

12775

# INSTRUCTION MANUAL

R

## MODEL 247A

DEC. 1947



# THE VICTOREEN INSTRUMENT CO.

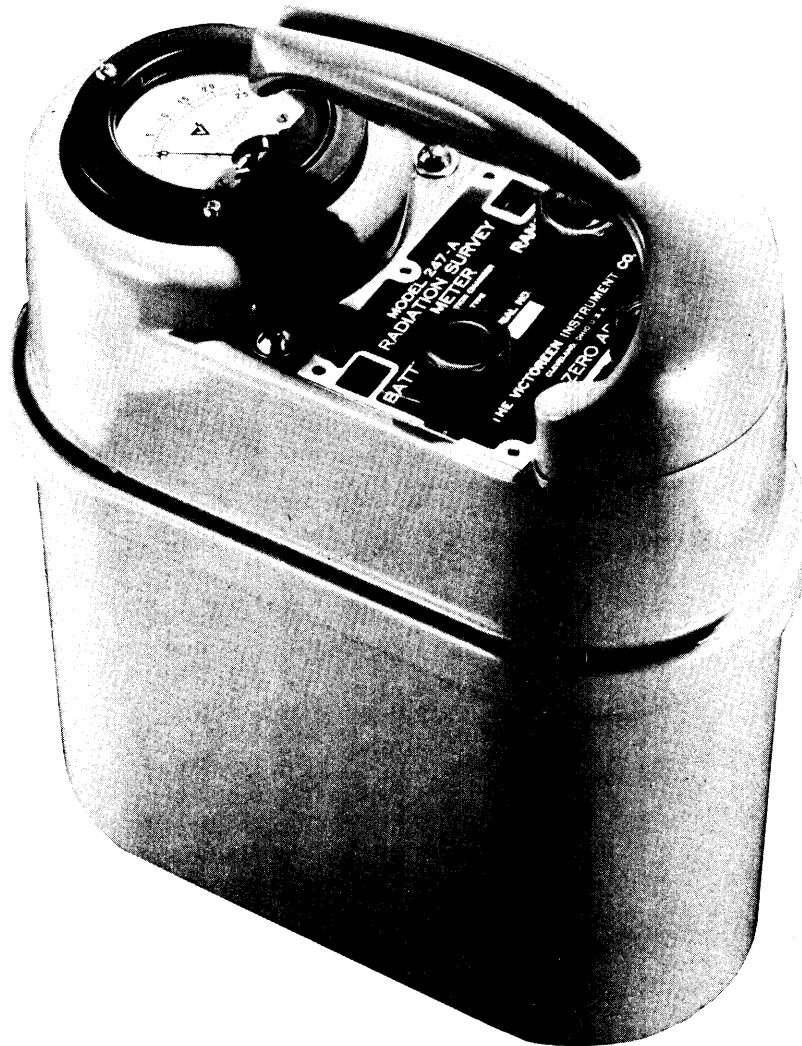
5608 HOUGH AVE., CLEVELAND, OHIO

# Victoreen

## INSTRUCTION MANUAL

### MODEL 247A

DEC. 1947



THE VICTOREEN INSTRUMENT CO.



5806 HOUGH AVE., CLEVELAND, O.

# MODEL 247A INSTRUCTION MANUAL

## TABLE OF CONTENTS

	<u>Page</u>
I - INTRODUCTION	1
A. Purpose	1
B. Special Features	1
II - SPECIFICATIONS	2
A. Physical Characteristics	2
B. Performance Characteristics	2
III - OPERATING INSTRUCTIONS	3
A. Operating Procedure	3
B. Test Procedure	3
IV - SERVICE NOTES	4
A. Dismantling the 247A	4
B. Replacement of the Chamber	4
C. Alignment of Chamber Switch with Indicator	4
D. Battery Compensation Adjustment	5
E. Battery Adjustment	5
F. Sensitivity Adjustment	6
G. Time Constant Adjustment	6
H. Chamber Voltage Check	6

## LIST OF ILLUSTRATIONS

247A, DISMANTLED

CIRCUIT DIAGRAM

HI-MEG, DATA SHEET 1

VX-41A, DATA SHEET 1

VX-41A, DATA SHEET 8

VX-41A, DATA SHEET 9

LIST OF REPLACEABLE PARTS

## MODEL 247A INSTRUCTION MANUAL

### I - INTRODUCTION

#### A. Purpose

The Victoreen Model 247A, Radiation Meter, is a portable gamma ray survey meter designed to replace the 247 for rugged field applications. Factory calibration on each instrument is made by two x-ray beams; 0.28, 0.12 A<sup>o</sup> effective wave length, and also on gamma rays from radium. Calibration of the instrument is expected to hold within plus or minus 10% under field operating conditions. Inside adjustments are provided which make possible a greater accuracy of calibration.

#### B. Special Features

1. Hermetically sealed chamber containing all high impedance circuits.
2. Replaceable chamber.
3. Hermetically sealed meter.
4. Water-tight case.
5. Four ranges of sensitivity.
6. Calibrated to read in Roentgens for all wave lengths of x-ray and gamma radiation, except for wall absorption of low energies.
7. Wide angle sensitivity.

II - SPECIFICATIONS

A. Physical Characteristics

Height - 12-59/64"  
Length - 10-11/32"  
Width - 5-11/32"  
Weight - 11-7/8 pounds  
Case - Watertight  
Finish - Baked enamel, navy gray  
Indicator - 3" microammeter, hermetically sealed  
Controls - Battery switch  
Range switch  
Zero adjustment  
Adjustments, inside - Battery  
Sensitivity  
Time constant  
Chamber voltage check switch

B. Performance Characteristics

Drop test - 2' on wooden surface  
Sensitivity, full scale - X1 - 0 to 2.5 mr/hr  
X10 - 0 to 25. mr/hr  
X100 - 0 to 250. mr/hr  
X1000 - 0 to 2500. mr/hr  
Accuracy of calibration -  $\pm 10\%$   
Wall thickness - Chamber 3/32" polyethylene  
Case 1/8" aluminum  
Time constant - Adjustable, 1/2 to 30 seconds  
Battery life - 150 hours

III - OPERATING INSTRUCTIONS

A. Operating Procedure

1. Turn the "BATTERY" switch to "ON".
2. Turn the "RANGE" switch to the desired sensitivity.
3. Record the meter reading, range, time, location and the exact position of the instrument with respect to the source of radiation.

B. Test Procedure

1. Turn the "BATTERY" switch to "CHECK", the meter reading should be greater than 1.9. (See service note IV, G.)
2. Turn the "BATTERY" switch to "ON".
3. Turn the "RANGE" switch to "ZERO CHECK".
4. Turn the "ZERO ADJ." control until the meter reading is zero.
5. Turn the "RANGE" switch to "SENS. CHECK", the meter reading should be greater than 1.9. (See service note IV, F.)

#### IV - SERVICE NOTES

##### A. Dismantling the 247A

1. Remove the two screws above the indicator windows. The bottom half of the container will slide off making the battery and chamber accessible for replacement. The service adjustment controls will also be accessible.

2. Remove all knobs on the top of the instrument.

3. Remove the four machine screws from the chassis plate. The cover plate will then slide off.

4. Remove the machine screw at the rear of the chassis, tip the top assembly upward. The controls and resistors are then accessible for repair or replacement.

NOTE: Care should be taken to prevent the drive chain from slipping off.

##### B. Replacement of the Chamber

1. Dismantle the instrument. (Part A above.)

2. Remove the three screws on the bottom of the chassis plate near the chamber and pull the chamber downward.

3. Plug in the new chamber and replace the screws.

4. Connect the meter. (Extension leads are provided in the spare parts kit.)

5. Adjust the battery drift compensating circuit. (Part D below.)

##### C. Alignment of Chamber Switch with Indicator

1. Place the chain on the sprocket.

2. Adjust the idler sprocket to take up the slack.

3. Place a Philiphead screwdriver or a 1/8" rode in the hole located on the left side of the chamber, immediately below the chamber sprocket.

4. Turn the range switch until the screwdriver can be slid into the switch eccentric.

5. Loosen the Allenhead screws on the chamber sprocket.

6. Turn the range switch to the "ZERO CHECK" position on the indicator.

7. Tighten the Allenhead screws on the Chamber sprocket.

#### D. Battery Compensation Adjustment

1. This is necessary after replacing a chamber or if the calibration is observed to change appreciably with battery aging.

2. Adjust the zero as in the operating instructions.

3. Adjust the "COMPENSATION" control, located just under the meter, until the meter indicates a minimum variation with change in the "BATT. ADJ." control.

#### E. Battery Adjustment

1. Battery adjustment may be used to assist the battery drift compensating in those cases where greater accuracy of calibration is required.

2. The control is located under the chassis plate at the rear of the instrument.

3. Turn the left hand panel control knob to "CHECK".

4. Adjust the "BATTERY" control knob until the meter reading is 2.0.

5. For maximum operating time between service adjustments, at reduced calibration accuracy, turn the "BATTERY" control fully clockwise.



6. Replace the batteries when the meter reading in part 4 or 5 above is less than 1.9.

F. Sensitivity Adjustment

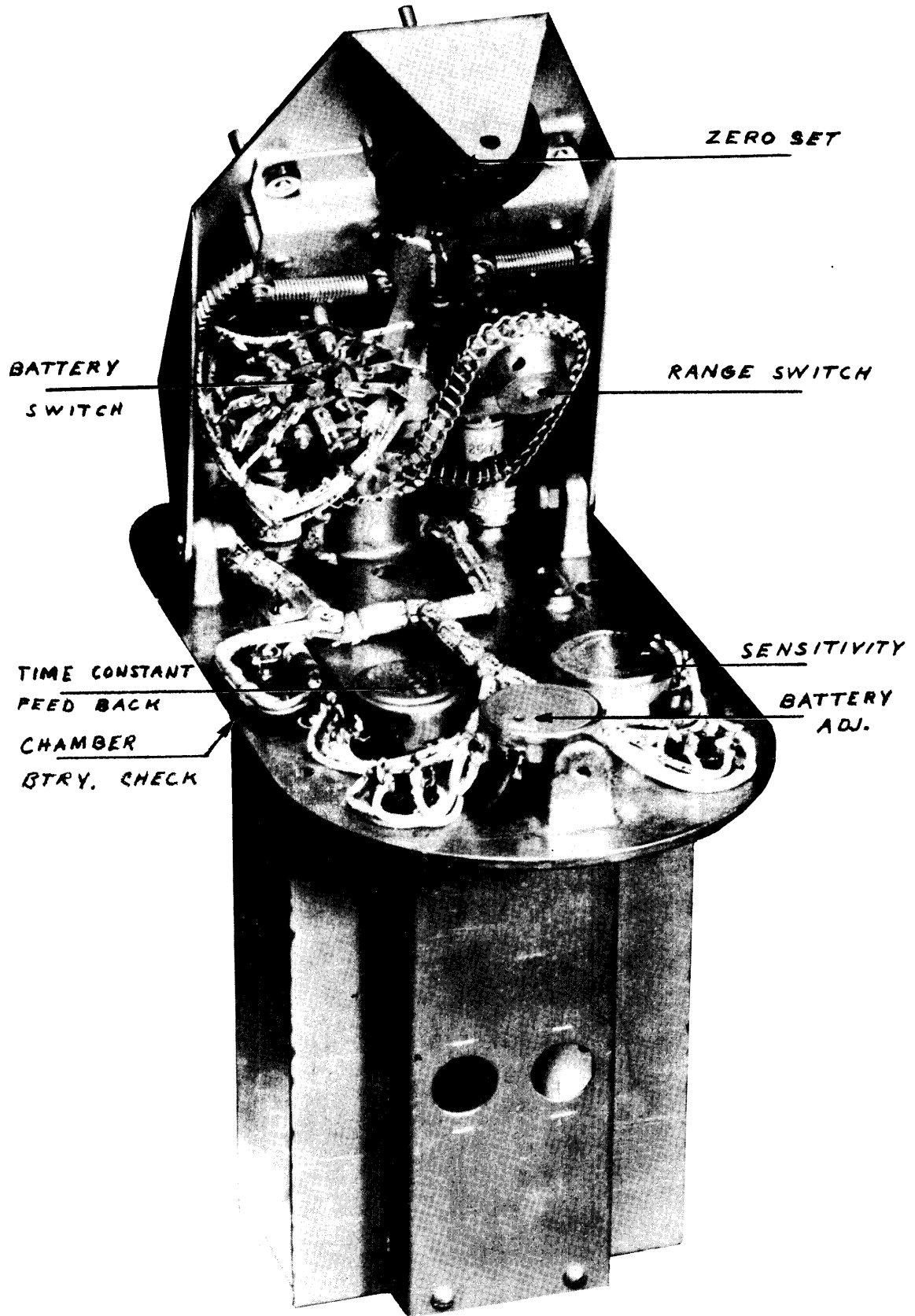
1. The sensitivity control is located on the bottom of the chassis plate below the range switch.
2. Set the battery voltage to 2.0. (See part E, 4.)
3. Reset the "ZERO ADJ.". (See operating procedure III, B.)
4. Adjust the "SENSITIVITY" control until the meter reading is 2.0.
5. Turn the control clockwise to increase sensitivity and counter-clockwise to decrease sensitivity.

G. Time Constant Adjustment

1. The time constant or feedback control is located under the chassis below the battery switch.
2. To increase the response of the meter to sudden changes in radiation intensity, turn the control clockwise.
3. To decrease the random fluctuation of the meter, particularly on the high sensitivity scale, turn the control counter-clockwise.

H. Chamber Voltage Check

1. For the purpose of checking batteries from stock, as well as used chamber batteries, there is a miniature switch located under the chassis plate near the left side of the battery bracket.
2. Turn the instrument off.
3. Press the miniature switch.
4. Replace the chamber batteries when the meter reading is less than 1.9.



ZERO SET

BATTERY  
SWITCH

RANGE SWITCH

TIME CONSTANT  
FEED BACK  
CHAMBER  
BTRY. CHECK

SENSITIVITY

BATTERY  
ADJ.

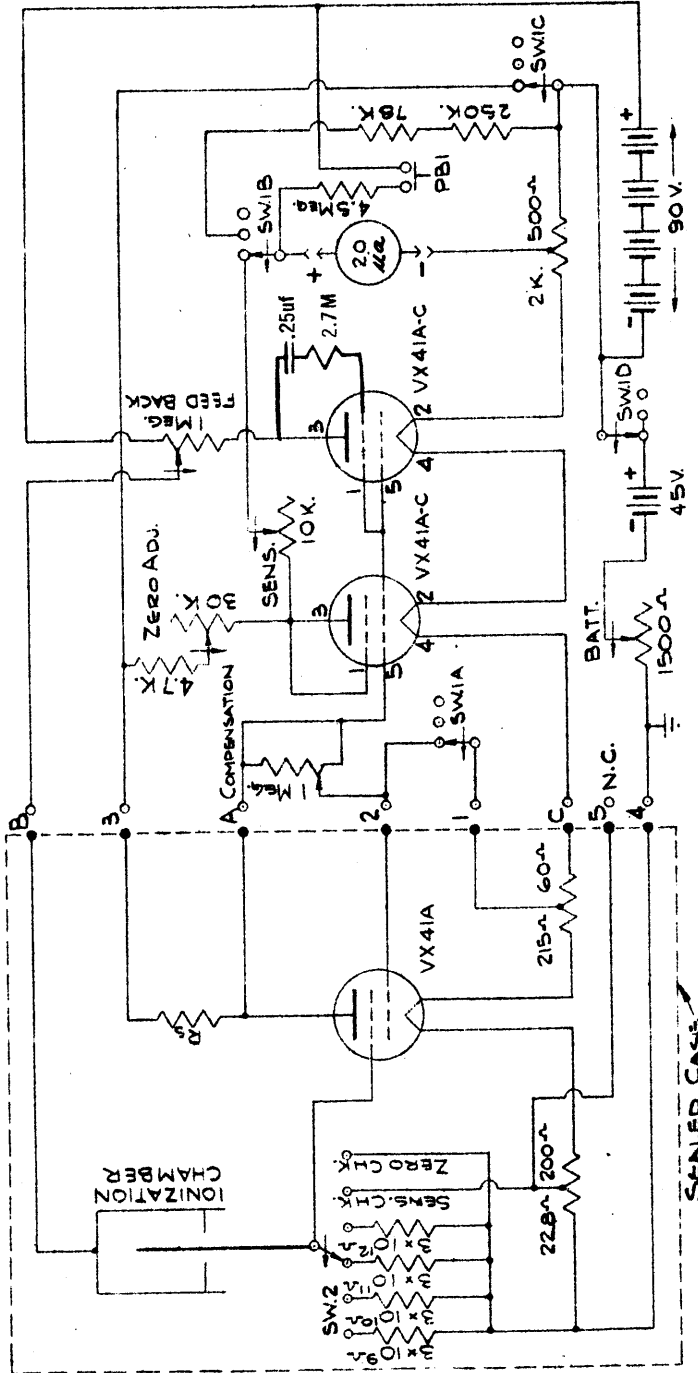


THE VICTOREEN INSTRUMENT CO.

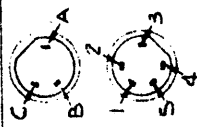
DEC. 1947

DATA SHEET 1

CIRCUIT DIAGRAM



CONNECTOR DETAIL



BASE VIEW

NOTE



ARROW INDICATES  
C.W. ROTATION OF  
CENTRAL KNOB.

SWITCH POSITION RANGE

SW.	OFF	ON
SW. 1	BATT. CHECK (45V.)	
SW. 2	ZERO CHECK	
	SENS. CHECK	
	X 1	
	X 10	
	X 100	
	X 1000	

PB1 - DEPRESSED BATT. CHECK (90V.)  
(WITH SW1 IN OFF POSITION)



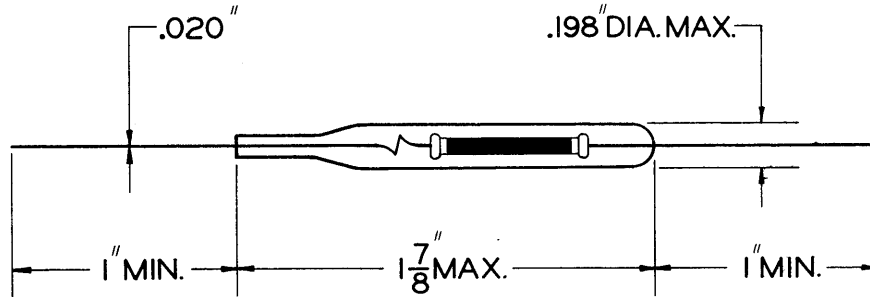
HI-MEG

THE VICTOREEN INSTRUMENT CO.

NOV. 1947

DATA SHEET - I

TENTATIVE



### HI-MEG RESISTOR

Victoreen hi-meg resistors were developed for use in electrometer circuits where stability, accuracy, and high humidity operation are of prime consideration. The resistor element is vacuum sealed in a glass envelope. A special silicon varnished surface makes the hi-meg less susceptible to humidity effects than other circuit components. A carefully controlled accelerated aging process insures stability and reliability. These hi-meg resistors together with electrometer tube developments have made high sensitivity ionization chamber instruments possible. They have also found application in Geiger tube circuits, photo cell circuits, mass spectrometers and leak detectors.

#### CHARACTERISTICS

	Min.	Nom.	Max.	
Resistance range *	$10^8$	-	$10^{12}$	ohms
Tolerance from specified resistance *	-10	-	10	%
Tolerance from labeled resistance	-1	-	1	%
Temperature coefficient	-.06	.1	-.15	%/°C
Voltage coefficient	-	.02	-.03	%/V.

#### OPERATING CONDITIONS

	Min.	Nom.	Max.	
Temperature	-40	30	120	°C.
Voltage	.0001	1	1000	V.
Relative humidity	0	-	98	

\*Higher resistance or closer tolerances are available on special request.



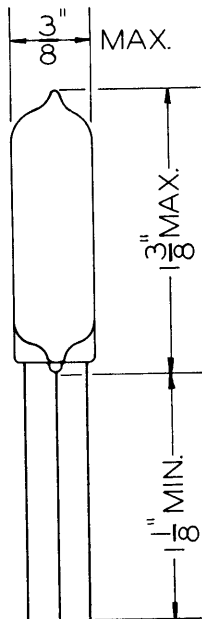
VX-41A

THE VICTOREEN INSTRUMENT CO.

OCT. 1947

DATA SHEET - I

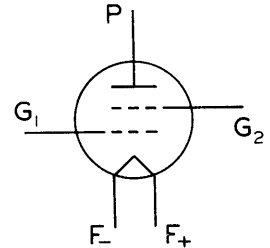
TENTATIVE



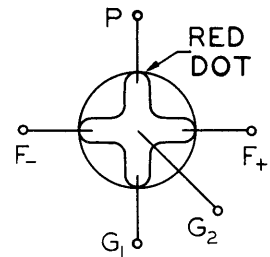
## VX-41A ELECTROMETER TETRODE

The VX-41A designed to replace the VX-41, has the new low microphonic feature. It is a low filament power subminiature tetrode designed specifically for electrometer applications. It has been treated inside and outside to provide maximum resistance between electrode and absolute minimum control grid (G2) current when connected as an electrometer. Care should be taken to prevent surface contamination of the glass in the vicinity of the leads. The cathode has been designed to provide long time

stability in dc amplifier applications. For optimum results as an electrometer the tube and input circuit should be electrostatically shielded and enclosed in a light-tight compartment to reduce grid current due to photo-electric effects. For minimum emission drift, the filament voltage should be applied a second before positive voltage is applied to any other electrode and the positive voltage should be removed before the filament cools.



SYMBOL



BASE VIEW

### CHARACTERISTICS

	Min.	Nominal	Max.
Filament current	9	10	13 ma
Filament resistance	112	125	137 ohms
Total cathode current	-	250	- ua
Positive voltage on any electrode	-	-	25 volts
Capacitance: Grid 1*	-	2	- uuf
Grid 2*	-	2	- uuf
Plate *	-	3	- uuf
Leakage resistance: Grid 1*	$10^{14}$	-	- ohms
Grid 2*	$10^{15}$	-	- ohms
Plate *	$10^{14}$	-	- ohms
Plate current - accelerator grid connection ( $I_f = 10$ ma; $I_{c1} = 250$ ua; $E_b = 4.5$ v; $E_{c2} = -3$ v)	6	12	18 ua

\* To all other electrode in parallel.



VX-41A

THE VICTOREEN INSTRUMENT CO.

NOV. 1947

DATA SHEET - 8

TENTATIVE

# LOW-MU TRIODE CONNECTION

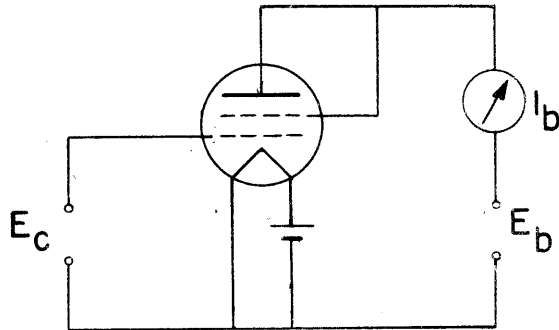
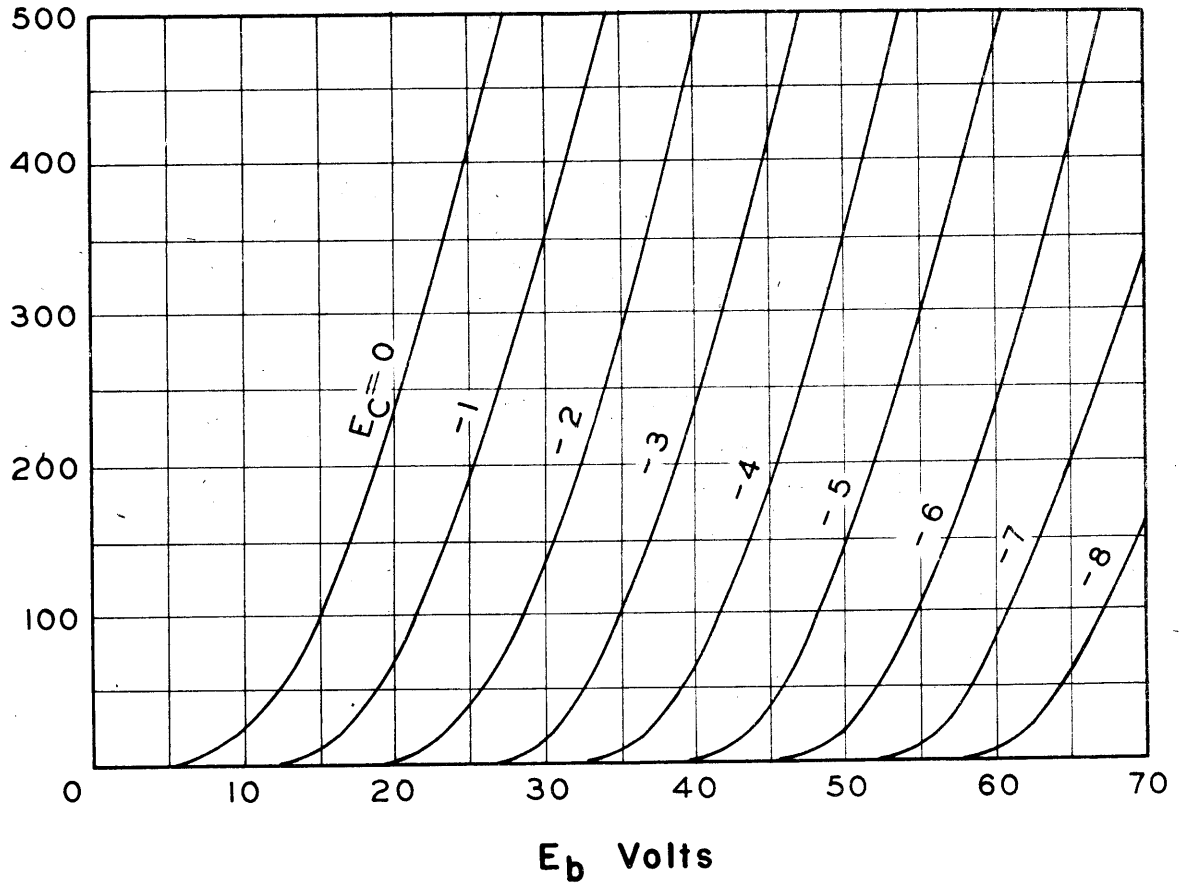


PLATE CHARACTERISTICS

$I_b$   $\mu$ pamps





THE VICTOREEN INSTRUMENT CO.

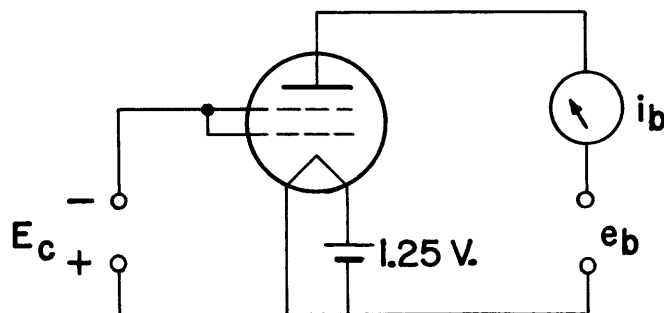
VX-41 A

NOV. 1947

DATA SHEET - 9

TENTATIVE

### VX-41 A HIGH MU TRIODE CONNECTION



TYPICAL DYNAMIC PLATE CHARACTERISTIC

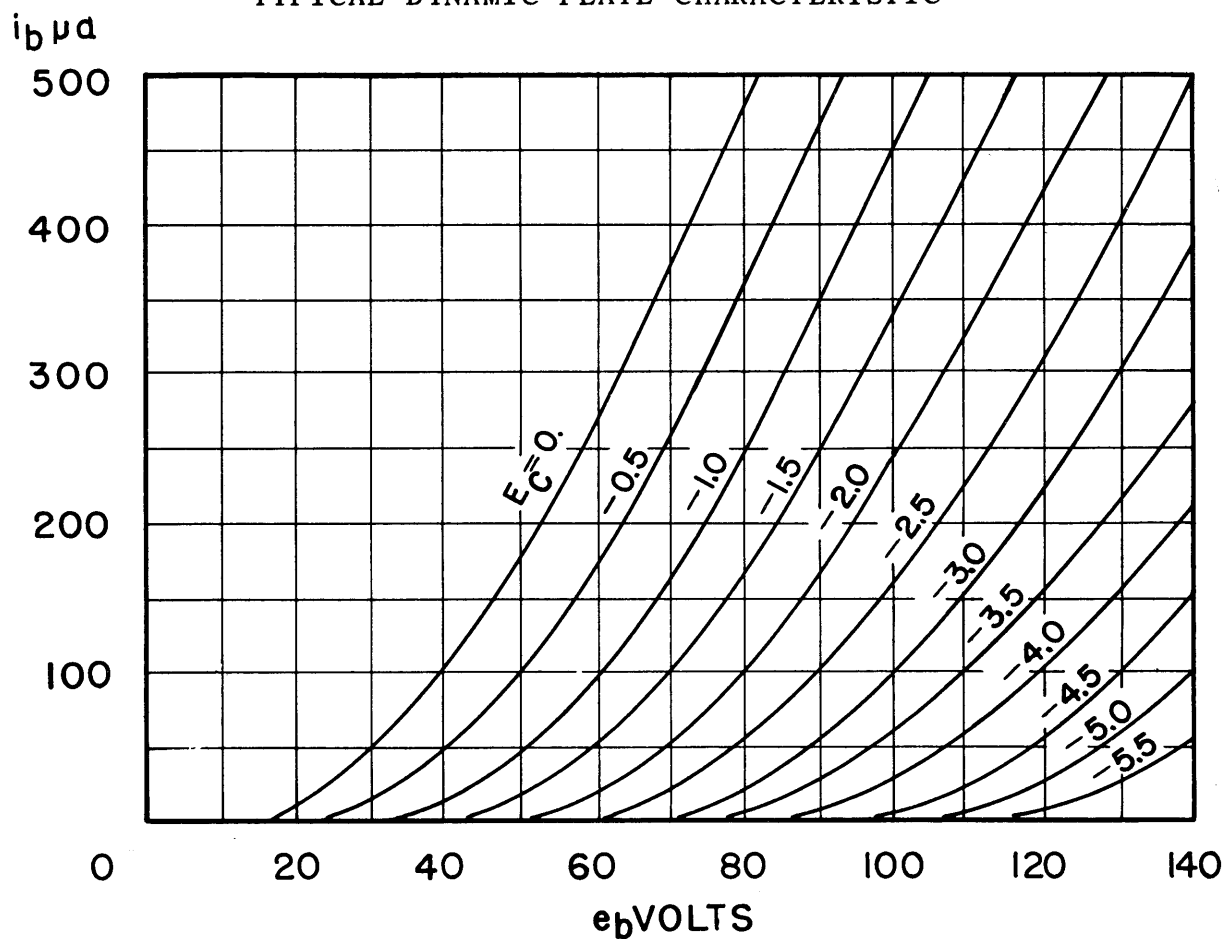


Fig. 5

247A SURVEY METER

LIST OF REPLACEABLE PARTS

Part No.	Component	Description	Function	Spare Parts Kit*	Manufacturer
10-69	Solder lug			10	Cinich
185-311	Resistor	2500 ohm W/500 ohm tap	Meter voltage divider	5	Decco
185-312	Resistor	250 K WW 2%	Voltmeter calibration	5	Decco
185-313	Resistor	78 K WW 2%	Voltmeter calibration	5	Decco
185-314	Resistor	4.5 meg. 2% 1 W	Voltmeter calibration	5	IRC
185-317	Resistor	4.7 K 10% 1 W	Plate load	10	IRC
247-104	Chamber	Assembly	Detection	3	Victoreen
247-109	Handle	Aluminum	Carrying	1	Manor
247-114	Durometer	O-Ring 40 8x8 $\frac{1}{2}$ x1/8	Water seal	10	Linear
247-115	Battery	45V	A & B supply	50	Eveready
247-116	Durometer	O-Ring 40 2 $\frac{3}{4}$ x3x1/8	Water seal	10	Linear
247-117	Durometer	O-Ring 70 $\frac{1}{2}$ x3/8x1/16	Water seal	80	Linear
247-118	Jack	Banana, with nuts	Meter connection	10	General Radio
247-121	Socket	5 pin with ring	Chamber connector	3	Amphenol
247-122	Socket	3 pin with ring	Chamber connector	1	Amphenol
247-129	Sprocket	Chamber	Switch drive	0	Ohio Gear
247-131	Chain	Ladder	Switch drive	0	Ohio Gear
247-132	Meter	20 ua., herm. sealed	Indicator	1	Hickok
247-137	Switch	Rotary	Battery switch	1	Centralab
247-138	Detent	Chamber switch	Positioning	1	Centralab
247-143	Bracket assembly	Battery	Battery holder	3	Victoreen
247-166	Screw extension	Assembly	Case support	5	Victoreen
247-173	Eccentric	Switch	Switch drive	0	Victoreen
247-176	Knob	Plastic	Inside adjustment	3	Gen. Cement



247A SURVEY METER

LIST OF REPLACEABLE PARTS (Continued)

Part No.	Component	Description	Function	Spare Parts Kit*	Manufacturer
247-178	Grommet	Rubber	Insulator	10	ICA
247-182	Cap screw	Special	Handle	8	Wedler Mfg.
247-183	Cap screw	Button head	Case assembly	5	Victoreen
247-194	Potentiometer	30 K, processed	Zero adjustment	5	Victoreen
247-195	Potentiometer	10 K, processed	Sensitivity	5	Clarostat
247-196	Potentiometer	1.5K, processed	Battery adjustment	5	Clarostat
247-197	Plug	Battery	B connector	5	JFD701
247-218	Vacuum tube	VX-41A - C	Amplifier	30	Victoreen
247-220	Manual	Instruction		0	Victoreen
247-224	Potentiometer	1 meg. processed	Time constant	5	Allen-Bradley
247-230	Switchette	Processed	Battery check	1	General Electric
247-271	Cover	Plastic	Splash-proof	40	Giller Products
247-272	Tool kit			6	Victoreen
247-276	Test leads	Assembly		6	Victoreen
247-280	Knob	1-1/8" diameter	Panel controls	3	Kury Kasch
263-152	Strap	Shoulder	Carrying	1	Williams Leather
356-38	Battery	22 1/2 V.	Chamber voltage	200	Eveready
	Screw	6-32x5/8 Phillips		8	
	Washer	1/4 I.D. x 9/16 O.D. x 3/64		5	

\* NOTE: The spare parts kit is designed to service 10 instruments under field operating conditions in accordance with United States Atomic Energy Commission specifications, and contains parts as listed above.