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# **HICKOK**

**1234 CardMatic**  
tube tester

# HICKOK



## INSTRUMENTS

DIVISION OF THE HICKOK ELECTRICAL INSTRUMENT COMPANY

FOR RESEARCH AND  
DEVELOPMENT



1234B

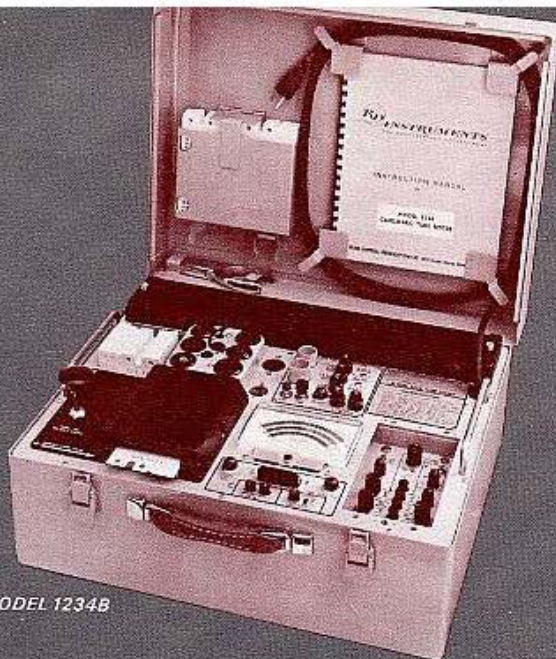


1234A

### MODEL 1234 CARDMATIC TUBE TESTER

MODEL 1234 CARDMATIC TUBE TESTERS  
AUTOMATICALLY TEST TUBES TO HIGHEST  
LABORATORY STANDARDS. THE SIMPLE, FOUR-  
STEP PROCEDURE ENABLES NON-TECHNICAL  
PERSONNEL TO ACHIEVE RELIABLE TESTS.





MODEL 1234B

# Model 1234 Cardmatic Tube Tester



MODEL 1234A

## REDUCES COMPLEXITY of TUBE TESTS

MODEL

1 234

Plug tube into socket and insert card into switch. If a short exists in the tube, indicating lights identify which elements are shorted. Heater-cathode leakage is read on the top scale of the meter.



MODEL

2 34

Depress Pushbutton 2 and read quality on the center scale of the meter. The scale is calibrated *good* and *replace*. The appropriate type of quality test is automatically selected by the test card.





Automatic tube testing, with laboratory accuracy, is possible with the RD Instruments Model 1234 series of Cardmatic Tube Testers. These instruments test tubes within 1 to 3% of recognized laboratory standards.

The instruments are designed so non-technical personnel can test tubes to highest laboratory standards with little possibility of error by the operator. Punched cards are used to program detailed testing circuits. Three scales on the meter—each marked *good* and *replace*—are used during the four-step testing procedure outlined at the bottom of this page. Four tests are performed:

- **SHORTS.** With the tube in the socket, shorts are indicated when the card is inserted. Five short indicator lamps show which electrodes are shorted.
- **HEATER-CATHODE LEAKAGE.** With the tube and card inserted, the instrument indicates heater-cathode leakage on the top scale.
- **QUALITY.** When Pushbutton 2 is depressed, the instrument automatically selects the appropriate quality test (mutual conductance, emission, etc.), and indicates quality on the center scale.
- **GAS.** The presence of gas in a tube is detected by measuring grid current. When Pushbutton 3 is depressed, the Model 1234 indicates grid current on the bottom scale.

Most tubes are tested by using only one card. Some tubes, e.g., ones with non-identical second sections,

are tested by using two or three cards in succession. The instrument automatically selects the correct type of quality test, as well as the correct value of meter shunt resistance to calibrate the *good/replace* point on the meter scale.

Five automatic overload devices positively protect the instrument against damage if the wrong card is inserted into the Cardmatic switch or if a tube has a direct short between elements.

Model 1234 can detect tubes which have a limited useful life. This is done by reducing the filament voltage 10% and noting the reduction in the quality reading. If the quality reading drops 25% or more, remaining life is short.

A set of punched cards for calibration purposes is included with the instrument. These cards are supplied so the user can check instrument calibration; however, it is rare that a Model 1234 requires re-calibration.

Eleven tube sockets accommodate virtually any small sized, low-power tube made by any manufacturer. Two pin straighteners—for seven and nine-pin miniature tubes—are located next to the tube sockets.

Filament voltage range is from 0-119.9 volts, in 0.1-volt steps. Tubes designed for dc filament voltage are checked with dc filament voltage. Others are checked with ac filament voltage.

Model 1234A and Model 1234B are very similar electrically. Model 1234A is basically a military version of the Model 1234B.

## TO PUSHBUTTON OPERATION

MODEL

1234

Depress Pushbutton 3 and read bottom meter scale for an indication of excessive gas present in the tube. The reject point is based on manufacturers' recommendations; sensitivity of the test is selected automatically by the instrument.



MODEL

1234

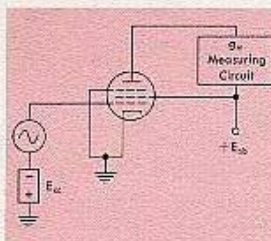
When the indicator lamp next to Pushbutton 4 lights, the tube has an identical second section. Test this section by depressing Pushbutton 4 and then repeating Steps 1, 2, and 3.



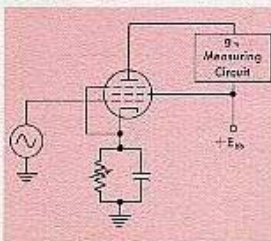


## Testing Methods

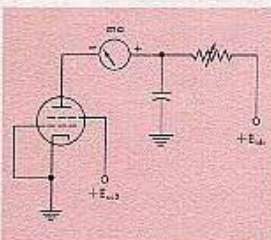
The Model 1234 Cardmatic Tube Tester automatically selects the proper type of quality test. Tubes are tested as close as possible to operating conditions, based on manufacturers' recommendations. For example, tubes which are designed for fixed-bias operation are tested with fixed bias; similarly, tubes designed for self-bias operation are tested with self bias.



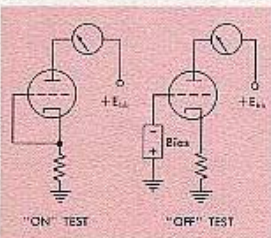
**AMPLIFIERS, FIXED BIAS**  
Bias and a test signal in series apply the desired test conditions to the control grid. Shunts, selected automatically by the instrument, calibrate the meter for an accurate *good / replace* mutual conductance reading.



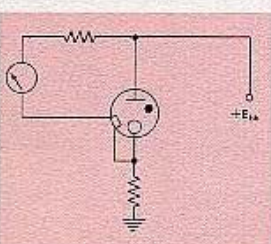
**AMPLIFIERS, SELF BIAS**  
The testing signal is applied directly to the control grid. A resistor in the cathode circuit, well bypassed, biases the tube to the recommended level.



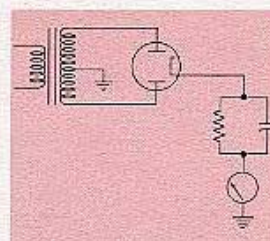
**CRT HORIZONTAL DEFLECTION TUBES**  
The instrument performs a "knee" plate current test on CRT horizontal deflection tubes. In this test, screen voltage is normal but plate voltage is very low. These conditions closely approximate in-service conditions when the tube is pulsed.



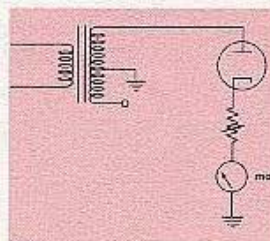
**COMPUTER TUBES**  
The instrument tests computer tubes for the "on" plate current condition and the "off" plate current condition. Also, a mutual conductance test is performed. Rejection is based on manufacturers' specifications.



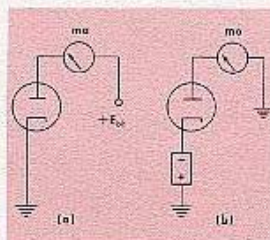
**VR TUBES**  
Voltage drop is tested at the upper and lower limits of current. In addition, a continuity test is performed on the jumpers. Finally, a leakage test is performed in accordance with military specifications.



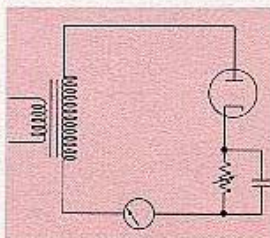
**FULL-WAVE RECTIFIERS**  
Current is measured in a full-wave circuit. Load resistance is selected to draw the rated cathode current. Rejection is based on military specifications.



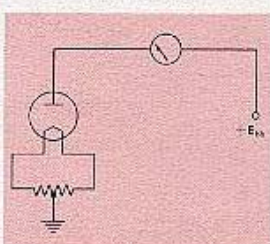
**HALF-WAVE RECTIFIERS**  
Cathode current is measured with rated voltage applied and the proper load resistor inserted in the circuit. Rejection is based on military specifications.



**DETECTOR TYPE DIODES**  
High-perveance types, rated at about 60 ma, are tested in a low impedance circuit (a); and low-perveance types are tested in a higher impedance circuit (b). Many low-perveance types are rated at about 2 ma and are rejected at 0.3 ma.



**DAMPER TUBES**  
The use of a filter capacitor across the load resistor develops a peak inverse voltage of approximately 1200 volts. This high voltage is useful for detecting tubes which may arc in service.



**HIGH-VOLTAGE DIODES**  
DC voltage is applied directly across the tube and current is metered. A center-tapped resistor, placed across the filament as shown, simulates actual operating conditions.



## Calibration and Special Tests

Fifty-three cards for calibrating and troubleshooting the Model 1234 Cardmatic Tube Tester are supplied with the instrument. The cards are supplied in two groups: 10 cards for routine calibration; and 43 cards for complete calibration and troubleshooting.

**10 Cards for routine calibration.** These are used when the instrument is initially installed and then about once a month.

Routine calibration takes only a few minutes. No auxiliary instruments of any kind, such as voltmeters, are required. A calibration cell, supplied with the instrument, assures maximum accuracy. Calibration controls are located in the auxiliary compartment, under a hinged cover.

The process consists of checking calibration of the following items: a. Meter. b. Short sensitivity. c. Bias voltage. d. Main B + voltage. e. The mutual conductance bridge.

**43 Cards for complete calibration and troubleshooting.** Complete calibration requires the use of four cards from this group plus one card from the routine calibration group. Complete calibration is required when the instrument is initially installed, about twice a year, and after maintenance is performed.

Complete calibration requires the use of an auxiliary voltmeter. The following items are adjusted: a. Test

signal level and regulation. b. Filament voltage. c. The main B + regulated supply.

Troubleshooting the Model 1234 Cardmatic Tube Tester is easy. The instruction book, supplied with the instrument, lists the complete troubleshooting procedure in detail. The instruction book also explains the procedures for routine and complete calibration.

### SPECIAL TUBE TESTS

The normal testing method is extremely simple—just insert the proper card and push two or three pushbuttons in succession (see pp 2-3). However, other tests are possible by operating controls located in the auxiliary compartment, or by preparing special cards to test tubes with unusual electrode potentials.

Five pushbuttons and four potentiometers in the auxiliary compartment are used to attain finer control over test conditions or to perform special tests.

Increased accuracy is achieved by adjusting filament voltage to compensate for line voltage variations. This is done by pressing a pushbutton and rotating a potentiometer until the meter reads half scale.

An accurate *good/replace* reading is possible with the mutual conductance bridge balanced during routine calibration. However, increased accuracy results from balancing this bridge with an auxiliary control during the time each tube is tested. This procedure is useful for selecting, matching and pairing tubes.

Tubes with little useful life remaining can be detected easily with the cathode activity test. This involves making a normal quality test, and then depressing an auxiliary pushbutton. This test reduces filament voltage to the tube; if the quality reading drops more than about 25%, the tube is rejected as having little useful life left.

A more sensitive grid-cathode short test is useful for tubes such as those used in oscilloscopes or television sets. This test is accomplished by depressing an auxiliary pushbutton and noting if any of the short lamps light or flicker.

Some tube tests require the use of a variable power supply. The voltage of this auxiliary B + supply can be adjusted by varying a control. This voltage may be read on the meter by depressing a pushbutton.

Special cards can be prepared to test tubes under non-standard conditions. This is extremely useful for predicting how a tube will react in a new type of circuit. This technique is often used in electronic factories which produce tubes for special applications.



Controls for calibration and special tests are located in an auxiliary compartment. A hinged cover (not shown) covers the compartment during normal operation.



## Card Reader

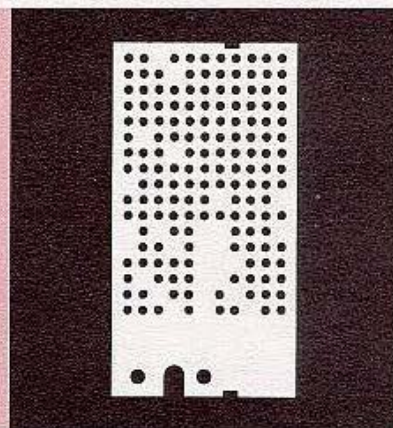
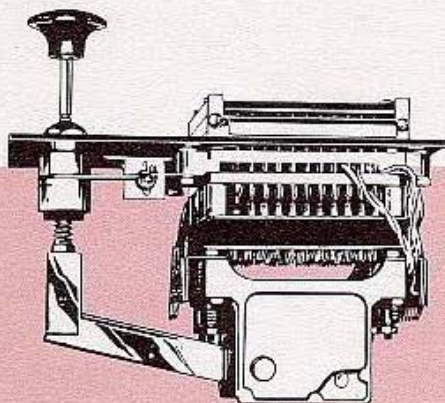
The heart of the Model 1234 Cardmatic Tube Tester is the Cardmatic Switch. Punched cards are used as information input sources for testing tubes. The Cardmatic Switch is designed with 17 rows of 11 contacts each—187 contacts total. One contact is used in conjunction with operating the switch itself; the other 186 are available for supplying testing information to the instrument.

The Cardmatic Switch works on the principle that the absence of a hole in a card creates a contact

closure. Therefore, if the switch is accidentally actuated with no card inserted, all contacts are in the open position. Thus there is no possibility of damage to the instrument circuitry because of accidental operation without an inserted card.

The Cardmatic Switch has a useful life of 100,000 operations or more. Cards are made of tough vinyl material for long life.

Blank cards and a card punch are supplied with the instrument. The instruction book includes details on *how to punch* cards manually for the Model 1234 Cardmatic Tube Tester.



## Hickok's Card Service

The Model 1234 Cardmatic Tube Tester is supplied with cards for routine calibration, complete calibration, and troubleshooting. Also, a group of 130 cards for testing common industrial tubes, as well as 50 blank cards and a card punch, are included with the instrument.

A complete listing of cards available comes with each instrument. A supplement to this list is issued every six months. There is no charge for the complete listing or for the supplements.

Additional cards can be ordered from the Service Department of Hickok at a nominal cost. Cards can

be ordered individually or in groups. One such group includes 2154 cards, and can check virtually any tube.

When new tubes are introduced, the Hickok Tube Data Department obtains samples and prepares tube data as soon as possible. If this data is requested before factory-stamped cards are available, Hickok supplies instructions for manually preparing a card.

Upon request, Hickok will prepare special cards for testing tubes under special, non-standard conditions. This can also be done by the user, following directions in the instruction manual.



## Specifications

**Power requirements:**

105-125 volts, 60-400 cps ac.  
55 watts nominal.

**Size:** 19½ x 9½ x 16½ in.

**Weight:** 42 lb. (approximately).

**Filament voltages (ac):**

0-119.9 volts in 0.1-volt steps.

**Filament voltages (dc):**

0-50 volts in 0.1-volt steps.

**Plate and screen voltages:**

10-250 vdc, regulated, in 10-volt steps.  
Manually adjustable auxiliary supply 0 to 300 vdc.

**Fixed bias voltages:**

0-100 volts in 0.1-volt steps.

**Self-bias resistances:**

10-71,100 ohms in 10-ohm steps.

**Mutual conductance ranges (full scale):**

500-26,000  $\mu$ mhos, in 100- $\mu$ mho steps.  
500-128,000  $\mu$ mhos, in 500- $\mu$ mho steps.

**Signal voltage (line frequency):**

222 mv, regulated.

**Current range (full scale):**

100-5200  $\mu$ a, in 100- $\mu$ a steps.  
100  $\mu$ a to 512 ma, in 2-ma steps.

**Heater-cathode leakage sensitivity:**

Reject values from 10-150  $\mu$ a, depending on tube type.

**Tube Testing Methods:**

Fixed bias mutual conductance for amplifier tubes.  
Self bias mutual conductance for amplifier tubes.  
Special mutual conductance for heptodes.  
"Knee" test for power pentodes.  
Zero bias plate current and high bias cut-off plate current for computer tubes.  
Full-wave and half-wave tests under load for rectifiers.  
High and low current tests for voltage regulators.  
Many special tests.  
Dual tests on identical triodes or diodes with a single card.

**Accuracy:** Within 1 to 3% of recognized standards for transconductance and plate current measurements.

**Number of tubes:** Eight.

**Protective features:**

Five overload devices.  
Accidental operation of Cardmatic switch with no card inserted opens all circuits.

**Sockets:**

4, 5, 6, 7, and 9-pin Jumbo.  
Octal, loctal.  
7 and 9-pin miniature.  
7-pin inline and octal subminiature.  
Special socket adapters are available for new types.

**Interelectrode short sensitivity:**

1 megohm; special high-sensitivity test, 10 megohm.

**Voltage drop tests:**

Meter ranges from 5-300 volts in 1-volt steps (half-scale values).  
Load resistance from 10 to 71,100 ohms, in 10-ohm steps.  
Rated loads on rectifier tubes up to 200 ma.

**Cardmatic switch:**

Contacts rated at 10 amperes at 0.0025 ohms contact resistance.  
186 contacts.  
Approximately  $2 \times 10^{16}$  switching possibilities.





In 1910, the name "HICKOK" first appeared on an electrical instrument. Radio instruments of the highest quality available came first; television instruments followed. Government instruments were next. And now, HICKOK RD INSTRUMENTS evolve from this heritage of excellence.

HICKOK RD INSTRUMENTS are a broad line of sophisticated test equipment for industrial and laboratory applications. The family of HICKOK RD INSTRUMENTS is continually expanding. It includes a full line of vacuum tube, transistor, and diode testing instruments. HICKOK RD INSTRUMENTS feature the same ease of operation, unmatched versatility, and unexcelled reliability that have characterized HICKOK products for more than a half century.

## THE HICKOK ELECTRICAL INSTRUMENT COMPANY

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Litho in U.S.A.

H2RD1234A/B

## ***AllegroSound***

— Established 1973 —

*"love what you listen with"*

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## Master-Index



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## ***AllegroSound***

— *Established 1973* —

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