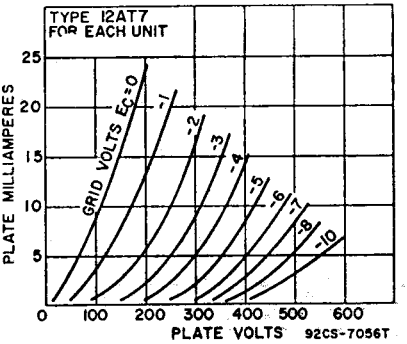
Direct Interelectrode Capacitances:		
Grid-Drive Operation:		
Grid to Plate (Each unit)	1.5	pF
Grid to Cathode and Heater (Each unit)	2.2	pF
Plate to Cathode and Heater:		
Unit No.1	0.5	pF
Unit No.2	0.4	pF
Cathode-Drive Operation:		
Cathode to Plate (Each unit)	0.2	pF
Cathode to Grid and Heater (Each unit)	4.6	pF
Plate to Grid and Heater (Each unit)	1.8	pF
Heater to Cathode (Each Unit)	2.4	pF

Class A$_1$ Amplifier (Each Unit)

MAXIMUM AND MINIMUM RATINGS (Design-Center Values)

Plate Voltage	300	volts
Grid Voltage, Negative-bias value	50	volts
Plate Dissipation	2.5	watts



CHARACTERISTICS

Plate Supply Voltage	100	250	volts
Cathode-Bias Resistor	270	200	ohms
Amplification Factor	60	60	
Plate Resistance (Approx.)	15000	10900	ohms
Transconductance	4000	5500	μmhos
Grid Voltage (Approx.) for plate current of 10 μA	—5	—12	volts
Plate Current	3.7	10	mA

12AT7WA Refer to chart at end of section.

12AT7WB Refer to chart at end of section.

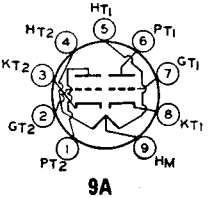
12AU6 Refer to type 6AU6A.

12AU7 Refer to chart at end of section. For replacement use type 12AU7A/ECC82.

12AU7A For replacement use type 12AU7A/ECC82.

12AU7A/ ECC82

7AU7, 9AU7 **MEDIUM-MU TWIN TRIODE**



9A

Miniature types used as phase inverters or push-pull amplifiers in ac/dc radio equipment and as multivibrators or oscillators in industrial control devices. Also used as combined vertical oscillators and vertical-deflection amplifiers, and as horizontal-deflection oscillators, in color and black-and-white television receivers. **Outlines section,** 6B; require miniature 9-contact socket. Each triode unit is independent of the other except for the common heater. For typical opera-

tion as a resistance-coupled amplifier, refer to **Resistance-Coupled Amplifier** section. Types 7AU7 and 9AU7 are identical with type 12AU7 and 12AU7A/ECC82 except for heater ratings.

	7AU7	9AU7	12AU7A 12AU7A/ ECC82	
Heater Voltage(ac/dc):				
Series	7	9.4	12.6	volts
Parallel	3.5	4.7	6.3	volts
Heater Current:				
Series	0.3	0.225	0.15	ampere
Parallel	0.6	0.45	0.3	ampere
Heater Warm-up Time (Parallel, Average)	11	11	—	seconds
Heater-Cathode Voltage:				
Peak value	±200 max	±200 max	±200 max	volts
Average value	100 max	100 max	100 max	volts
Direct Interelectrode Capacitances (Approx.):	Unit No.1	Unit No.2		
Grid to Plate	1.5	1.5		pF
Grid to Cathode and Heater	1.6	1.6		pF
Plate to Cathode and Heater	0.5	0.35		pF

Class A_1 Amplifier (Each Unit Unless Otherwise Specified)

MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage	330	volts
Cathode Current	22	mA
Plate Dissipation:		
Each Plate	2.75	watts
Both Plates (Both units operating)	5.5	watts

CHARACTERISTICS

Plate Voltage	100	250	volts
Grid Voltage	0	—8.5	volts
Amplification Factor	19.5	17	
Plate Resistance (Approx.)	6250	7700	ohms
Transconductance	3100	2200	μmhos
Plate Current	11.8	10.5	mA
Grid Voltage (Approx.) for plate current of 10 μA	—	—24	volts

MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance:		
For fixed-bias operation	0.25	megohm
For cathode-bias operation	1	megohm

Oscillator (Each Unit Unless Otherwise Specified)

For operation in a 525-line, 30-frame system

MAXIMUM RATINGS (Design-Maximum Values)	Vertical-Deflection Oscillator	Horizontal-Deflection Oscillator	
DC Plate Voltage	330	330	volts
Peak Negative-Pulse Grid Voltage	440	660	volts
Peak Cathode Current	66	330	mA
Average Cathode Current	22	22	mA
Plate Dissipation:			
Each Plate	2.75	2.75	watts
Both Plates (Both units operating)	5.5	5.5	watts

MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance	2.2	2.2	megohms

Vertical-Deflection Amplifier (Each Unit Unless Otherwise Specified)

For operation in a 525-line, 30-frame system

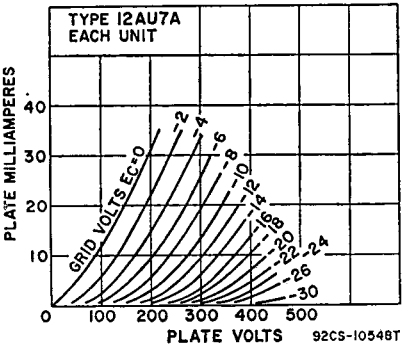
MAXIMUM RATINGS (Design-Maximum Values)

DC Plate Voltage	330	volts
Peak Positive-Pulse Plate Voltage#	1200	volts
Peak Negative-Pulse Grid Voltage	275	volts
Peak Cathode Current	66	mA
Average Cathode Current	22	mA
Plate Dissipation:		
Each Plate	275	volts
Both Plates (Both units operating)	5.5	watts

MAXIMUM CIRCUIT VALUE

Grid-Circuit Resistance, for cathode-bias operation	2.2	megohms

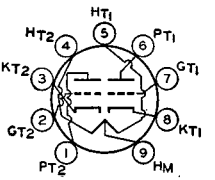
Pulse duration must not exceed 15% of a vertical scanning cycle (2.5 milliseconds).



12AV5GA	Refer to type 6AV5GA.
12AV6	Refer to type 6AV6.
12AV7	Refer to chart at end of section.
12AW6	Refer to chart at end of section.
12AX3	Refer to type 6AX3.
12AX4GT **12AX4GTA**	Refer to chart at end of section.
12AX4GTB	Refer to type 6AX4GTB.
12AX7	Refer to chart at end of section. For replacement use type 12AX7A/ECC83.
12AX7A	For replacement use type 12AX7A/ECC83.

12AX7A/ ECC83

HIGH-MU TWIN TRIODE



9A

Miniature types used as phase inverters or twin resistance-coupled amplifiers in radio equipment. Outlines section, 6B; require miniature 9-contact socket. Each triode unit is independent of the other except for common heater. For characteristics and curves, refer to type 6AV6. For typical operation as a resistance-coupled amplifier, refer to **Resistance-Coupled Amplifier** section.

	Series	Parallel	
Heater Arrangement:			
Heater Voltage (ac/dc)	12.6	6.3	volts
Heater Current	0.15	0.3	ampere
Heater-Catnode-Voltage:			
Peak value		±200 max	volts
Average value		100 max	volts
Direct Interelectrode Capacitances (Approx.):	Unit No.1	Unit No.2	
Grid to Plate	1.7	1.7	pF
Grid to Cathode and Heater	1.6	1.6	pF
Plate to Cathode and Heater	0.46	0.34	pF