19X8

TRIODE-PENTODE CONVERTER

9-Pin Miniature Type

TENTATIVE DATA

RCA-19X8 is a multi-unit tube of the 9-pin miniature type containing a medium-mu triode and a sharp-cutoff pentode in one envelope. It is designed primarily for use as a combined oscillator and mixer tube in "transformerless" AM/FM receivers. The 19X8 has a 150-milliampere heater which permits series-string heater operation with other tubes having 150-milliamperes heaters.

The pentode mixer unit of the 19X8 provides low grid-No.1-to-plate capacitance as compared with a triode mixer and also has low output capacitance. The low value of capacitance between grid No.1 and plate minimizes feedback problems often encountered in mixer circuits operating into high-impedance plate loads. The low value of output capacitance enables the tube to work into a high-impedance plate circuit with resultant increase in mixer gain.

The 19X8 offers versatility to designers of AM/FM receivers. In the AM section, the pentode unit may be used as a pentode mixer to provide high gain; in the FM section, the pentode unit may be used either as a pentode mixer or as a triode-connected mixer depending on signal-to-noise considerations. Because triode mixers have relatively low equivalent noise resistance, they are preferred for receiver designs which do not include an rf stage. For receiver designs with an rf stage, a pentode mixer not only provides higher gain but better performance because in such designs the noise introduced by the mixer is negligible. For both the AM and the FM sections, the triode unit of the 19X8 makes a satisfactory oscillator.

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:			
Voltage (AC or DC)		18.9	volts
Current		0.15	ampere
Direct Interelectrode Capacitances:	Without External Shield	With External Shield#	
Triode Unit:			
Grid to Plate	1.4	1.4	μμf
Input	2.0	2.6	μμf
Output	0.5	1.0	μμf
Pentode Unit:			
Grid No.1 to Plate	0.09 max.	0.06 max.	μμf
Input	4.3	4.5	μμf
Output	0.7	1.4	μμf
Pentode Grid No.1 to Triode Plate	0.045 max.	0.035 max.	μμf
Pentode Plate to Triode Plate	0.040 max.	0.008 max.	μμf
Heater to Cathode	5.2	5.2	μμf

Direct Interelectrode Capacitances (Cont'd):	Without External Shield	With External Shield#	
Pentode Unit Connected as Triode:▲			
Grid No.1 to Plate	1.4	1.3	μμf
Input	3.0	3.2	μμf
Output	1.6	2.0	μμf

Characteristics:

Triode Unit:		
Plate Voltage	100	volts
Cathode-Bias Resistor	100	ohms
Amplification Factor	40	
Plate Resistance (Approx.)	6900	ohms
Transconductance	5800	μmhos
Grid-No.1 Bias (Approx.) for Plate Current of 10 μamp	-10	volts
Plate Current	8.5	ma
Pentode Unit:		
Plate Voltage	250	volts
Grid No.3 (Suppressor)	Connected to Cathode at Socket	
Grid-No.2 Voltage	150	volts
Cathode-Bias Resistor	200	ohms
Plate Resistance (Approx.)	750000	ohms
Transconductance	4600	μmhos
Grid-No.1 Bias (Approx.) for Plate Current of 10 μamp	-10	volts
Plate Current	7.7	ma
Grid-No.2 Current	1.6	ma
Pentode Unit Connected as Triode:		
Plate Voltage	150	volts
Grid No.3	Connected to Cathode at Socket	
Grid No.2	Tied to Plate	
Cathode-Bias Resistor	250	ohms
Amplification Factor	42	
Plate Resistance (Approx.)	7900	ohms
Transconductance	4000	μmhos
Grid-No.1 Bias (Approx.) for Plate Current of 10 μamp	-10	volts
Plate Current	7.8	ma

CONVERTER SERVICE

Maximum Ratings, ***Design-Center Values:***

Triode Unit as Oscillator

PLATE VOLTAGE	250 max.	volts
GRID VOLTAGE: Negative bias value	40 max.	volts
GRID VOLTAGE: Positive bias value	0 max.	volts
PLATE DISSIPATION	1.5 max.	watts
GRID INPUT	0.5 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Pentode Unit as Mixer

PLATE VOLTAGE	250 max.	volts
GRID-No.3 (SUPPRESSOR) VOLTAGE	0 max.	volts
GRID-No.2 SUPPLY VOLTAGE	250 max.	volts
GRID-No.2 (SCREEN) VOLTAGE	See Fig.1	
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative bias value	40 max.	volts
Positive bias value	0 max.	volts
PLATE DISSIPATION	2.0 max.	watts
GRID-No.2 INPUT	0.4 max.	watt
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Pentode Unit as Triode-Connected Mixer▲

PLATE VOLTAGE	250 max.	volts
GRID-No.1 (CONTROL-GRID) VOLTAGE:		
Negative bias value	40 max.	volts
Positive bias value	0 max.	volts
PLATE DISSIPATION	2.4 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Typical Operation:

Triode Unit as 250-Mc Oscillator:●		
Plate Voltage	150	volts
Grid Resistor	2700	ohms
Plate Current	13	ma
Grid Current	3.6	ma
Power Output (Approx.)	0.5	watt
*Pentode Unit as Mixer:**		
Plate Voltage	150	volts
Grid No.3 (Suppressor)	Connected to Cathode at Socket	
Grid-No.2 Voltage	150	volts
Mixer Grid-No.1 Supply Voltage	-3.5	volts
Oscillator Voltage at Mixer Grid No.1	2.6 rms	volts
Mixer Grid-No.1-Circuit Resistance	120000	ohms
Conversion Transconductance	2100	μmhos
Plate Current	6.2	ma
Grid-No.2 Current	1.8	ma
Grid-No.1 Current	2.0	μamp
Pentode Unit as Triode-Connected Mixer:▲		
Plate Voltage	150	volts
Grid-No.1 Supply Voltage	-3.5	volts
Oscillator Voltage at Grid No.1	2.6 rms	volts
Grid-No.1-Circuit Resistance	120000	ohms
Conversion Transconductance	2800	μmhos
Plate Current	7.8	ma
Grid-No.1 Current	2.0	μamp

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1 max.	megohm
For cathode-bias operation	0.5 max.	megohm

According to RTMA Standard ET-109A with external shield No.315 tied to cathode.

▲ Grid No.3 connected to cathode; grid No.2 connected to plate.

* With separate excitation and triode unit grounded.

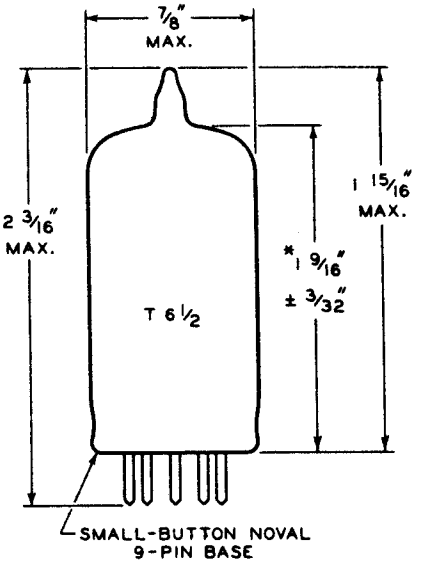
● In FM receivers, it is generally desirable to operate the oscillator with less power input than shown in the tabulated data in order to avoid over excitation and excessive oscillator radiation.

OPERATING CONSIDERATIONS

The *maximum ratings* in the tabulated data for the 19X8 are working design-center maximums established according to the standard design-center system of rating electron tubes. Tubes so rated will give satisfactory performance in equipment designed so that these maximum ratings will not be exceeded when the equipment is operated from ac or dc power-line supplies whose normal voltage including normal variations fall within ± 10 per cent of line-center voltage value of 117 volts.

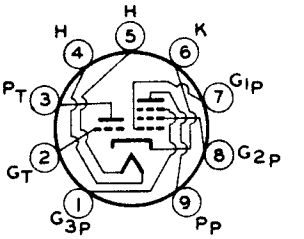
When the 19X8 is used as the converter in AM broadcast receivers, it is important that the tuned plate-load impedance of the first if coil does not exceed 75000 ohms. Any higher value will cause excessive degeneration due to the feedback in the pentode mixer unit.

DIMENSIONAL OUTLINE



* MEASURED FROM BASE SEAT TO BULB-TOP LINE AS DETERMINED BY RING GAUGE OF 7/16" I.D.

SOCKET CONNECTIONS
Bottom View



PIN 1: PENTODE GRID No.3
PIN 2: TRIODE GRID
PIN 3: TRIODE PLATE
PIN 4: HEATER
PIN 5: HEATER
PIN 6: CATHODE
PIN 7: PENTODE GRID No.1
PIN 8: PENTODE GRID No.2
PIN 9: PENTODE PLATE

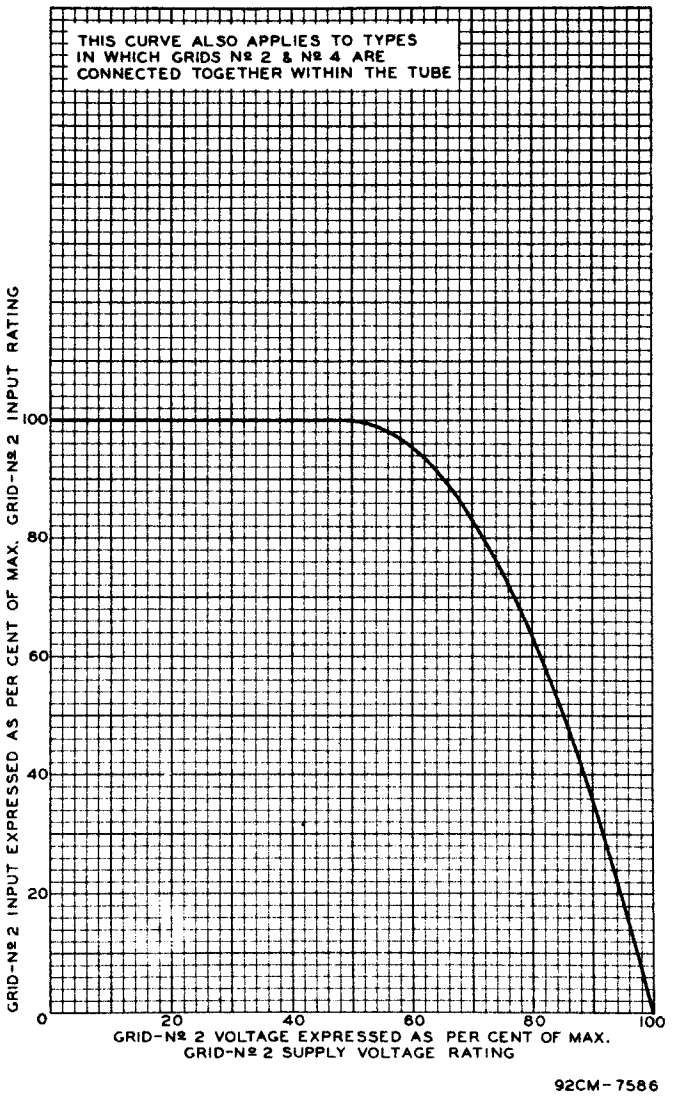


Fig. 1 - Grid-No. 2 Input Rating Curve of Type 19X8.

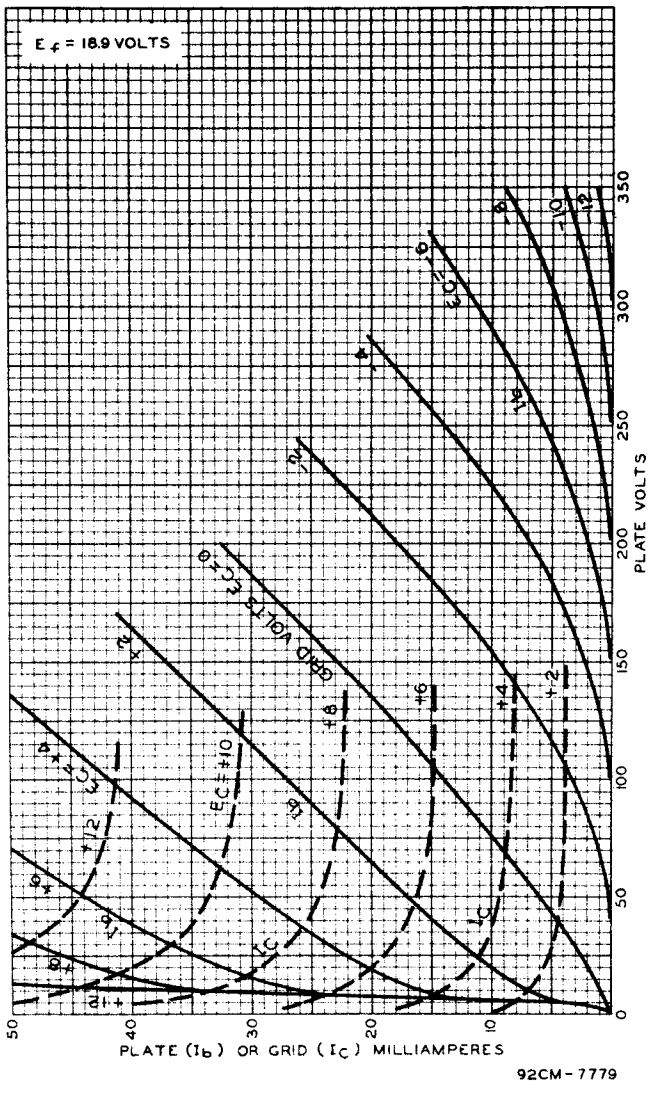


Fig. 2 - Average Plate Characteristics of 19X8 Triode Unit.

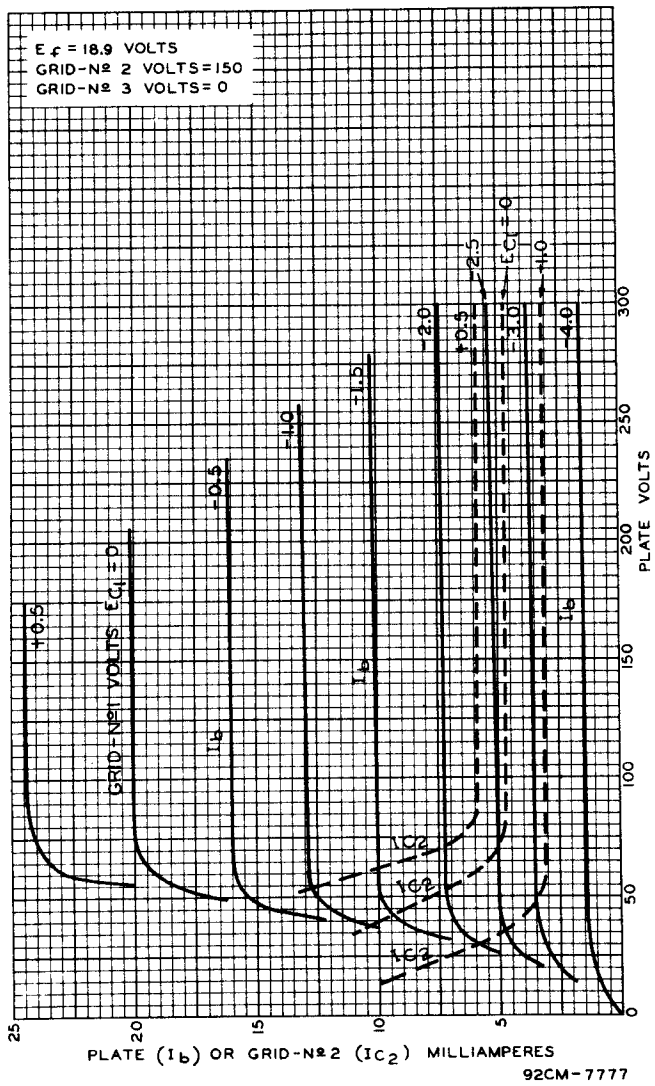


Fig. 3 - Average Plate Characteristics of 19X8 Pentode Unit.

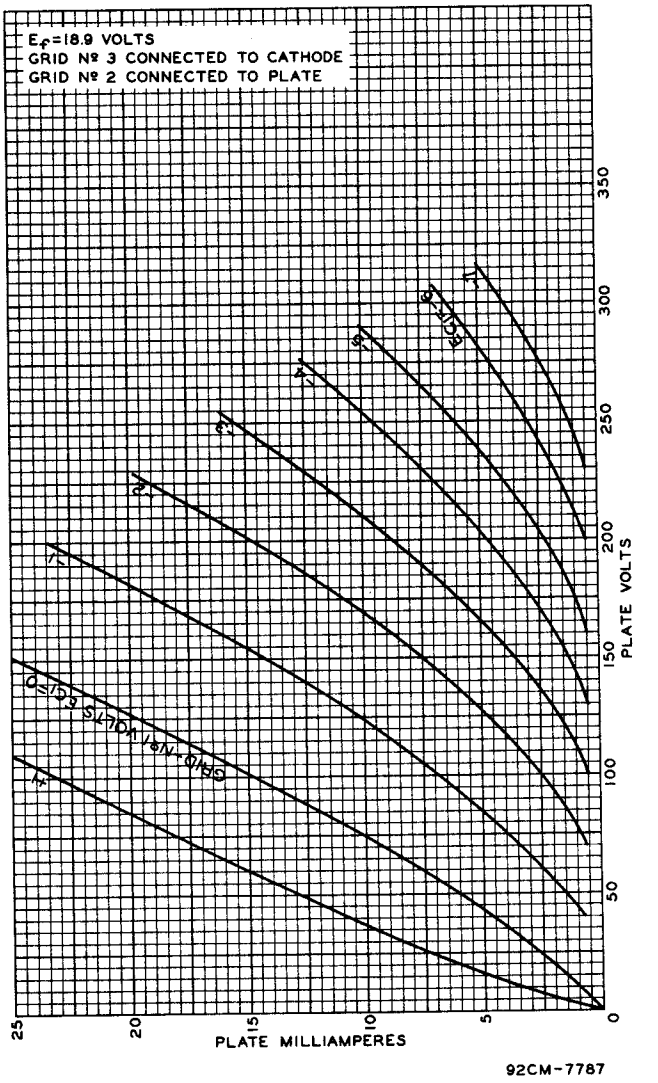


Fig. 4 - Average Plate Characteristics of 19X8 Pentode Unit Connected as Triode.

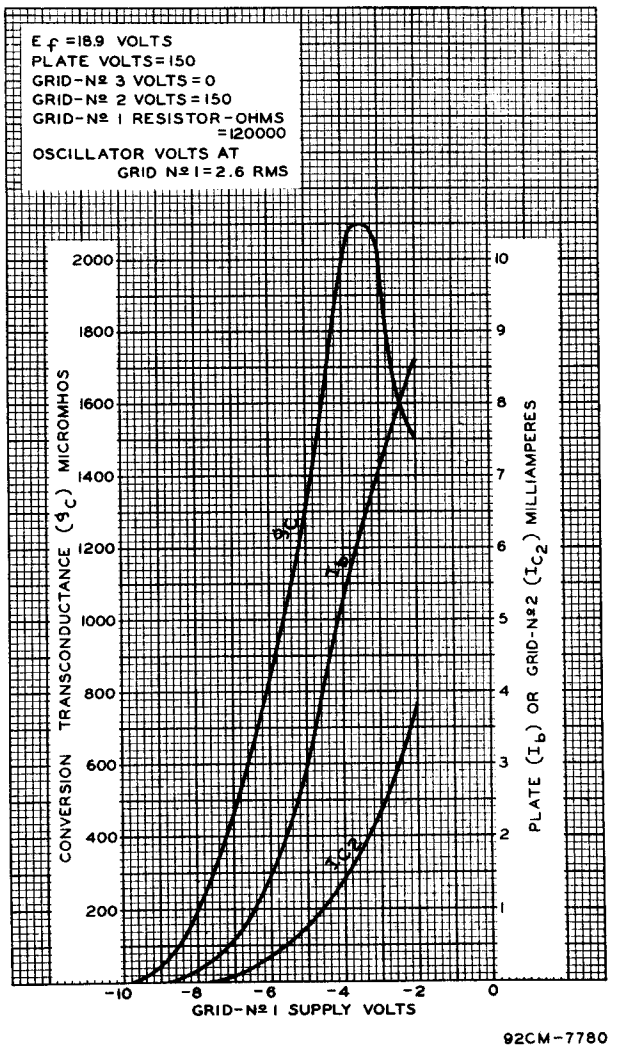


Fig. 5 - Operation Characteristic with Separate Oscillator Excitation of 19X8 Pentode Unit.

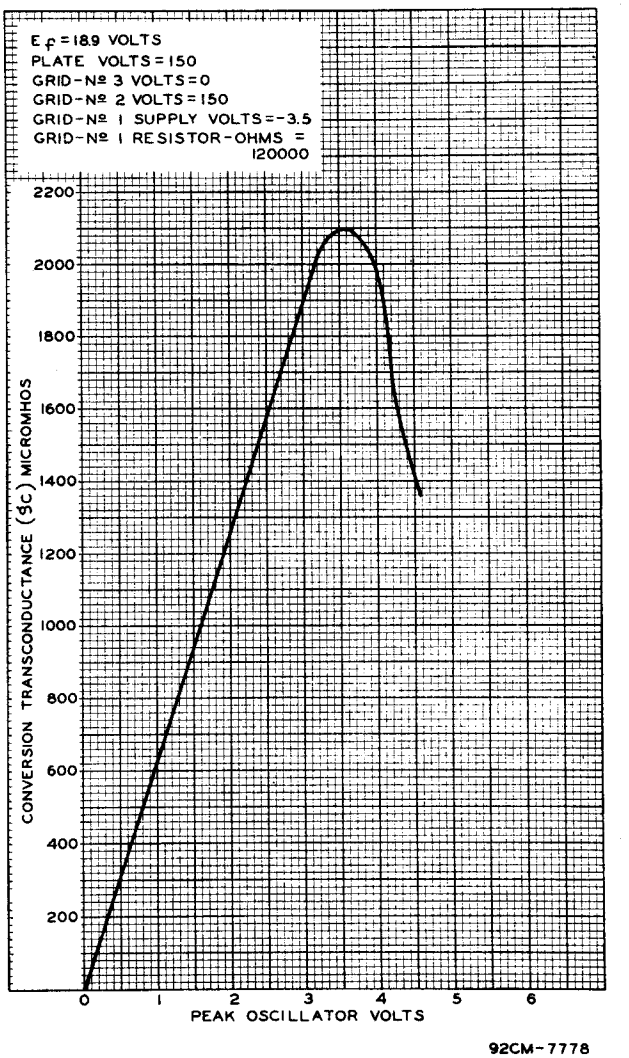


Fig. 6 - Operation Characteristic with Separate Oscillator Excitation of 19X8 Pentode Unit.

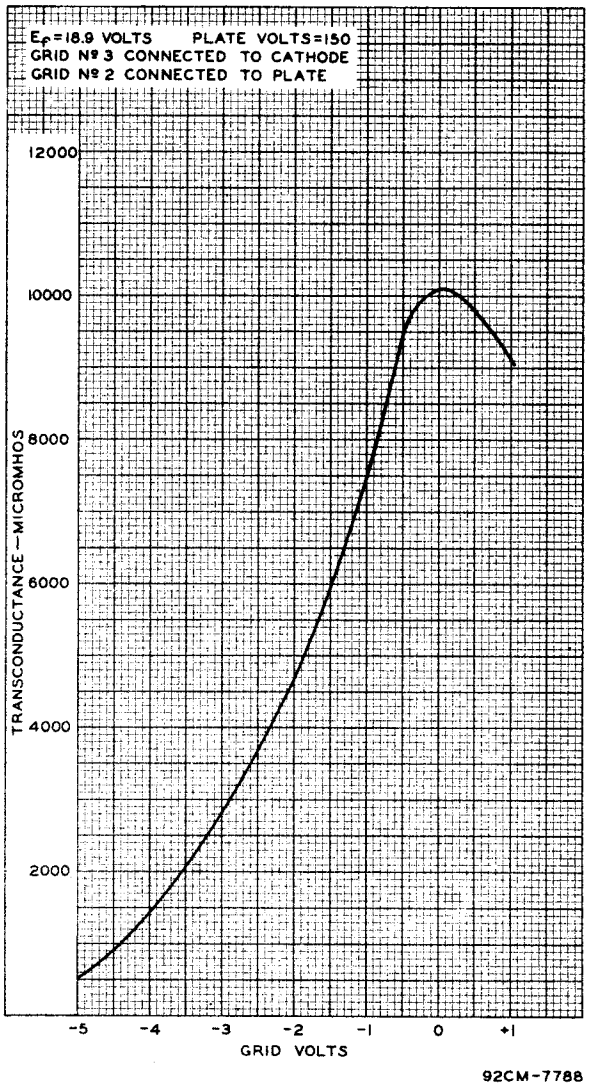


Fig. 7 - Average Characteristic of 19X8 Pentode Unit Connected as Triode.