

ELECTRONIC TUBE REFERENCE

16ADP7

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

Sixteen-inch metal-shell P7 oscillograph tube with magnetic focusing and approximately 53-degree deflection, intended for low-frequency waveform display and typically operated around a 12 kV ultor supply.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
NOMINAL HEATER	— / —	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Cathode Ray
No fixed ratings recorded.
Source-derived section; promoted fields populated where applicable.

16ADP7 — Metal-Shell 16-Inch Oscillograph Tube

The **16ADP7** is a 16-inch metal-shell cathode-ray oscillograph tube designed for applications requiring a temporary record of electrical phenomena. It utilizes magnetic focus and magnetic deflection with a nominal 53-degree deflection angle. The tube is particularly suited for radar indicator service and general oscillographic applications where grid No. 1 is pulse-modulated at low frequencies.

Optical and Screen Characteristics

The 16ADP7 features a cascade (two-layer) screen designated with P7 phosphor. This screen exhibits a dual-persistence characteristic:

- **Fluorescence:** A short-persistence bluish light emitted during excitation.
- **Phosphorescence:** A long-persistence greenish-yellow light that remains visible for several minutes under conditions of adequate excitation and low ambient light.

This long-persistence characteristic makes the tube highly effective for observing low-speed non-recurring phenomena or high-speed recurring phenomena. It also permits the simultaneous observation of multiple phenomena using an external switching arrangement.

Without an optical filter, the 16ADP7 can operate at scanning frequencies as low as 30 cycles per second without causing excessive flicker. For operation at even lower scanning frequencies, a yellow filter such as a Wratten No. 15 (G) can be placed over the tube face to reduce the visual effect of the initial short-persistence blue fluorescence, emphasizing the long-persistence phosphorescence. Conversely, if only the short-persistence fluorescence is desired, a blue filter such as a Wratten No. 47A can be used to filter out the greenish-yellow phosphorescence. While the tube can function as a short-persistence device, its inherent persistence is slightly longer than that of a standard P11 phosphor, meaning photographic recording in this mode should be limited to moderate film speeds.

The faceplate is constructed of Filterglass, which provides approximately 66% light transmission. The Filterglass incorporates a neutral light-absorbing material that reduces ambient-light reflections from the phosphor and internal reflections within the faceplate itself at a much higher ratio than it reduces the directly viewed light of the trace. This significantly improves trace contrast. The relatively flat surface of the faceplate also facilitates the use of an external, transparent, calibrated scale.

Electron Gun and Focusing Systems

The electron gun of the 16ADP7 incorporates a limiting aperture at its end. This design feature produces a sharper, rounder spot on the screen, resulting in greater effective resolution. This is particularly beneficial in pulse-modulated applications where high grid No. 1 drive leads to high beam currents.

Focusing and deflection are both achieved magnetically:

- **Deflection Angle:** Approximately 53 degrees.
- **Focusing Coil Current:** Under typical operating conditions with an ultor voltage of 12,000 V and an ultor current of 200 microamperes, a specimen focusing coil (similar to JETEC No. 109) requires a direct current of 95 ± 15 mA. This specification assumes the focusing coil is positioned with its air gap toward the faceplate and the center line of the air gap located 3-1/4 inches from the reference line.
- **Spot Position:** The center of the undeflected, unfocused spot falls within a circle of 25-mm radius concentric with the center of the tube face.

Electrical Characteristics and Operating Points

The 16ADP7 is equipped with an indirectly heated, coated unipotential cathode. The electrical and interelectrode capacitance characteristics are detailed below:

Heater and Capacitance Data

- **Heater Voltage (AC or DC):** 6.3 V
- **Heater Current:** 0.6 A
- **Grid No. 1 to All Other Electrodes Capacitance:** 6 μF (approximate)
- **Cathode to All Other Electrodes Capacitance:** 5 μF (approximate)

Maximum Ratings (Design-Center Values)

- **Ultor Voltage:** 14,000 max volts (Grid No. 3, which has the ultor function, and the collector are connected together internally and referred to collectively as the "ultor").
- **Grid-No. 2 Voltage (Positive):** 410 max volts (DC or Peak AC)
- **Grid-No. 2 Voltage (Negative):** 180 max volts (DC or Peak AC)
- **Grid-No. 1 Voltage (Negative Bias):** 180 max volts
- **Grid-No. 1 Voltage (Positive Bias):** 0 max volts
- **Grid-No. 1 Voltage (Positive Peak):** 2 max volts
- **Peak Grid-No. 1 Drive from Cutoff:** 65 max volts
- **Peak Heater-Cathode Voltage (Heater negative or positive with respect to cathode):** 125 max volts
- **Ultor Input Power:** The effective resistance of the ultor supply must be adequate to limit the ultor input power to 6 watts.

Typical Operation

- **Ultor Voltage:** 12,000 V (Operation below 8,000 V is not recommended, as brilliance and definition decrease significantly with lower voltages).
- **Grid-No. 2 Voltage:** 250 V
- **Grid-No. 1 Voltage (for visual extinction of undeflected focused spot):** -27 to -63 V
- **Grid-No. 2 Current:** -15 to +15 μA
- **Grid-No. 1 Circuit Resistance:** 1.5 max megohms

Physical Construction, Basing, and Installation

The 16ADP7 features a robust metal-shell envelope with a glass faceplate. Its physical dimensions and basing configuration are as follows:

- **Maximum Overall Length:** 22 inches
- **Greatest Diameter at Lip:** 15-7/8 inches $\pm$ 1/8 inch
- **Minimum Useful Screen Diameter:** 14-3/8 inches

- **Base:** Small-Shell Duodecal 7-Pin (JETEC No. B7-51)
- **Mounting Position:** Any

Pin Connections (Bottom View)

- **Pin 1:** Heater
- **Pin 2:** Grid No. 1
- **Pin 6:** No Connection
- **Pin 7:** No Connection
- **Pin 10:** Grid No. 2
- **Pin 11:** Cathode
- **Pin 12:** Heater
- **Cap (Metal-Shell Lip):** Grid No. 3, Collector (Ultor Terminal)

Installation and Safety Precautions

Because the metal shell and glass face operate at high voltage, any material in contact with either the shell or the face must be thoroughly insulated to withstand the maximum applied ultor voltage. Additionally, the socket for the duodecal base must not be rigidly mounted; it should utilize flexible leads and be allowed to move freely to prevent mechanical stress on the tube.

Grid-Drive Characteristics

The average grid-drive characteristics of the 16ADP7 illustrate the relationship between the ultor current (in microamperes) and the video signal voltage (in volts from cutoff) under different Grid-No. 2 operating potentials:

- At a Grid-No. 2 voltage of 250 V, the ultor current rises from 0 μA at cutoff to approximately 200 μA with a video signal drive of 30 V, and reaches approximately 450 μA at 45 V of drive.
- At a Grid-No. 2 voltage of 400 V, the drive characteristic is shifted, requiring a higher video signal voltage for equivalent beam currents. For example, a drive of 30 V yields approximately 150 μA , while a drive of 50 V is required to reach approximately 500 μA .

These curves demonstrate how the limiting aperture maintains spot quality even as the grid drive and resulting beam current are increased.

Technical Summary

The **16ADP7** is a 16-inch, metal-shell, magnetically focused and deflected oscillograph tube featuring a long-persistence P7 cascade screen and a high-contrast Filterglass faceplate. Operating with a 6.3 V, 0.6 A heater, it is designed for high-resolution display of electrical phenomena, particularly in radar indicator and low-frequency pulse-modulated applications. With an ultor rating of up to 14,000 V and a specialized limiting aperture in its electron gun, the 16ADP7 provides a sharp, high-contrast trace capable of being viewed directly, filtered for specific persistence characteristics, or recorded photographically.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1940 RCA

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1940 RCA

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
53° peflection Angle Filterglass Face 22" Max. Length	22	53° peflection Angle Filterglass Face 22" Max. Length
RCA-[	6	RCA-[6ADP7 is a 6-inch oscillograph tube of the metal-shell type utiliz-
as	30	as 30 cycles
Voltage (AC or DC)	6.3 V	Voltage (AC or DC) 6.3 volts
Current. e e e e s	600 mA	Current. e e e e s . 0.6 ampere
Cathode to Al{ Other Electrodes	5 pF	Cathode to Al{ Other Electrodes. 5 uuf
ULTOR® VOLTAGE « + « v v v v v v v v v v v a v o	14000 V	ULTOR® VOLTAGE « + « v v v v v v v v v v a v o 14000 max. volts
GRID-No	2	GRID-No.2 VOLTAGE:
Positive value (DC or Peak AC)	410 V	Positive value (DC or Peak AC) 410 max, volts
Negative value (DC or Peak AC) . . « . . + « « .	80 V	Negative value (DC or Peak AC) . . « . . + « « . 80 max. volts
Negative bias value. « « « + « «	180 V	Negative bias value. « « « + « « . 180 max. volts
Positive bias value® « . . . «	0 V	Positive bias value® « . . . « . 0 max. volts
Positive peak value. . . e e e e e e e	2 V	Positive peak value. . . e e e e e e 2 max, volts
PEAK GRID—No. DRIVE FROM CUTOFF e e e e e e e	65 V	PEAK GRID—No. DRIVE FROM CUTOFF e e e e e e e 65 max. volts
Heater negative with respect to cathode. {	25 V	Heater negative with respect to cathode. {25 max. volts

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater positive with respect to cathode	125 V	Heater positive with respect to cathode. 125 max. volts
Ultor Voltage® ¢ ¢ v v & v v v & o o« o o	12000 V	Ultor Voltage® ¢ ¢ v v & v v v & o o« o o 12000 volts
Grid-No	250 V	Grid-No.2 Voltage. . . . e e e e e e e e e e 250 volts
of Undelected Focused Spot	-63 V	of Undelected Focused Spot. . . . -27 to -63 volts
Grid-No	15	Grid-No.2 Current. . . e e e e e e e e e e -15 to +15 pamp
Focusing—Coil Current (DC)Oo e e e e e e e e	5 mA	Focusing—Coil Current (DC)Oo e e e e e e e e 95 t 5% ma
Grid—No. ~Circuit Resistance	5	Grid—No. ~Circuit Resistance 5 max. megohms
in the	3	in the 16ADP7, grid No.3 which has the ultor the ultor voltage should not be less than
function, and collector are connected together	8000 V	function, and collector are connected together 8000 volts,
which is applied the highest dc voltage for and ultor current of	200	which is applied the highest dc voltage for and ultor current of 200 microamperes. The
Brilliance and definition decrease with will fall within a circle having	25 mm	Brilliance and definition decrease with will fall within a circle having 25-mm radius
FHE ¢ =	6.3 V	FHE ¢ = 6.3 VOLTS
b COLLECTOR) VOLTS =	14000 V	b COLLECTOR) VOLTS = 8000 TO 14000
92CM - 7692	7692	92CM - 7692
92CM - 7690	7690	92CM - 7690
NOTE	3	NOTE 3: METAL SHELL AND GLASS FACE OPERATE ATHIGH VOLTAGE. ANY MATERIAL