

**AMERICAN NATIONAL
STANDARD**

ANSI/EIA-191-D-1984
APPROVED NOVEMBER 28, 1984

EA-191-D

EIA STANDARD

MEASUREMENT OF DIRECT
INTERELECTRODE CAPACITANCES
OF ELECTRON TUBES

EIA-191-D

(Revision of RS-191-C)



JANUARY, 1985



Engineering Department

ELECTRONIC INDUSTRIES ASSOCIATION

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This Standard contains the major technical contents of International Electrotechnical Commission Publication No. 100, Methods for the Measurement of Direct Interelectrode Capacitances of Electronic Tubes and Valves (1962). It differs from Publication No. 100 in certain important respects: a) EIA-191-D contains, as an addition, definitions of bridge operating frequency ranges for the RF and transmission methods and a new range definition for an audio frequency method; b) it contains a method of measuring capacitance using standard commercial equipment sockets; and c) it contains a technical statement added in para. 1.4 to define when to use the audio frequency method in lieu of the RF or transmission methods, particularly when measuring low capacitances in an electron tube wherein exceptionally high shunting tube capacitances simultaneously exist in the same tube.

These differences have been called to the attention of the U.S.N.C. Technical Advisory Group (TAG) for IEC Technical Committee 39 (Electronic Tubes), and resolution of these differences will be sought in future meetings of TC39.

Published by

Electronic Industries Association
Engineering Department
2001 Eye Street, N.W.
Washington, D.C. 20006

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Electronic Industries Association

PRICE: \$9.00

NOTE: The prefix "RS" is being deleted in favor of "EIA." This change will eventually be reflected in all EIA Standards. This is simply an editorial change to provide more positive identification of the source for the standard -- there is no technical significance to the change.

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MEASUREMENT OF DIRECT INTERELECTRODE CAPACITANCES OF ELECTRON TUBES

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MEASUREMENT OF DIRECT INTERELECTRODE CAPACITANCES OF ELECTRON TUBES

(From EIA Standard RS-191-C and Standards Proposal No. 1754 formulated under the cognizance of TEPAC JT-6 on Color CRT's.)

SCOPE

This standard covers the measurement of direct interelectrode capacitances of tubes in the following classes: Receiving, Cathode Ray, Gas, Phototubes and Multiplier Phototubes, and High Power Vacuum Tubes.

1. METHODS OF TESTS

1.1 Definitions

In this standard the following definitions will apply. They are taken from IEEE Standards on Electron Tubes: Definitions of Terms, 1957 (IEEE Publication 160).

Electrode (Electron Tubes). A conducting element that performs one or more of the functions of emitting, collecting, or controlling by an electromagnetic field, the movements of electrons or ions.

Element (Electron Tubes). A constituent part of the tube that contributes directly to its electrical operation.

Filament. A cathode of a thermionic tube, usually in the form of a wire or ribbon, to which heat may be supplied by passing current through it. This is also known as a filamentary cathode.

1.2 Measurement of Interelectrode Capacitances of Tubes

The specified interelectrode capacitance shall be measured directly rather than derived from combinations of two or more individual capacitance measurements. In the measurement, elements to be excluded are connected to the reference ground. This is not to be confused with grounding in circuit applications.

It shall be standard to connect the several tube elements as follows: Unless otherwise specified, all elements and metal parts except electrodes shall be connected to the cathode. These elements include internal shields, heaters, etc., and the metal parts include external shields, base sleeves, unused pins or leads, etc. Not included, though, are the elements of inactive units of multiple-unit tubes. The elements of units of multiple-unit tubes which are not common to the unit under test shall be connected to ground. For high power vacuum tubes employing metal sleeve-type bases with the sleeve not connected internally to any base pin or electrode, the capacitance measurement shall be made without grounding that sleeve or connecting it to any electrode; capacitance to other objects shall be kept at a minimum. On all types, for elements terminated in two or more pins or leads, all such pins or leads shall be connected together. In those cases where two or more elements are internally connected, the combination shall be treated as the major element of the combination. For example, a suppressor grid internally connected to the cathode shall be considered the cathode in the tables of connections. For directly heated filament types, the filament is the cathode electrode. The application of these principles to the capacitance normally measured in various types of tubes are indicated in Tables I to V inclusive.

TABLES OF CONNECTIONS OF ELECTRODES OF TUBE SECTIONS FOR MEASURING DIRECT INTERELECTRODE CAPACITANCES

TABLE I—RECEIVING TUBES

<i>Type of Tube Unit</i>	<i>Capacitance</i>	<i>Measure Between</i>	<i>Ground</i>
Indirectly Heated Cathode Types	Heater-Cathode	Heater and cathode	All other elements, shields, metal parts, etc.
Diode	Plate-All	Plate and (cathode + heater + shields + metal parts, etc.)	Other units

TABLE I—RECEIVING TUBES
(continued)

<i>Type of Tube</i>	<i>Capacitance</i>	<i>Measure Between</i>	<i>Ground</i>
Diode (cont'd)	Cathode-Diode Plate	Cathode and (diode plate + heater + shields + metal parts, etc.)	Other units
	Coupling (Between Units)	Diode plate and plate of other unit(s)	All other elements, shields, metal parts, etc.
	Coupling (Between Units)	Diode plate and grid of other unit(s)	All other elements, shields, metal parts, etc.
Triode, Tetrode, Pentode	Inter-electrode (General)	Specified two electrodes of same unit	All other elements, shields, metal parts, etc.
	Grid-Plate	Grid and plate	All other elements, shields, metal parts, etc.
	Input	Grid and (cathode + heater + screen + suppressor + shields + metal parts, etc.)	Plate, diodes, inactive unit(s)
	Output	Plate and (cathode + heater + screen + suppressor + shields + metal parts, etc.)	Grid, diode, inactive unit(s)
	Coupling (Between Units)	Grid of one unit and plate of other	All other elements, shields, metal parts, etc.
	Coupling (Between Units)	Plate of one unit and plate of other	All other elements, shields, metal parts, etc.
	Coupling (General)	Electrode of one unit and electrode of other	All other elements, shields, metal parts, etc.
	Cathode-Plate (Grounded Grid)	Cathode and plate	All other elements, shields, metal parts, etc.
	Input (Grounded Grid)	Cathode and (grid + heater + screen + suppressor + shields + metal parts, etc.)	Plate, diodes, inactive unit(s)
	Output (Grounded Grid)	Plate and (grid + heater + screen + suppressor + shields + metal parts, etc.)	Cathode, diodes, inactive unit(s)
	Signal Grid (1)-Plate	Signal grid (1) and plate	All other elements, shields, metal parts, etc.
Mixer	Signal Grid (2) and Plate	Signal grid (2) and plate	All other elements, shields, metal parts, etc.
	Input (1)	Signal grid (1) and (all other elements, shields, metal parts, etc.)	

TABLE I—RECEIVING TUBES
(continued)

<i>Type of Tube</i>	<i>Capacitance</i>	<i>Measure Between</i>	<i>Ground</i>
Mixer (cont'd)	Input (2)	Signal grid (2) and (all other elements, shields, metal parts, etc.)	
	Output	Plate and (all other elements, shields, metal parts, etc.)	
	Coupling	Signal grid (1) and signal grid (2)	All other elements, shields, metal parts, etc.
Converter	Signal Grid-Mixer Plate	Signal grid and mixer plate	All other elements, shields, metal parts, etc.
	R.F. Input	Signal grid and (all other elements, shields, metal parts, etc.)	
	Mixer Output	Mixer plate and (all other elements, shields, metal parts, etc.)	
	Osc. Grid-Osc. Plate	Osc. grid and osc. plate	All other elements, shields, metal parts, etc.
	Osc. Input	Osc. grid and (cathode + heater + mixer plate + signal grid + shields + metal parts, etc.)	Osc. plate
	Osc. Output	Osc. plate and (cathode + heater + mixer plate + signal grid + shields + metal parts, etc.)	Osc. grid
	Osc. Input*	Osc. grid and (all other elements, shields, metal parts, etc.)	
	Osc. Output*	Cathode and (heater + mixer plate + signal grid + osc. plate + shields + metal parts etc.)	Osc. grid
	Osc. Grid-Cathode*	Osc. grid and cathode	All other elements, shields, metal parts, etc.
	Osc. Grid-Mixer Plate*	Osc. grid and mixer plate	All other elements, shields, metal parts, etc.
	Osc. Grid-All Except Cathode*	Osc. grid and (mixer plate + signal grid + osc. plate + heater + shields + metal parts, etc.)	Cathode
	Coupling	Osc. grid and signal grid	All other elements, shields, metal parts, etc.
	Coupling	Osc. plate and signal grid	All other elements, shields, metal parts, etc.

* Applies to converters normally operated with R F voltage between cathode and ground.



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