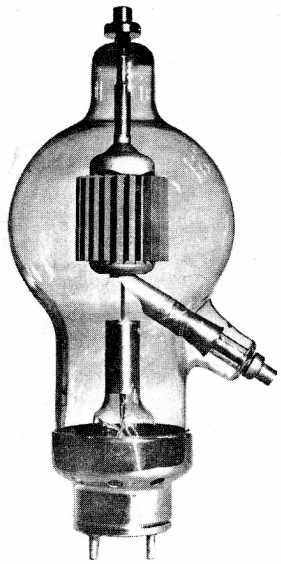
EIMAC
Division of Varian
SAN CARLOS
CALIFORNIA

1500T

MEDIUM-MU
TRIODE

The EIMAC 1500T is a medium-mu power triode intended for use as an amplifier, oscillator or modulator. It has a maximum plate-dissipation rating of 1500 watts and a maximum plate voltage rating of 8000 volts at frequencies up to 40 MHz.

The 1500T in Class-C rf service will deliver up to 4500 watts plate power output with 85 watts driving power. Two 1500T's in Class-B modulator service will deliver up to 7000 watts maximum-signal plate output with 115 watts nominal driving power.



GENERAL CHARACTERISTICS[1]

ELECTRICAL

Filament: Thoriated Tungsten	
Voltage	7.5 ± 0.375 V
Current, at 7.5 volts	24.0 A
Transconductance (Average):	
I_b = 1.25A, E_b = 6000 volts	10,000 μmhos
Amplification Factor (Average):	24
Direct Interelectrode Capacitances (grounded filament)[2]	
Grid-Plate	7.2 pF
Grid-Filament	9.9 pF
Plate-Filament	1.5 pF
Frequency of Maximum Rating:	
CW	40 MHz

1. Characteristics and operating values are based upon performance tests. These figures may change without notice as the result of additional data or product refinement. EIMAC Division of Varian should be consulted before using this information for final equipment design.
2. In Shielded Fixture.

MECHANICAL

Maximum Overall Dimensions:	
Length	17.000 in; 431.80 mm
Diameter	7.125 in; 180.98 mm
Net Weight	36 oz; 1020 gm
Operating Position	Vertical, base up or down
Maximum Operating Temperature:	
Plate and Base Seals	225°C
Cooling	Radiation and forced air
Base	Special 4-pin
Recommended Socket	Johnson 124-214 or equivalent
Recommended Heat-Dissipating Connectors:	
Plate	HR-8
Grid	HR-8

RADIO FREQUENCY POWER AMPLIFIER OR OSCILLATOR Class C Telegraphy or FM Telephony (Key-Down Conditions)

ABSOLUTE MAXIMUM RATINGS

DC PLATE VOLTAGE	8000	VOLTS
DC PLATE CURRENT	1.25	AMPERE
PLATE DISSIPATION	1500	WATTS
GRID DISSIPATION	125	WATTS

TYPICAL OPERATION (Frequencies to 40 MHz)

Plate Voltage	5000	6000	7000	Vdc
Grid Voltage	-375	-600	-500	Vdc
Plate Current	1.00	1.00	0.86	Adc
Grid Current	150	165	110	mAdc
Grid Dissipation[1]	59	61	30	W
Peak rf Grid Voltage[1]	850	1100	885	v
Calculated Driving Power[1]	115	160	85	W
Plate Input Power	5000	6000	6000	W
Plate Dissipation	1500	1500	1500	W
Plate Output Power	3500	4500	4500	W

1. Approximate value.

PLATE MODULATED RADIO FREQUENCY POWER AMPLIFIER GRID DRIVEN Class C Telephony (Carrier Conditions)

ABSOLUTE MAXIMUM RATINGS

DC PLATE VOLTAGE	6500	VOLTS
DC PLATE CURRENT	1.0	AMPERE
PLATE DISSIPATION[1]	1000	WATTS
GRID DISSIPATION[2]	125	WATTS

1. Corresponds to 1500 watts at 100% sine-wave modulation.
2. Average, with or without modulation.

TYPICAL OPERATION (Frequencies to 40 MHz)

Plate Voltage	4000	5000	6000	Vdc
Grid Voltage	-450	-550	-650	Vdc
Plate Current	0.75	0.70	0.66	Adc
Grid Current	85	75	70	mAdc
Grid Dissipation[1]	30	26	25	W
Peak rf Grid Voltage[1]	860	950	1050	v
Calculated Driving Power[1]	68	67	70	W
Plate Input Power	3000	3500	4000	W
Plate Dissipation	1000	1000	1000	W
Plate Output Power	2000	2500	3000	W

1. Approximate value.

AUDIO FREQUENCY POWER AMPLIFIER OR MODULATOR Class B, Grid Driven (Sinusoidal Wave)

ABSOLUTE MAXIMUM RATINGS (Per Tube)

DC PLATE VOLTAGE	8000	VOLTS
DC PLATE CURRENT	1.25	AMPERE
PLATE DISSIPATION	1500	WATTS
GRID DISSIPATION	125	WATTS

TYPICAL OPERATION (Two Tubes)

Plate Voltage	4000	5000	6000	Vdc
Grid Voltage[1/4]	-95	-145	-190	Vdc
Zero-Signal Plate Current	0.50	0.40	0.33	Adc
Max. Signal Plate Current	1.88	1.72	1.65	Adc
Peak af Grid Voltage[2]	485	535	570	v
Peak Driving Power[3]	190	210	230	w
Max. Signal Plate Dissipation	1500	1500	1450	W
Plate Output Power	4500	5600	7000	W
Load Resistance (plate to plate)	4150	6150	8200	Ω

1. Approximate value.
2. Per tube.
3. Nominal drive power is one-half peak power.
4. Adjust to give stated zero-signal plate current.

NOTE: TYPICAL OPERATION data are obtained by measurement or calculation from published characteristic curves. Adjustment of the rf grid voltage to obtain the specified plate current at the specified bias, and plate voltages is assumed. If this procedure is followed, there will be little variation in output power when the tube is changed, even though there may be some variation in grid current. The grid current which results when the desired plate current is obtained is incidental and varies from tube to tube. These current variations cause no difficulty so long as the circuit maintains the correct voltage in the presence of the variations in current. If grid bias is obtained principally by means of a grid resistor, the resistor must be adjustable to obtain the required bias voltage when the correct rf grid voltage is applied.

RANGE VALUES FOR EQUIPMENT DESIGN

	Min.	Max.	
Filament: Current at 7.5 volts	22.0	25.0	A
Interelectrode Capacitances [1] (grounded filament connection)			
Grid-Plate	5.5	9.0	pF
Grid-Filament	7.5	12.5	pF
Plate-Filament	---	2.0	pF

APPLICATION

MECHANICAL

MOUNTING - The 1500T must be mounted vertically, base up or base down. Flexible leads should be provided between the grid and plate terminals and the external grid and plate circuits. The tube must be protected from vibration and shock.

COOLING - Forced-air cooling is required on the envelope and also in the base of the tube. Envelope cooling may be accomplished by locating an 8- or 10-inch fan about one foot from the tube and directing the air at the middle of the envelope.

Base cooling requires an air flow of 2½ cu. ft. per min. directed up through the bottom of the base toward the filament press. The base of the tube is provided with a 1-inch diameter hole for this purpose. If a socket is used with a 1-inch diameter matching hole and the manifold is of the same diameter, a static pressure of less than 0.1 inch of water is required at the manifold to provide the 2½ cu. ft. per min.

One type of socket provides a ¼ inch diameter pipe for the air inlet to the base. With this type of socket a static pressure of 5½ inches of water is required at the pipe to obtain the necessary 2½ cu. ft. per min. volume.

Suitable electrical interlocks should be provided to remove the plate and filament voltages in the event that the supply of cooling air is interrupted.

ELECTRICAL

FILAMENT VOLTAGE - The filament voltage, as measured directly at the filament pins, should be between 7.125 and 7.875 volts. All four socket terminals should be used by employing two for each connection to filament supply. See base diagram and outline drawing.

BIAS VOLTAGE - There is little advantage in using bias voltages in excess of those given under Typical Operation, except in certain very specialized applications. Where bias is obtained by a grid bias resistor, suitable protective means must be provided to prevent excessive plate dissipation in the event of loss of excitation. The grid bias resistor should be adjustable to facilitate maintaining the bias voltage and plate current at the desired values from tube to tube.

GRID DISSIPATION - The power dissipated by the grid of the 1500T must not exceed 125 watts. Grid dissipation may be calculated from the following expression:

$$P_g = e_{cmp} \times I_c$$

where: P_g = Grid dissipation

e_{cmp} = Peak positive grid voltage, and

I_c = dc grid current

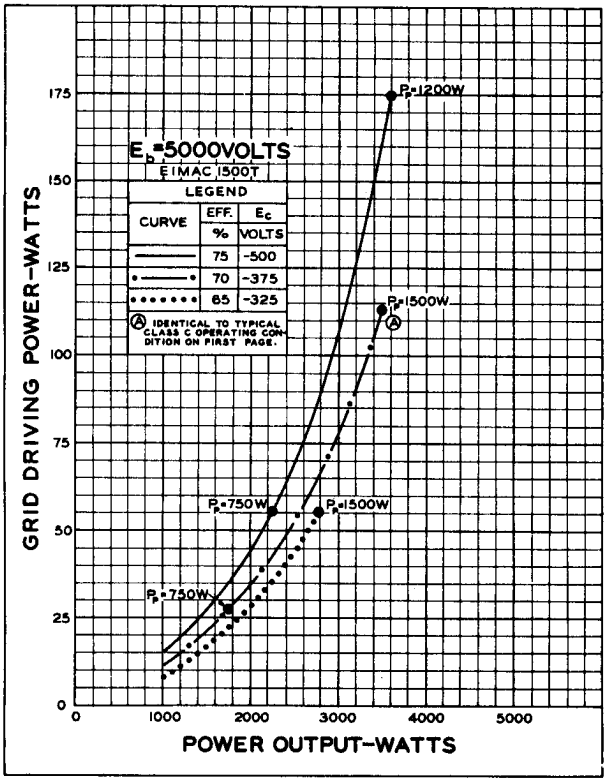
e_{cmp} may be measured by means of a suitable peak voltmeter connected between filament and grid. In equipment in which the plate loading varies widely, such as oscillators used for radio-frequency heating, care should be taken to make certain that the grid dissipation does not exceed the maximum rating under any condition of loading.

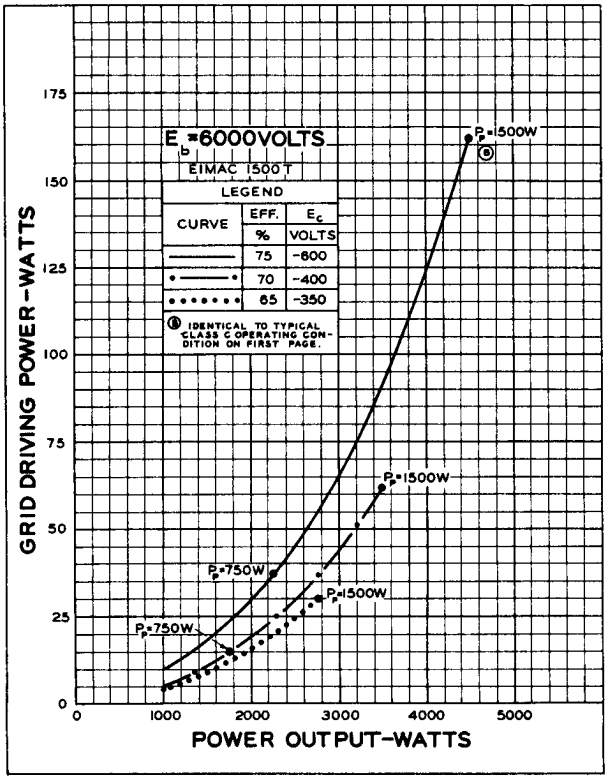
PLATE DISSIPATION - The plate is a red-orange color when dissipating 1500 watts. Under normal operating conditions the power dissipated by the plate of the 1500T should not be allowed to exceed the maximum rating. Plate dissipation in excess of the maximum rating is permissible for short periods of time, such as during tuning procedures.

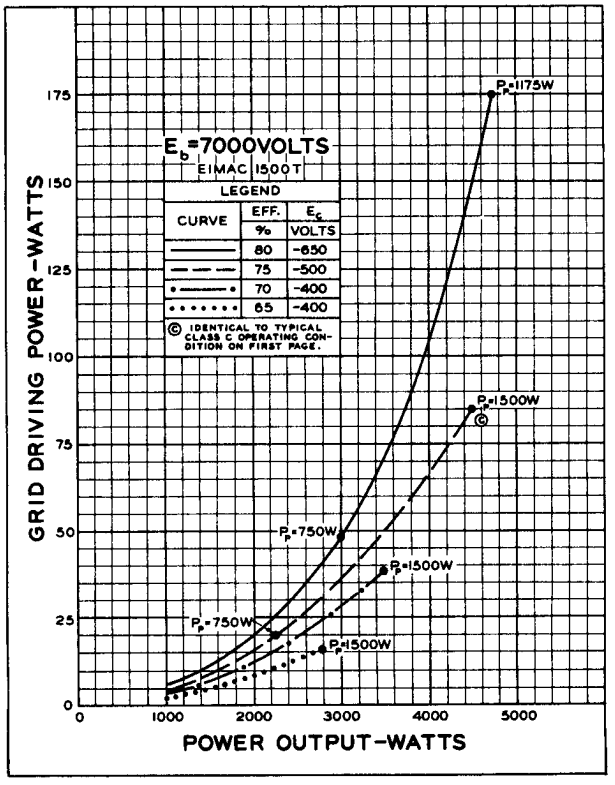
DRIVING POWER vs. POWER OUTPUT

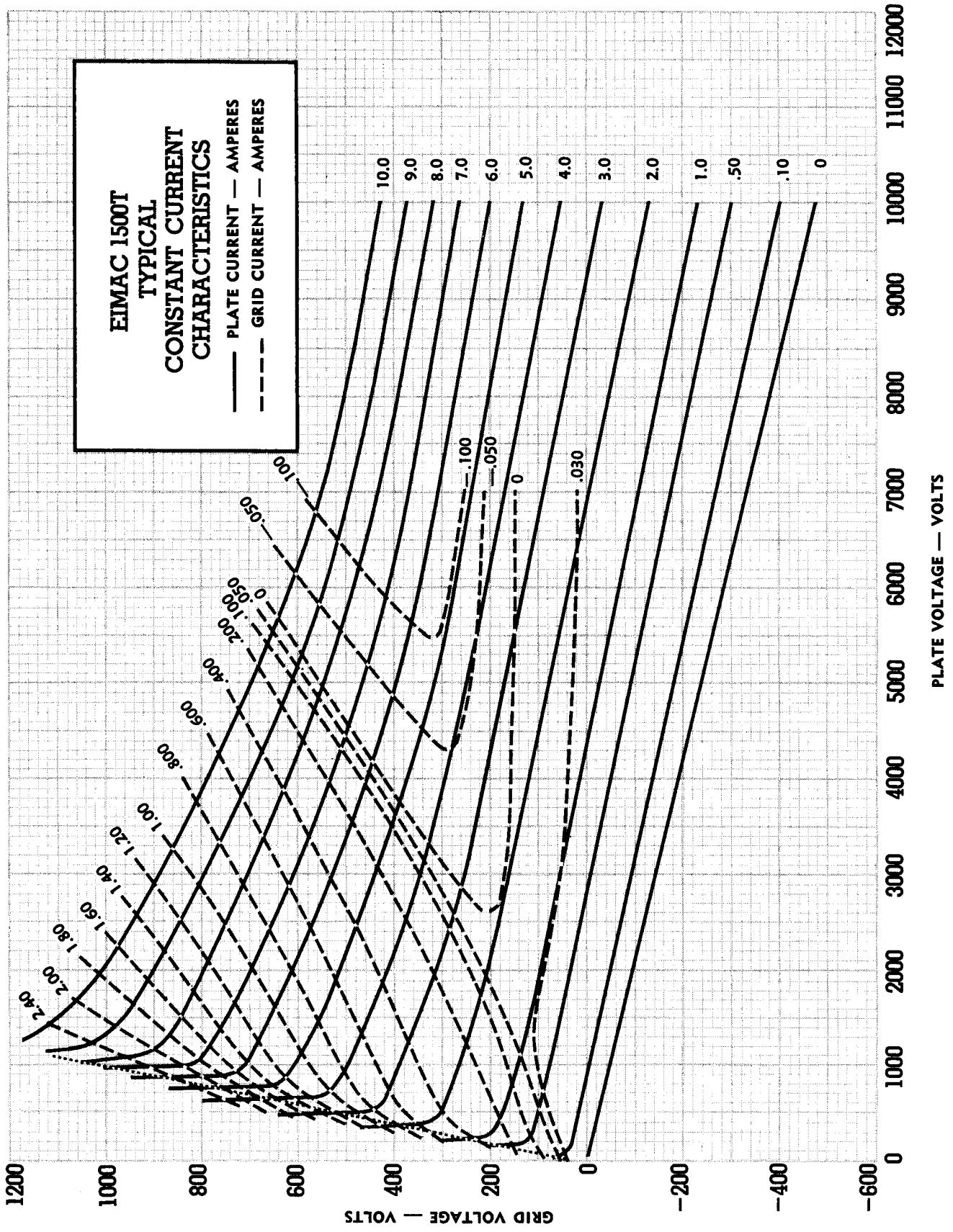
The three charts on this page show the relationship of plate efficiency, power output and approximate grid driving power at plate voltages of 5000, 6000, and 7000 volts. These charts show combined grid and bias losses only. The driving power and power output figures do not include circuit losses. The plate dissipation in watts is indicated by Pp.

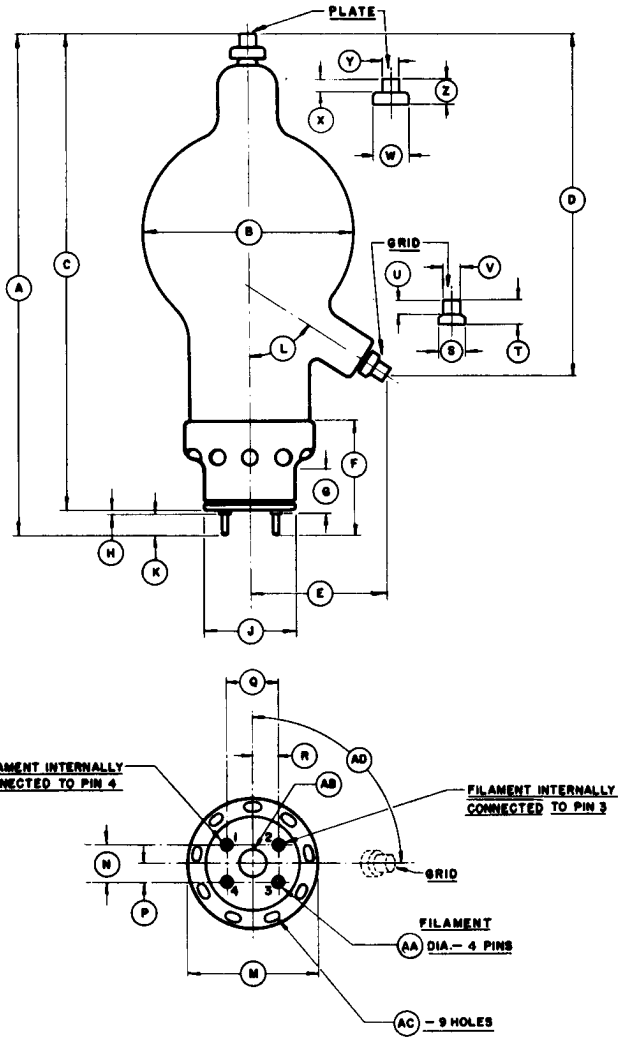
Points A, B, and C are identical to the typical Class C operating conditions shown on the first page under 5000, 6000, and 7000 volts respectively.








EIMAC 1500T
TYPICAL
CONSTANT CURRENT
CHARACTERISTICS
PLATE CURRENT — AMPERES
GRID CURRENT — AMPERES
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
.50
.10
0
.100
.050
0
.030
2.40
2.00
1.80
1.60
1.40
1.20
1.00
.800
.600
.400
.200
.100
.050
0
.050
.100
GRID VOLTAGE — VOLTS
1200
1000
800
600
400
200
0
-200
-400
-600
PLATE VOLTAGE — VOLTS
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000



DIMENSIONAL DATA

DIM.	INCHES			MILLIMETERS		
	MIN.	MAX.	REF.	MIN.	MAX.	REF.
A	16.000	17.000	- -	406.40	431.80	- -
B	- -	7.125	- -	- -	180.98	- -
C	15.250	16.250	- -	387.35	412.75	- -
D	10.875	11.625	- -	276.23	295.28	- -
E	4.313	4.813	- -	109.55	122.25	- -
F	- -	- -	3.750	- -	- -	95.25
G	- -	- -	1.313	- -	- -	33.35
H	- -	- -	0.094	- -	- -	2.39
J	- -	3.013	- -	- -	76.53	- -
K	0.731	0.763	- -	18.57	19.38	- -
L	37°	87°	- -	37°	87°	- -
M	- -	4.250	- -	- -	107.95	- -
N	- -	- -	1.250	- -	- -	31.75
P	- -	- -	0.625	- -	- -	15.88
Q	- -	- -	1.688	- -	- -	42.88
R	- -	- -	0.844	- -	- -	21.44
S	- -	- -	0.875	- -	- -	22.23
T	- -	- -	0.812	- -	- -	20.62
U	0.484	- -	- -	12.30	- -	- -
V	0.558	0.568	- -	14.18	14.43	- -
W	- -	- -	1.125	- -	- -	28.58
X	0.453	- -	- -	11.51	- -	- -
Y	0.558	0.568	- -	14.18	14.43	- -
Z	- -	- -	0.797	- -	- -	20.24
AA	0.249	0.251	- -	6.32	6.38	- -
AB	0.750 DIA	- -	- -	19.05 DIA.	- -	- -
AC	0.250 DIA	- -	- -	6.35 DIA.	- -	- -
AD	80°	100°	- -	80°	100°	- -

NOTES:
1. REF. DIMS. ARE FOR INFO. ONLY & ARE NOT REQD. FOR INSPECTION PURPOSES.