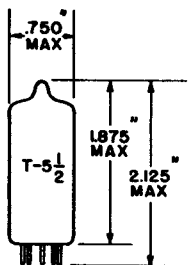


## TUNG-SOL

## → TWIN TRIODE

MINIATURE TYPE



GLASS BULB  
SMALL-BUTTON MINIATURE  
7 PIN BASE E7-1  
OUTLINE DRAWING  
JEDEC 5-2

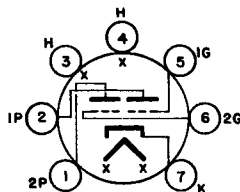
ANY, BUT FOR UTMOST IN SERVICE, THE TUBE SHOULD BE OPERATED IN A VERTICAL POSITION WITH BASE UP OR DOWN, OR IN A HORIZONTAL POSITION WITH BASE PINS 1 & 6 IN A VERTICAL PLANE.

UNIPOENTIAL CATHODE

HEATER

6.3±10% VOLTS 0.45 AMP.

AC OR DC

OPERATING POSITION<sup>22</sup>

BOTTOM VIEW  
BASING DIAGRAM  
JEDEC 78F

THE 5964 IS A MEDIUM-MU TWIN TRIODE IN THE 7 PIN MINIATURE CONSTRUCTION. IT IS ESPECIALLY DESIGNED FOR FREQUENCY-DIVIDER CIRCUITS IN ELECTRONIC COMPUTERS AND OTHER 'ON-OFF' CONTROL APPLICATIONS REQUIRING LONG PERIODS OF OPERATION UNDER CUT-OFF CONDITIONS.

**DIRECT INTERELECTRODE CAPACITANCES - APPROX.**  
WITHOUT EXTERNAL SHIELD

## EACH UNIT

GRID TO PLATE	1.3	pf
GRID TO CATHODE AND HEATER	2.1	pf
PLATE TO CATHODE AND HEATER	0.4	pf
GRID OF UNIT #1 TO GRID OF UNIT #2 (MAX.)	0.5	pf

## RATINGS

MAXIMUM ABSOLUTE VALUES

## EACH UNIT

FREQUENCY DIVIDER IN COMPUTER SERVICE  
AND  
'ON-OFF' CONTROL SERVICE

MAXIMUM PLATE VOLTAGE	250	VOLTS
MAXIMUM GRID VOLTAGE:		
NEGATIVE BIAS VALUE	100	VOLTS
POSITIVE BIAS VALUE	0	VOLTS
PEAK NEGATIVE VALUE	200	VOLTS
MAXIMUM PLATE DISSIPATION	1.5	WATTS
MAXIMUM GRID INPUT	0.1	WATT
MAXIMUM DC CATHODE CURRENT <sup>A</sup>	15	MA.
MAXIMUM PEAK CATHODE CURRENT <sup>A</sup>	75	MA.
MAXIMUM PEAK HEATER-CATHODE VOLTAGE:		
HEATER NEGATIVE WITH RESPECT TO CATHODE	90	VOLTS
HEATER POSITIVE WITH RESPECT TO CATHODE	90	VOLTS
MAXIMUM BULB TEMPERATURE (AT HOTTEST POINT ON BULB SURFACE)	150	°C

→ INDICATES A CHANGE.

CONTINUED ON FOLLOWING PAGE

## TUNG-SOL

CONTINUED FROM PRECEDING PAGE

## TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

CLASS A AMPLIFIER - EACH UNIT  
WITH BOTH UNITS OPERATING

PLATE VOLTAGE	100	VOLTS
CATHODE-BIAS RESISTOR	50	OHMS
AMPLIFICATION FACTOR	39	
PLATE RESISTANCE	6500	OHMS
TRANSCONDUCTANCE	6000	$\mu$ MHOS
PLATE CURRENT	9.5	MA.

FREQUENCY DIVIDER IN COMPUTER SERVICE  
AND  
'ON-OFF' CONTROL SERVICETYPICAL OPERATION AS FREQUENCY HALFER  
EACH UNIT

	CUTOFF CONDITION	ZERO-BIAS CONDITION	
PLATE-SUPPLY VOLTAGE	150	150	VOLTS
PLATE-CIRCUIT RESISTANCE	20000	20000	OHMS
GRID-SUPPLY VOLTAGE	-10	0	VOLTS
GRID-CIRCUIT RESISTANCE	47000	47000	OHMS
PLATE CURRENT	0	5	MA.

## CIRCUIT VALUES

GRID-CIRCUIT RESISTANCE: (MAX.) FOR FIXED-BIAS OPERATION	0.5	MEGOHM
FOR CATHODE-BIAS OPERATION	1.0	MEGOHM

## RANGE VALUES FOR EQUIPMENT DESIGN

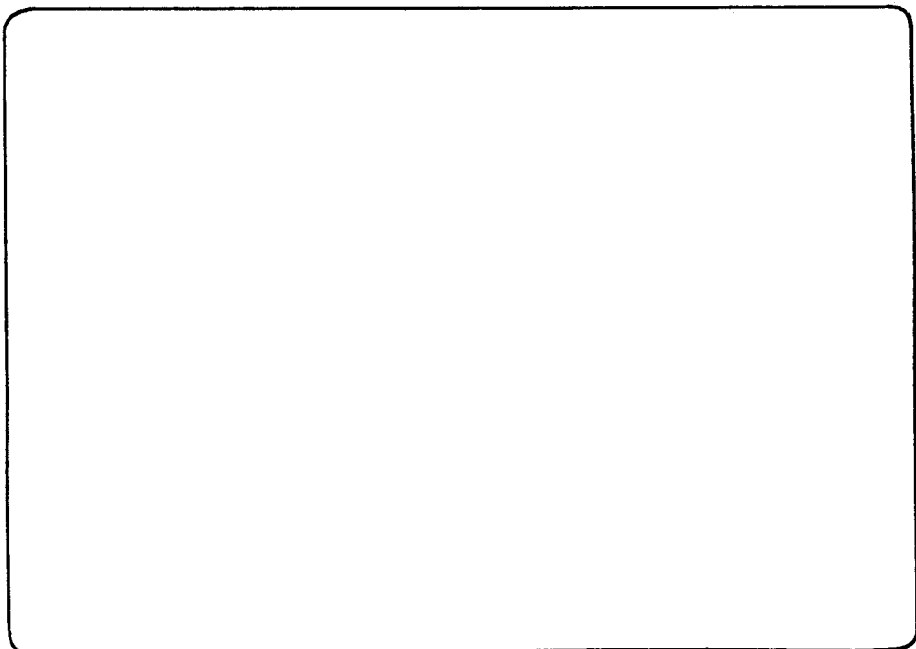
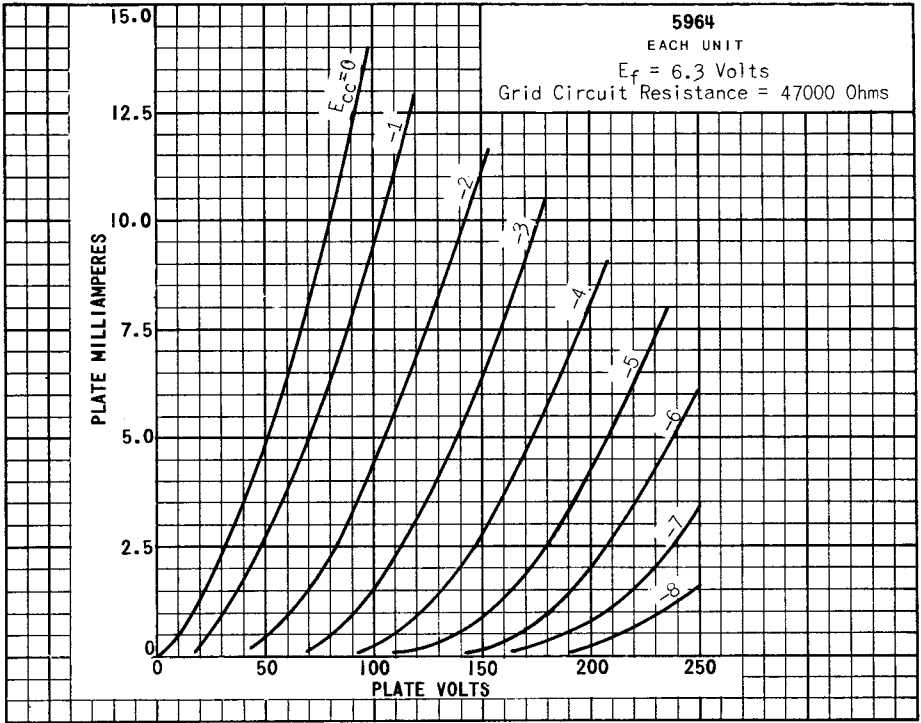
CUTOFF CONDITION	MIN.	MAX.	
PLATE CURRENT (EACH UNIT) <sup>B</sup>	---	0.075	MA.
DIFFERENCE IN PLATE CURRENT BETWEEN UNITS	---	0.2	MA.
ZERO-BIAS CONDITION			
PLATE CURRENT (EACH UNIT) <sup>C</sup>	4.3	5.7	MA.
DIFFERENCE IN PLATE CURRENT BETWEEN UNITS	---	1.4	MA.

<sup>A</sup> WITH BOTH UNITS OPERATING, THE DC CATHODE CURRENT SHOULD NOT EXCEED 30 MILLIAMPERES, AND THE PEAK CATHODE CURRENT SHOULD NOT EXCEED 150 MILLIAMPERES.

<sup>B</sup> FOR CONDITIONS WITH 6.3 VOLTS ON HEATER, PLATE-SUPPLY VOLTS = 150, PLATE-CIRCUIT RESISTANCE (OHMS) = 20000, GRID-SUPPLY VOLTS = -10, AND GRID-CIRCUIT RESISTANCE (OHMS) = 47000.

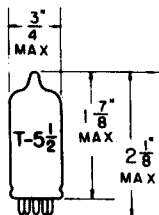
<sup>C</sup> CONDITIONS ARE SAME AS FOR NOTE 1 EXCEPT THAT GRID-SUPPLY VOLTS = 0.

<sup>\*</sup> COMMON TO BOTH UNITS.



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## TUNG-SOL

TRIODE  
MINIATURE TYPE

GLASS BULB

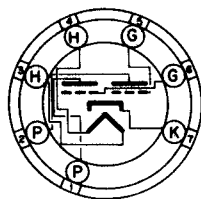
UNIPOTENTIAL CATHODE  
HEATER

6.3±10% VOLTS 0.45 AMP.

AC OR DC

OPERATING POSITION<sup>1</sup>

<sup>1</sup> ANY, BUT FOR UTMOST IN SERVICE, THE TUBE SHOULD BE OPERATED IN A VERTICAL POSITION WITH BASE UP OR DOWN, OR IN A HORIZONTAL POSITION WITH BASE PINS 1 & 6 IN A VERTICAL PLANE.



**BOTTOM VIEW**  
SMALL-BUT TON MINIATURE  
7 PIN BASE  
7 BF

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**DIRECT INTERELECTRODE CAPACITANCES - APPROX.**  
WITHOUT EXTERNAL SHIELD

## EACH UNIT

GRID TO PLATE	1.3	μfd
GRID TO CATHODE AND HEATER	2.1	μfd
PLATE TO CATHODE AND HEATER	0.4	μfd
GRID OF UNIT #1 TO GRID OF UNIT #2 (MAX.)	0.5	μfd

## RATINGS

MAXIMUM ABSOLUTE VALUES

## EACH UNIT

FREQUENCY DIVIDER IN COMPUTER SERVICE  
AND  
'ON-OFF' CONTROL SERVICE

HEATER VOLTAGE	6.3±10%	VOLTS
MAXIMUM PLATE VOLTAGE	250	VOLTS
MAXIMUM GRID VOLTAGE:		
NEGATIVE BIAS VALUE	100	VOLTS
POSITIVE BIAS VALUE	0	VOLTS
PEAK NEGATIVE VALUE	200	VOLTS
MAXIMUM PLATE DISSIPATION	1.5	WATTS
MAXIMUM GRID INPUT	0.1	WATT
MAXIMUM DC CATHODE CURRENT <sup>A</sup>	15	MA.
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MAXIMUM PEAK HEATER-CATHODE VOLTAGE:		
HEATER NEGATIVE WITH RESPECT TO CATHODE	90	VOLTS
HEATER POSITIVE WITH RESPECT TO CATHODE	90	VOLTS
MAXIMUM BULB TEMPERATURE (AT HOTTEST POINT ON BULB SURFACE)	150	°C

→ INDICATES A CHANGE.

CONTINUED ON FOLLOWING PAGE

# TUNG-SOL

CONTINUED FROM PRECEDING PAGE

## TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

CLASS A AMPLIFIER - EACH UNIT  
WITH BOTH UNITS OPERATING

HEATER VOLTAGE	6.3±10%	VOLTS
HEATER CURRENT	0.45	AMP.
PLATE VOLTAGE	100	VOLTS
CATHODE-BIAS RESISTOR	50	OHMS
AMPLIFICATION FACTOR	39	
PLATE RESISTANCE	6500	OHMS
TRANSCONDUCTANCE	6000	μMHOS
PLATE CURRENT	9.5	MA.

FREQUENCY DIVIDER IN COMPUTER SERVICE  
AND  
'ON-OFF' CONTROL SERVICE

TYPICAL OPERATION AS FREQUENCY HALFER  
EACH UNIT

	CUTOFF CONDITION	ZERO-BIAS CONDITION	
PLATE-SUPPLY VOLTAGE	150	150	VOLTS
PLATE-CIRCUIT RESISTANCE	20000	20000	OHMS
GRID-SUPPLY VOLTAGE	-10	0	VOLTS
GRID-CIRCUIT RESISTANCE	47000	47000	OHMS
PLATE CURRENT	0	5	MA.

### CIRCUIT VALUES

GRID-CIRCUIT RESISTANCE: (MAX.) FOR FIXED-BIAS OPERATION	0.5	MEGOHM
FOR CATHODE-BIAS OPERATION	1.0	MEGOHM

### RANGE VALUES FOR EQUIPMENT DESIGN

	MIN.	MAX.	
CUTOFF CONDITION			
PLATE CURRENT (EACH UNIT) <sup>B</sup>	---	0.075	MA.
DIFFERENCE IN PLATE CURRENT BETWEEN UNITS	---	0.2	MA.
ZERO-BIAS CONDITION			
PLATE CURRENT (EACH UNIT) <sup>C</sup>	4.3	5.7	MA.
DIFFERENCE IN PLATE CURRENT BETWEEN UNITS	---	1.4	MA.

<sup>A</sup> WITH BOTH UNITS OPERATING, THE DC CATHODE CURRENT SHOULD NOT EXCEED 30 MILLIAMPERES, AND THE PEAK CATHODE CURRENT SHOULD NOT EXCEED 150 MILLIAMPERES.

<sup>B</sup> FOR CONDITIONS WITH 6.3 VOLTS ON HEATER, PLATE-SUPPLY VOLTS = 150, PLATE-CIRCUIT RESISTANCE (OHMS) = 20000, GRID-SUPPLY VOLTS = -10, AND GRID-CIRCUIT RESISTANCE (OHMS) = 47000.

<sup>C</sup> CONDITIONS ARE SAME AS FOR NOTE 1 EXCEPT THAT GRID-SUPPLY VOLTS = 0.

<sup>D</sup> COMMON TO BOTH UNITS.

→ INDICATES A CHANGE