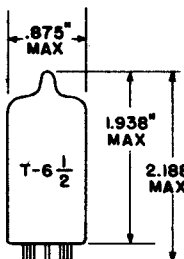


**TUNG-SOL**

→ TWIN TRIODE

MINIATURE TYPE



GLASS BULB  
SMALL-BUTTON NOVAL  
9 PIN BASE E9-1  
OUTLINE DRAWING  
JEDEC 6-2

UNIPOTENTIAL CATHODE

HEATER

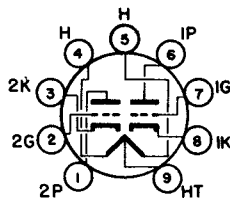
SERIES  
12.6± 1.3 VOLTS  
0.15 AMP.

PARALLEL  
6.3± 0.6 VOLTS  
0.3 AMP.

AC OR DC

OPERATING POSITION\*

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 6 & 9 IN A VERTICAL PLANE.



BOTTOM VIEW  
BASING DIAGRAM  
JEDEC 9A

THE 5963 IS A MEDIUM-MU TWIN TRIODE IN THE 9 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**  
WITHOUT EXTERNAL SHIELD

GRID TO PLATE (EACH UNIT)	1.5	pF
GRID TO CATHODE & HEATER (EACH UNIT)	1.9	pF
PLATE TO CATHODE & HEATER (UNIT #1)	0.5	pF
PLATE TO CATHODE & HEATER (UNITS #2)	0.35	pF
GRID OF UNIT #1 TO GRID OF UNIT #2 (MAX.)	0.01	pF

**RATINGS**

ABSOLUTE MAXIMUM VALUES

EACH UNIT

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

MAXIMUM PLATE VOLTAGE	250	VOLTS
MAXIMUM GRID VOL TAGE:		
NEGATIVE BIAS VALUE	100	VOLTS
POSITIVE BIAS VALUE	0	VOLTS
PEAK NEGATIVE VALUE	200	VOLTS
MAXIMUM PLATE DISSIPATION	2.5	WATTS
MAXIMUM GRID INPUT	0.5	WATT
MAXIMUM DC CATHODE CURRENT	20	MA.
MAXIMUM PEAK CATHODE CURRENT	100	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)	120	°C

→ INDICATES A CHANGE.

CONTINUED ON FOLLOWING PAGE

## TUNG-SOL

CONTINUED FROM PRECEDING PAGE

## TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

CLASS A AMPLIFIER (EACH UNIT)

PLATE VOLTAGE	67.5	VOLTS
GRID VOLTAGE	0	VOLTS
AMPLIFICATION FACTOR	21	
PLATE RESISTANCE	6600	OHMS
TRANSCONDUCTANCE	3200	$\mu$ MHOS
PLATE CURRENT	8.5	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
GRID VOLTAGE	-15	0	VOLTS
PLATE CIRCUIT RESISTANCE	20000	20000	OHMS
GRID-CIRCUIT RESISTANCE	47000	47000	OHMS
PLATE CURRENT	0	5.1	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

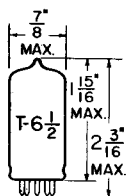
	NOTE	MIN	MAX	
CUTOFF CONDITION				
PLATE CURRENT	1	—	50	$\mu$ AMP.
DIFFERENCE IN PLATE CURRENT BETWEEN UNITS	—	—	50	$\mu$ AMP.
ZERO-BIAS CONDITION				
PLATE CURRENT	2	4.6	5.4	MA.
DIFFERENCE IN PLATE CURRENT BETWEEN UNITS	—	—	0.8	MA.

<sup>1</sup>FOR CONDITIONS WITH 12.6 VOLTS ON HEATER, PLATE-SUPPLY VOLTS = 150, PLATE-CIRCUIT RESISTANCE (OHMS) = 20000, GRID-SUPPLY VOLTS = -15, AND GRID-CIRCUIT RESISTANCE (OHMS) = 47000.

<sup>2</sup>CONDITIONS ARE SAME AS FOR NOTE 1 EXCEPT THAT GRID-SUPPLY VOLTS = 0.

**TUNG-SOL**

**TRIODE**  
MINIATURE TYPE



**GLASS BULB**

UNIPOENTIAL CATHODE

HEATER

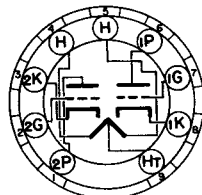
SERIES  
12.6±10% VOLTS  
0.15 AMP.

PARALLEL  
6.3±10% VOLTS  
0.3 AMP.

AC OR DC

ANY MOUNTING POSITION

MICROPHONISM NOT TESTED



**BOTTOM VIEW**

SMALL-BUTTON NOVAL  
9 PIN BASE

9A

THE 5963 IS A MEDIUM-MU TRIODE IN THE 9 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**  
WITHOUT EXTERNAL SHIELD

GRID TO PLATE (EACH UNIT)	1.5	μμf
GRID TO CATHODE & HEATER (EACH UNIT)	1.9	μμf
PLATE TO CATHODE & HEATER (UNIT #1)	0.5	μμf
PLATE TO CATHODE & HEATER (UNITS #2)	0.35	μμf
GRID OF UNIT #1 TO GRID OF UNIT #2 (MAX.)	0.01	μμf

**RATINGS**

ABSOLUTE MAXIMUM VALUES

EACH UNIT

FREQUENCY DIVIDER IN COMPUTER SERVICE  
AND

'ON-OFF' CONTROL SERVICE

	SERIES 12.6±10%	PARALLEL 6.3±10%	
HEATER VOLTAGE			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	2.5		WATTS
MAXIMUM GRID INPUT	0.5		WATT
MAXIMUM DC CATHODE CURRENT	20		MA.
MAXIMUM PEAK CATHODE CURRENT	100		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)	120		°C

CONTINUED ON FOLLOWING PAGE

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## TUNG-SOL

CONTINUED FROM PRECEDING PAGE

### TYPICAL OPERATING CONDITIONS AND CHARACTERISTICS

CLASS A AMPLIFIER (EACH UNIT)

HEATER VOLTAGE (SERIES)	12.6±10%	VOLTS
HEATER VOLTAGE (PARALLEL)	6.3±10%	VOLTS
HEATER CURRENT (SERIES)	0.15	AMP.
HEATER CURRENT (PARALLEL)	0.3	AMP.
PLATE VOLTAGE	67.5	VOLTS
GRID VOLTAGE	0	VOLTS
AMPLIFICATION FACTOR	21	
PLATE RESISTANCE	6600	OHMS
TRANSCONDUCTANCE	3200	μMHOS
PLATE CURRENT	8.5	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
GRID VOLTAGE	-15	0	VOLTS
PLATE CIRCUIT RESISTANCE	20000	20000	OHMS
GRID-CIRCUIT RESISTANCE	47000	47000	OHMS
PLATE CURRENT	0	5.1	MA.

#### CIRCUIT VALUES

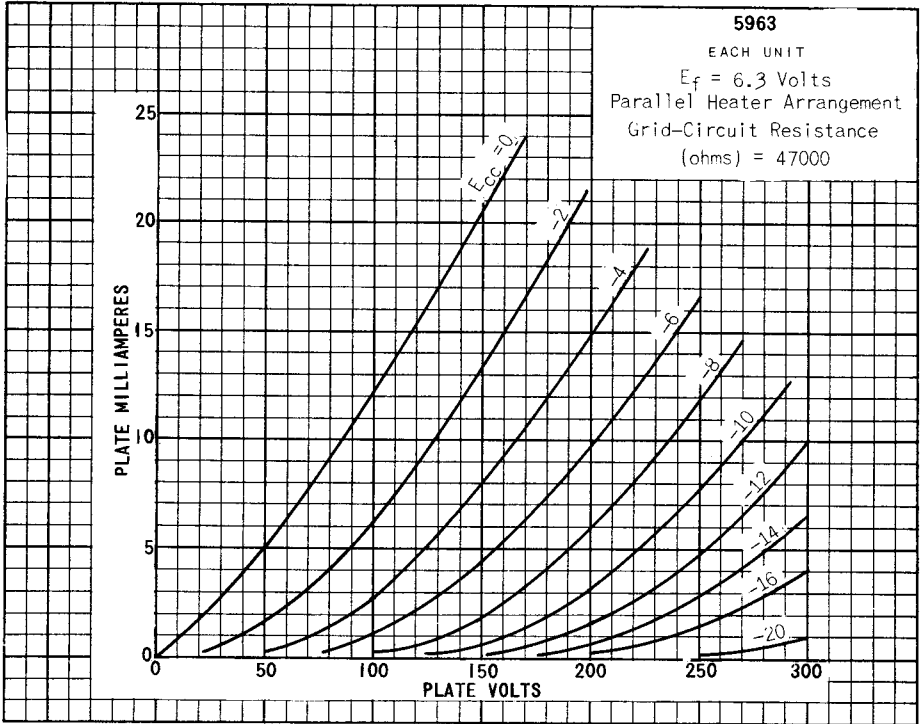
GRID-CIRCUIT RESISTANCE: (MAX.) FOR FIXED BIAS OPERATION	0.5	MEGOHM
FOR CATHODE-BIAS OPERATION	1.0	MEGOHM

#### RANGE VALUES FOR EQUIPMENT DESIGN

	NOTE	MIN	MAX	
CUTOFF CONDITION				
PLATE CURRENT	1	—	50	μAMP.
DIFFERENCE IN PLATE CURRENT BETWEEN UNITS	—	—	50	μAMP.
ZERO-BIAS CONDITION				
PLATE CURRENT	2	4.6	5.4	MA.
DIFFERENCE IN PLATE CURRENT BETWEEN UNITS	—	—	0.8	MA.

<sup>1</sup>FOR CONDITIONS WITH 12.6 VOLTS ON HEATER, PLATE-SUPPLY VOLTS = 150, PLATE-CIRCUIT RESISTANCE (OHMS) = 20000, GRID-SUPPLY VOLTS = -15, AND GRID-CIRCUIT RESISTANCE (OHMS) = 47000.

<sup>2</sup>CONDITIONS ARE SAME AS FOR NOTE 1 EXCEPT THAT GRID-SUPPLY VOLTS = 0.



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