma
DC Grid Current (Approx.) . .	13	15	ma
Driver Power Output (Approx.)	2.2	3	watts
Useful Power Output (Approx.)	7[h]	10[h]	watts

Maximum Circuit Values:

Grid-Circuit Resistance . . .	0.1 max.	0.1 max.	megohm

PLATE-MODULATED RF POWER AMPLIFIER — Class C Telephony

Carrier conditions per tube for use with maximum modulation factor of 1

Maximum Ratings, *Absolute-Maximum Values:*

For altitudes up to 60,000 feet

	CCS[e]	*ICAS*[f]	
DC PLATE VOLTAGE.	275 max.	330 max.	volts
DC GRID VOLTAGE	−100 max.	−100 max.	volts
DC PLATE CURRENT.	33 max.	46 max.	ma
DC GRID CURRENT	25 max.	25 max.	ma
DC CATHODE CURRENT.	50 max.	60 max.	ma
PLATE INPUT	9 max.	15 max.	watts
PLATE DISSIPATION	5.5 max.	9 max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode. . . .	50 max.	50 max.	volts
Heater positive with respect to cathode. . . .	50 max.	50 max.	volts

Typical Operation in Cathode-Drive Circuit at 500 Mc:

	CCS[e]	*ICAS*[f]	
DC Plate-to-Grid Voltage. . .	317	372	volts
DC Cathode-to-Grid Voltage[g] .	42	52	volts
DC Plate Current.	35	35	ma
DC Grid Current (Approx.) . .	13	12	ma
Driver Power Output (Approx.)	2	2.4	watts
Useful Power Output (Approx.)	6.7[h]	8[h]	watts

Maximum Circuit Values:

Grid-Circuit Resistance . . .	0.1 max.	0.1 max.	megohm

[a] A flat plate shield 1-1/4" diameter located parallel to the plane of the grid flange and midway between the grid flange and the radiator plate terminal. The shield is tied to the cathode.

[b] Grayhill, Inc., 561 Hillgrove Avenue, LaGrange, Illinois.

[c] Cinch Manufacturing Company, 1026 South Homan Avenue, Chicago, Illinois.

[d] Modulation, essentially negative, may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

[e] Continuous Commercial Service.

[f] Intermittent Commercial and Amateur Service. No Operating or "ON" period exceeds 5 minutes and every "ON" period is followed by an "OFF" or standby period of at least the same or greater duration.

[g] From a grid resistor, or from a suitable combination of grid resistor and fixed supply or grid resistor and cathode resistor.

[h] This value of useful power is measured at load of output circuit having an efficiency of about 75 per cent.

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	Min.	Max.	
Heater Current	1	0.265	0.295	amp
Direct Interelectrode Capacitances:				
Grid to plate	–	1.45	1.95	$\mu\mu$f
Grid to cathode	–	2.45	3.35	$\mu\mu$f
Plate to cathode	–	–	0.08	$\mu\mu$f
Reverse Grid Current	1,2	–	0.5	μa
Plate Current (1)	1,3	18	36	ma
Plate Current (2)	1,4	–	55	μa
Amplification Factor	1,3	20	34	
Transconductance	1,3	5600	8400	μmhos
Heater-Cathode Leakage Current:				
Heater negative with respect to cathode	1,5	–	100	μa
Heater positive with respect to cathode	1,6	–	100	μa
Emission Voltage	1,7	–	10	volts
Leakage Resistance:				
From grid to plate and cathode tied together	1,8	25	–	megohms
From plate to grid and cathode tied together	1,9	25	–	megohms
Power Output	1,10	6.5	–	watts
Change in Power Output	11	–	0.5	watt

Note 1: With 6.0 volts ac or dc on heater.

Note 2: With dc plate voltage of 200 volts, dc grid voltage of –2 5 volts, grid resistor of 0.5 megohm.

Note 3: With dc plate supply voltage of 200 volts, cathode resistor of 100 ± 1% ohms, and cathode bypass capacitor of 1000 μf.

Note 4: With dc plate voltage of 200 volts, dc grid voltage of –20 volts.

Note 5: With 50 volts dc between heater and cathode, heater negative with respect to cathode.

Note 6: With 50 volts dc between heater and cathode, heater positive with respect to cathode.

Note 7: With dc voltage on grid and plate which are tied together adjusted to produce a cathode current of 30 ma.

Note 8: With grid 100 volts negative with respect to plate and cathode which are tied together.

Note 9: With plate 300 volts negative with respect to grid and cathode which are tied together.

Note 10: With dc plate voltage of 350 volts, grid resistor adjusted to give a dc plate current of 50 milliamperes in a cavity-type oscillator operating at 500 ± 15 Mc and having an efficiency of approximately 75 per cent.

Note 11: At end of Power-Output test, reduce heater voltage to 5.0 volts and note change in power output.

SPECIAL TESTS & PERFORMANCE DATA

Low-Pressure Voltage Breakdown Test:

This test (similar to MIL-E-1D, paragraph 4.9.12.1) is performed on a sample lot of tubes from each production run. Tubes are tested in a chamber at an air pressure equivalent to an altitude of 60,000 feet. Breakdown will not occur when a 60 cycle rms voltage of 500 volts is applied between the plate cylinder and grid flange.

Low-Frequency Vibration Performance:

This test (MIL-E-1D, paragraph 4.9.19.1) is performed on a sample lot of tubes from each production run under the following conditions:

Heater voltage of 6.0 volts, dc plate supply voltage of 200 volts, grid voltage of -3 volts, and plate load resistor of 10,000 ohms. The tubes are vibrated in a plane perpendicular to the tube axis at 25 cycles per second at an acceleration of 2.5 g. The rms output voltage across the plate load resistor as a result of vibration of the tube will not exceed 100 millivolts.

High-Frequency Vibration Performance:

This test (similar to MIL-E-1D, paragraph 4.9.19.2) is performed on a sample lot of tubes from each production run. The tube is vibrated perpendicular to its axis, with no voltages applied to the tube. Vibration frequency is 40 to 60 cps and acceleration is 10 g. At the end of this test, tubes will not show temporary or permanent shorts or open circuits and will meet the following limits:

Heater-Cathode Leakage Current. . . . . . 100 max. μa
For conditions shown under *Characteristics Range Values Notes 1,5 and 1,6.*

Low-Frequency Vibration (rms) . . . . . . 100 max. mv
For conditions shown above under *Low-Frequency Vibration Performance.*

Plate Current (2) . . . . 55 max. μa
For conditions shown under *Characteristics Range Values Notes 1,4.*

Shorts and Continuity Test:

This test (MIL-E-1D, paragraph 4.7.5) is performed on all tubes from each production run. In this test, a tube is considered inoperative if it shows a permanent or temporary short or open circuit, an air leak, or reverse grid current in excess of 1 microampere for the conditions shown under *Characteristics Range Values, Notes 1,2.*

Glass-Seal Fracture Test:

This test is performed on a sample lot of tubes from each production run. Tubes are placed on supports spaced 15/16" ± 1/64" apart with cathode cylinder resting on one support and plate cylinder resting on the other support at a point between the radiator fins and the plate flange. Tubes will withstand gradual application, perpendicular to tube axis, of a force of 60 pounds upon the grid flange without causing fracture of the glass insulation.

Heater Cycling Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.7) is performed on a sample lot of tubes from each production run. With 6.0 volts on heater and no voltage on plate and grid, the heater is cycled three minutes on and three minutes off for at least 2000 cycles. At the end of this test, tubes will not show temporary or permanent shorts or open circuits, and are required to meet the following limits:

Grid-Plate and Cathode Leakage Resistance. 25 min. megohms
For conditions shown under *Characteristics Range Values Notes 1,8.*

Heater-Cathode Leakage Current. . . . . . 150 max. µa
For conditions shown under *Characteristics Range Values Notes 1,5.*

1-Hour Stability Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure that the tubes have been properly stabilized. Tubes are operated under the following conditions: heater voltage of 6.0 volts, plate dissipation of 2.5 to 3 watts. At the end of 1 hour, the change in transconductance value for each tube, referred to its initial transconductance reading, will not exceed 15% of the initial value, for conditions shown under *Characteristics Range Values, Notes 1,3.*

50-Hour Survival Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.1.a) is performed on a sample lot of tubes from each production run to insure a low percentage of early inoperatives. Life-test conditions are the same as those specified for *1-Hour Stability Life Performance* except that all voltages are cycled at the rate of 110 minutes on and 10 minutes off. At the end of 50 hours, the tubes are required to meet the following limits:

Power Output. . . . . 5 min. watts
For conditions shown under *Characteristics Range Values Notes 1,10.*

Plate Current (2) . . . . 100 max. µa
For conditions shown under *Characteristics Range Values Notes 1,4.*

Shorts and Continuity Test specified above.

Intermittent Dynamic Life Performance:

This test (similar to MIL-E-1D, paragraph 4.11.3.2) is performed on a sample lot of tubes from each production run to insure high quality of rf performance. Each tube is life-tested in a cavity-type oscillator at 500 ± 15 Mc under the following conditions:

Heater voltage of 6.0 volts, plate supply voltage of 400 volts, grid resistor is adjusted to give a dc plate current of 40 ma. and value is recorded, cathode resistor of 0 ohms, plate-circuit load resistance of 100 ± 5 ohms, heater positive with respect to cathode by 50 volts, and plate-seal temperature of 175° C min. Heater voltage is cycled at a rate of 110 minutes on and 10 minutes off.

At the end of 500 hours, the tube will not show permanent shorts or open circuits and will be criticized for the total number of defects in the sample lot and for the number of tubes failing to meet the following limits:

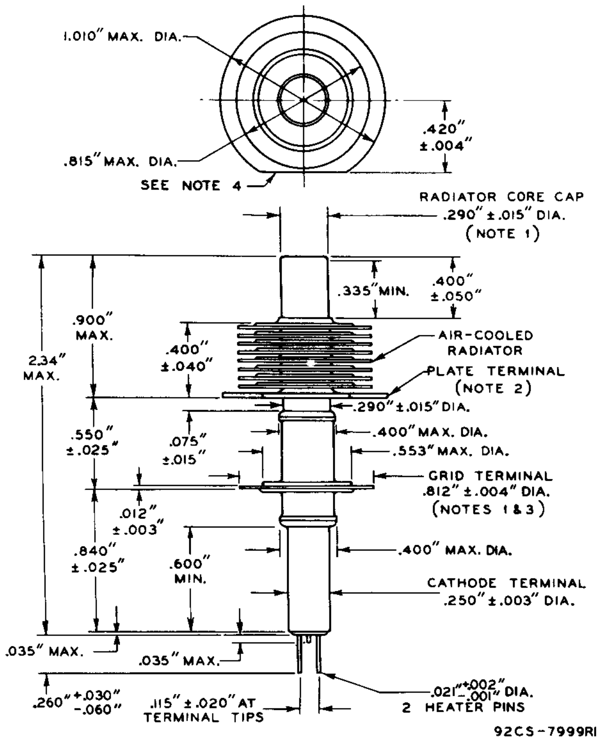
Reverse Grid Current. . . . . 1 max. μa
For conditions shown under *Characteristics Range Values Notes 1,2.*

Power Output. . . . . 5 min. watts
For conditions shown under *Characteristics Range Values Notes 1,10.*

OPERATING CONSIDERATIONS

The *heater* leads of the 6263A should not be soldered to circuit elements. The heat of the soldering operation may crack the glass seals of the heater pins and damage the tube.

The *cathode* should preferably be connected to one side of the heater. When, in some circuit designs, the heater is not connected directly to the cathode, precautions must be taken to hold the peak heater-cathode voltage to the maximum values shown in the tabulated data.


1.010" MAX. DIA.
.815" MAX. DIA.
SEE NOTE 4
.420" ±.004"
RADIATOR CORE CAP .290" ±.015" DIA. (NOTE 1)
.335" MIN.
.400" ±.050"
.900" MAX.
2.34" MAX.
.400" ±.040"
AIR-COOLED RADIATOR
PLATE TERMINAL (NOTE 2)
.290" ±.015" DIA.
.550" ±.025"
.075" ±.015"
.400" MAX. DIA.
.553" MAX. DIA.
GRID TERMINAL .812" ±.004" DIA. (NOTES 1 & 3)
.012" ±.003"
.840" ±.025"
.600" MIN.
.400" MAX. DIA.
CATHODE TERMINAL .250" ±.003" DIA.
.035" MAX.
.035" MAX.
.260" +.030" -.060"
.115" ±.020" AT TERMINAL TIPS
.021" +.002" -.001" DIA. 2 HEATER PINS
92CS-7999R1

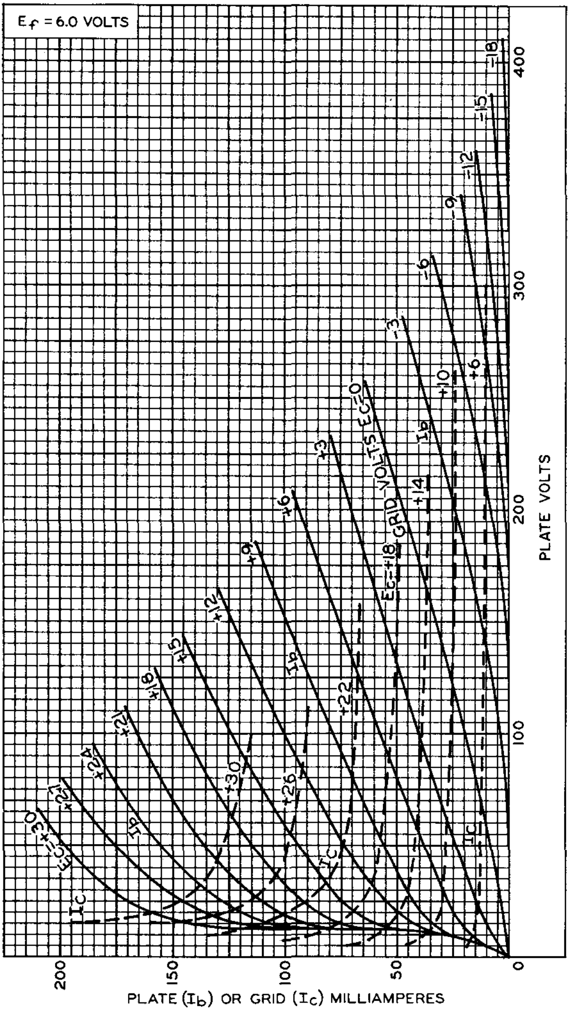
NOTE 1: ECCENTRICITY OF RADIATOR-CORE CAP WITH RESPECT TO THE CATHODE TERMINAL IS ONE-HALF THE TOTAL RUN-OUT DETERMINED BY CHUCKING THE CATHODE TERMINAL 0.050" TO 0.100" FROM CATHODE FLANGE, ROTATING THE TUBE, AND GAUGING THE TOTAL RUN-OUT AT A POINT 0.125" FROM THE END OF THE RADIATOR-CORE CAP. THE ECCENTRICITY WILL NOT EXCEED 0.030".

NOTE 2: TILT OF PLATE-TERMINAL FIN OF RADIATOR WITH RESPECT TO ROTATIONAL AXIS OF CATHODE CYLINDER IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE PLATE-TERMINAL FIN PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM THE STRAIGHT EDGE OF THE PLATE-TERMINAL FIN FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.025".

NOTE 3: TILT OF GRID-TERMINAL FLANGE WITH RESPECT TO ROTATIONAL AXIS OF CATHODE TERMINAL IS DETERMINED BY CHUCKING THE CATHODE TERMINAL, ROTATING THE TUBE, AND GAUGING THE TOTAL TRAVEL DISTANCE OF THE GRID-TERMINAL FLANGE PARALLEL TO THE AXIS AT A POINT APPROXIMATELY 0.020" INWARD FROM ITS EDGE FOR ONE COMPLETE ROTATION. THE TOTAL TRAVEL DISTANCE WILL NOT EXCEED 0.025".

NOTE 4: THE STRAIGHT EDGE ON THE PERIMETER OF THE LARGE FIN (PLATE TERMINAL) IS PARALLEL TO A PLANE THROUGH THE CENTERS OF THE HEATER PINS AT THEIR SEALS WITHIN 15°.

AVERAGE CHARACTERISTICS



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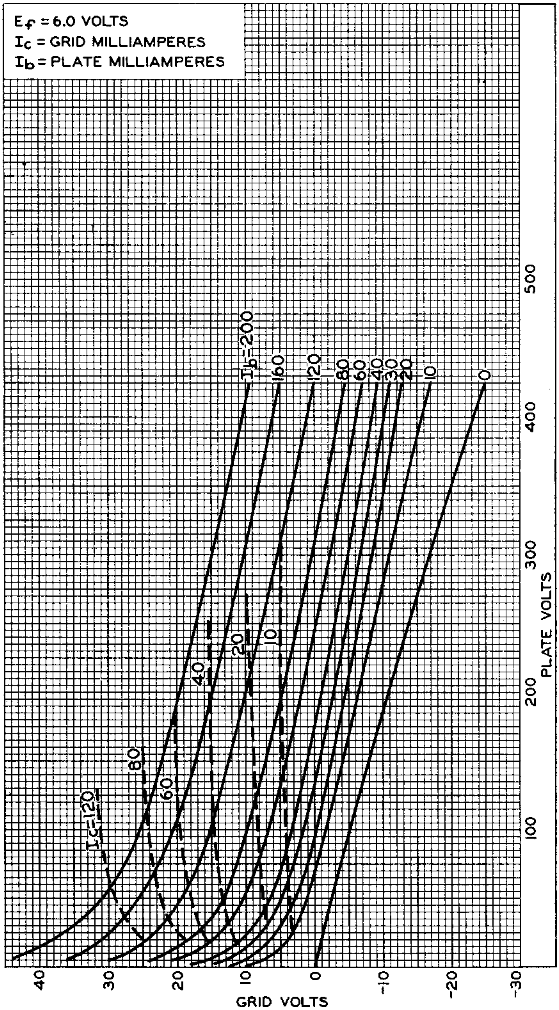
AVERAGE CONSTANT-CURRENT CHARACTERISTICS



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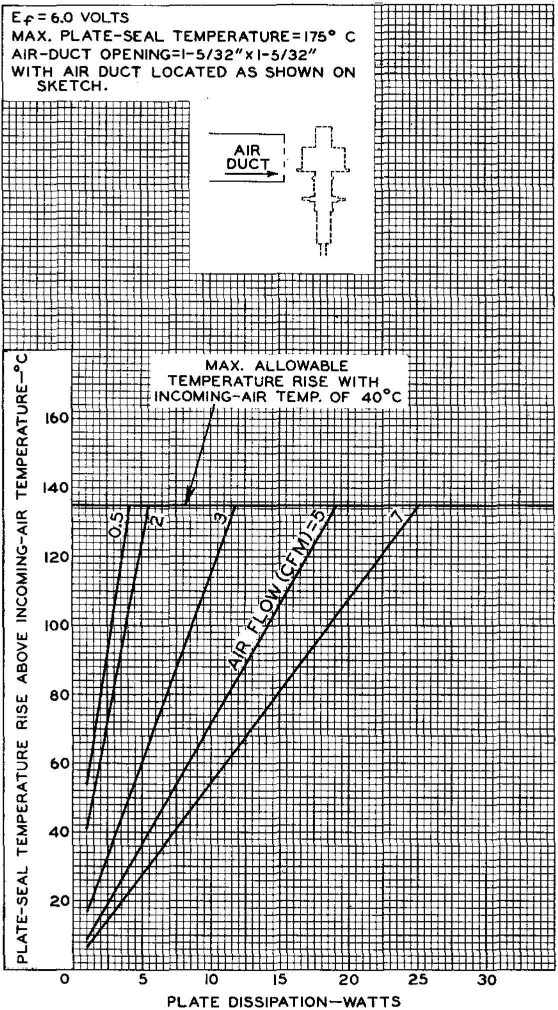
COOLING REQUIREMENTS



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