

HICKOK

Electrical
Instruments

PANEL METERS

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NEW CATALOG NO. 25

THE HICKOK ELECTRICAL INSTRUMENT COMPANY . CLEVELAND, OHIO

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THE STANDARD OF QUALITY

HICKOK
INSTRUMENTS

FOR A THIRD OF A CENTURY

Four Inch Rectangular Panel

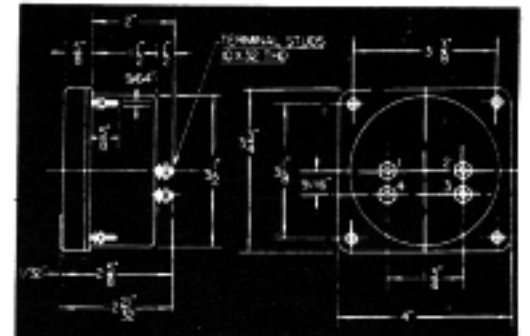
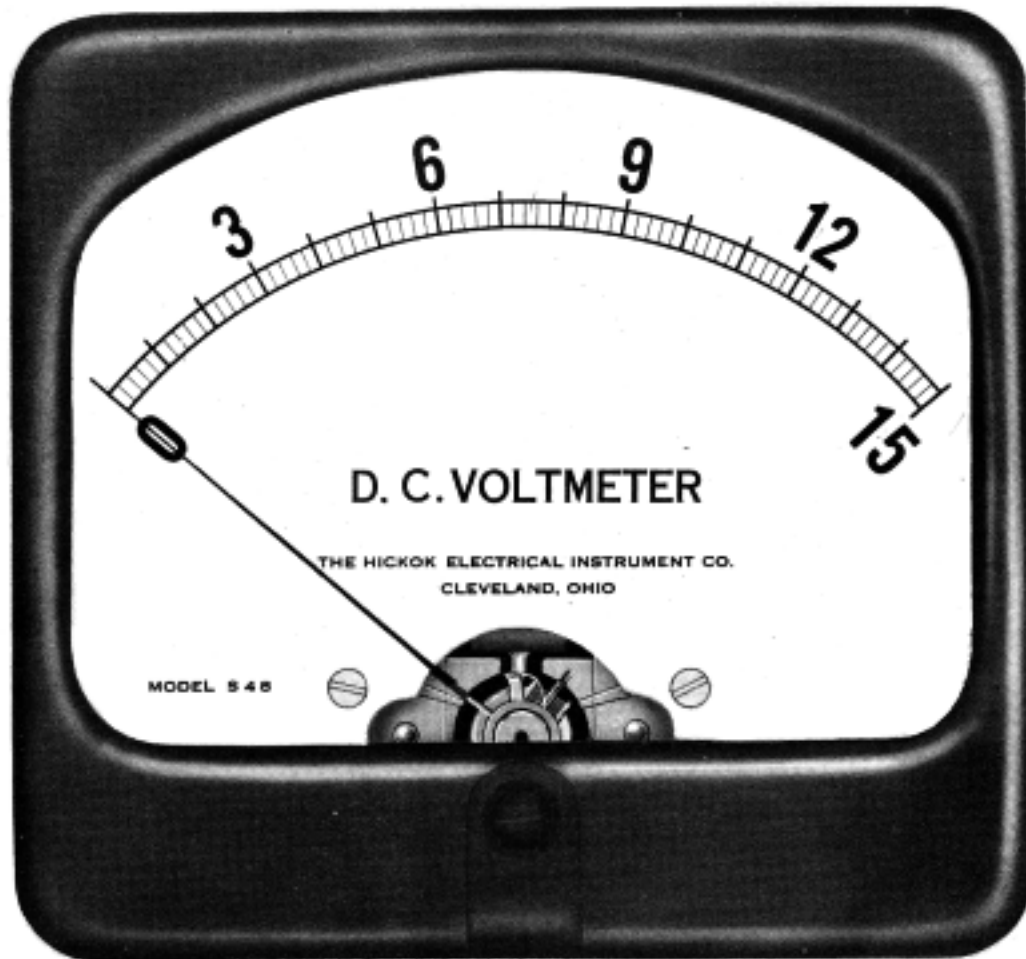
MODELS S48 D.C., S49M, S49, S49T, S49X A.C.

Furnished with or without illuminated dials.

Accuracy within 1½%. Molded Bakelite Cases—For Flush or Surface Mounting. Dull Black Finish Standard, Other Phenolic Colors Available. D.C. Scale Length 3¾"—Longest Which Can be Attained in an Instrument of this size. A.C. Scale Length 3.2", 85 Degrees Deflection.

The Hickok 4" rectangular meters are compact and economical, and are expressive of a new achievement in design. The case has a distinct improvement in appearance and utility, has longer scale and larger dial opening; the outside dimensions are smaller than round meters having the same scale length. The cases are sealed dustproof and moistureproof and insulated in accordance with N.E.M.A. specifications.

The meters are especially adaptable for switchboard or panel board use in both the alternating and direct current types, including multiple ranges. A complete line of A.C. switchboard meters is available—frequency meters, polyphase wattmeters, (see illustration) and power factor meters.



Polyphase wattmeters and power factor meters have cases approximately 2" deeper, diameters 3⅝"; otherwise are the same as the diagram. Frequency meters are self-contained and have same dimensions as diagram—no external reactor is used. The instruments can be supplied shielded from the effect of external magnetic fields, (case diameter increased by 3/32").

Volt-ammeters and volt-milliammeters, etc., having built-in push-button switches available. Push button and switch is located completely within the instrument.

Illuminated dials are available at a moderate increase in price.

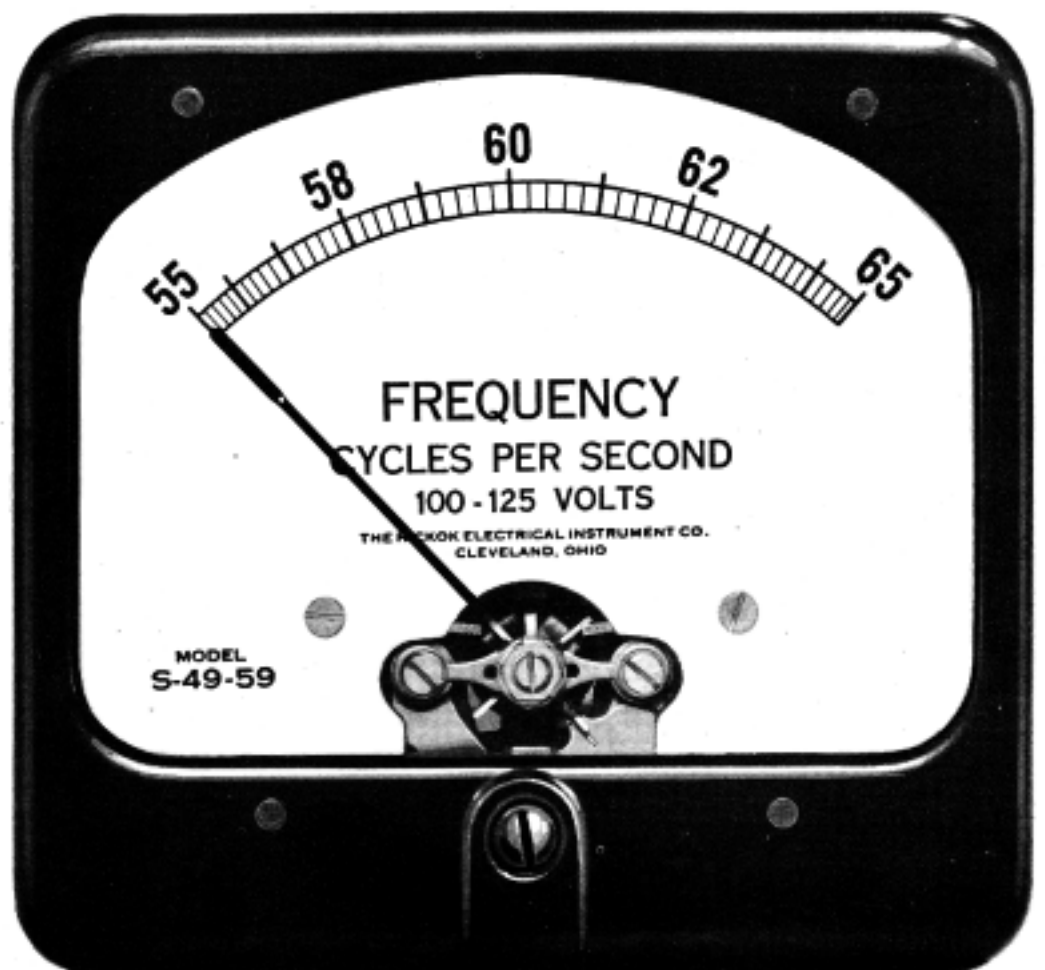
1. Glass dials, on quantity orders. All color combinations.
2. Translucent bakelite dials. Many color combinations.
3. Standard silver plated metal or bristol dials externally illuminated. State your requirements.

The surface mounting case is made entirely of bakelite and supplied at \$3.00 list additional. Mounting is by means of the instrument terminal studs, made 1¾" long.

POINTERS AND DIALS. Pointers on listed instruments are knife-edge as illustrated on the voltmeter, or of the broad lance type as illustrated on the frequency meter. Dials are silver plated metal, but can be supplied white enamel.

Mounting the instruments on steel panels sometimes affects the calibration. Please state thickness of the steel panel when ordering.

For prices, see consolidated price list, pages 21, 22, 23 and 24.



Actual Size—Self Contained

PRECISION CALIBRATED . LASTING ACCURACY

Pocket Portable Instruments

MODELS 480 AND 481

Accuracy within 1%. Unshielded. D.C. Model 480. Scale length 3 3/4". Voltmeters, Millivoltmeters, Ammeters, Milliammeters, Microammeters and Volt-ammeters. A.C. Model 481. Scale length 3 1/4". Ammeters Milliammeters, Voltmeters, Wattmeters—single phase. Mirror Scales. Knife Edge Pointers.

DIMENSIONS

Length.....	6 3/4"
Width.....	4 3/4"
Depth.....	2 3/4"
Weight.....	3 lbs.
Case.....	Molded Bakelite

Cases furnished with slip hinges permitting the cover to be removed. The resistor compartment is separate from the meter movement and beneath the panel on which the binding posts are mounted. Model 480 and 481 pocket portables are designed for smallness and accuracy. They will easily slip into the pocket and their high accuracy enables them to be used in many testing and inspecting applications. They have been found especially handy for field service work and are extensively used by the U. S. Signal Corps. All types have mirror scales, knife edge pointers and full open faces as illustrated. This latter feature enables the use of multiple scales, which are easily readable and unusually long. The movements are especially designed for portable use in these models, and are of the very highest quality.

Prices listed on pages 10, 11 and 12.



BATTERY TESTING VOLTMETER MODEL 5038T

Accurate within 1 1/2 %

High torque D'Arsonval movement—Double Range

Scale length.....	2 3/8"	Overall length.....	10"
Diameter of case.....	3 3/8"	Weight complete.....	12 oz.
Depth of case.....	1 1/8"	Finish.....	Red

Dial has English reading as well as direct reading scale. The "Good" segment is green, "Discharged" is yellow and the "Defective" portion is red. The range is extended to negative .2 volts, and positive .5 volts is marked on the scale to facilitate readings with a cadmium lead. Deluxe case is red, all metal parts gold plated.

Cables as illustrated supplied with each voltmeter.

The case is molded bakelite and is acid proof.

Ranges	Res.	Scale Div.	Net Price
0.2-0-3 10 volts	100 ohms	35	\$22.50
Cadmium lead \$2.75 extra.			



"P" SERIES PORTABLE INSTRUMENTS MODELS P46, P47, P47M

Accuracy within 1 1/2 %. Size: Width 2 3/4", height 2 1/8", length 4". Model P47X, accuracy within 5%. Shielded.

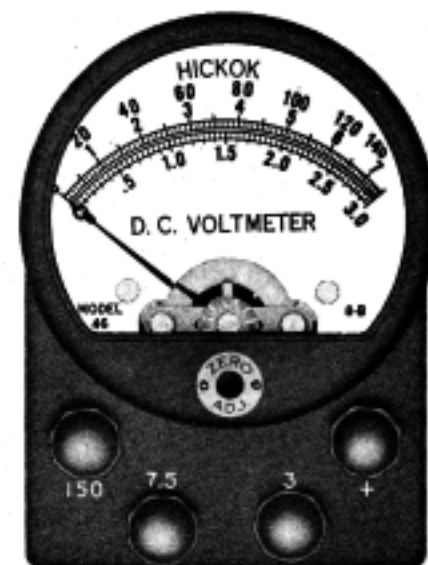
The "P" Series Instruments are very convenient for work where ordinary accuracy is required, space and cost are factors.

The case is of steel and the base is of molded insulating material with polished finish.

All "P" Series instruments are supplied with a set of thirty inch leads with insulated test prods on one end.

"P" Series Ammeters and Wattmeters are conveniently used with small portable current transformers for factory maintenance work, motor repairs, electrical appliances, etc. See multiple range, and single range portable current transformers listed on pages 13 and 27 of this catalog.

Prices listed on consolidated price list on pages 21, 22, 23 and 24.



THE STANDARD OF QUALITY

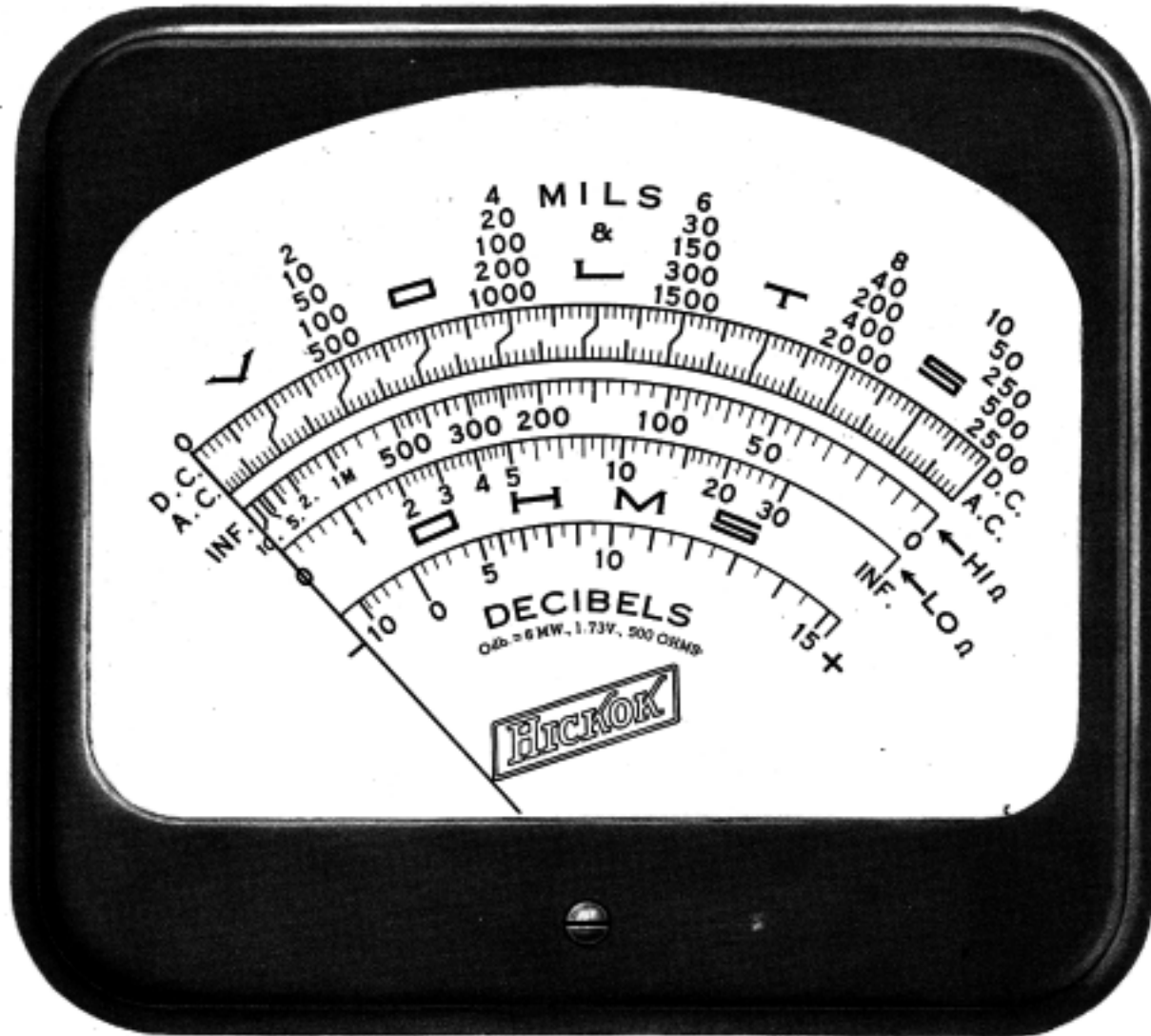
HICKOK
INSTRUMENTS

FOR A THIRD OF A CENTURY

Nine Inch Rectangular

MODELS S2244 D.C., S2243M, S2243T, S2243X A.C.

Furnished with or without illuminated dials. Accurate within 2%. Black Enamel or Chromium Plated Finish. Metal Cases. Shielded. Flush Mountings.

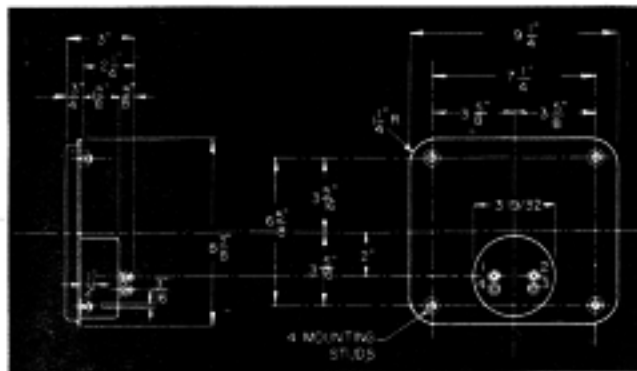


These are the largest rectangular instruments. Cases are pressed steel. Standard finish is black enamel; chromium plated or nickel-plated cases \$2.00 list extra. Various enamel or lacquer colors and finishes will also be supplied on special order.

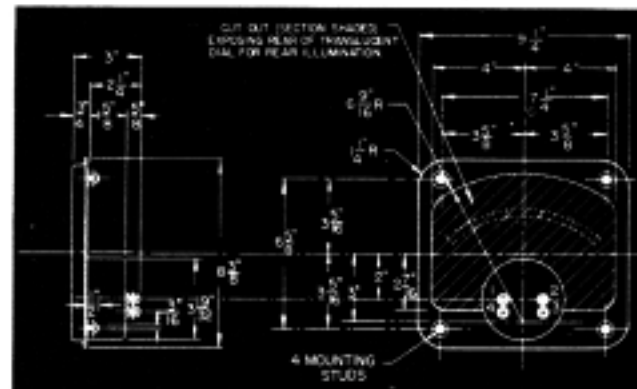
The standard pointer is a knife edge with round shank approximately .005" in diameter. The dials are supplied white enamel finish as standard but matte silver or any other suitable finish or color can be supplied for special quantity requirements. Illumination is accomplished by using a translucent dial made from plastic material. The rear of the case is cut out as per sketch below and a lamp is placed behind the dial in a convenient location. As noted on the illustration,

these instruments are suitable where a large number of scale arcs are required, and the various scales can be made in different colors in order to facilitate reading. This meter is also adaptable for automotive testing equipment where a large amount of data on the dial is required. For use on servicing equipment in the shop or garage where the customer can watch the indications, this type of meter is unexcelled.

Movements are permanent magnet and moving coil in the D.C. and magnetic vane in the alternating current types. A sensitivity in the D.C. instruments as low as 200 microamperes can be supplied. For lower sensitivity in this size instrument the Hickok Models S12, 32 or 22 are recommended.



Prices on pages
21, 22, 23
and 24.



PRECISION CALIBRATED . LASTING ACCURACY

Three and One-Half Inch Rectangular

FLUSH MOUNTINGS—Model S46, S47, S47M, S47X, S47T
BAKELITE CASES

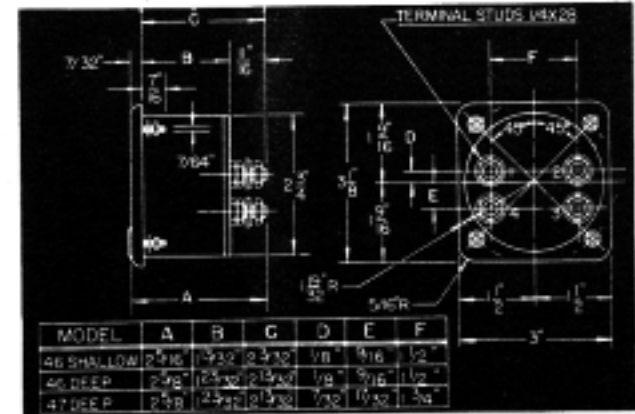


Rectangular Molded Phenolic Flush Case

Body diameter and scale length same as in round type instruments.

Large opening, symmetrically designed, admits a maximum of light to the dial—thick flange eliminates danger of breakage and improves appearance—less panel space required than for round flush instruments.

Case will pass N.E.M.A. requirements for insulation. Movements per JAN-I-6 Joint Army-Navy Spec. 30 October 1944.



THREE AND ONE-HALF INCH ROUND FLUSH AND SURFACE

INCLUDING JOINT ARMY-NAVY STANDARD JAN-I-6

Accurate within 1 1/2 %. Will meet JAN Performance Specifications. D.C. Model 46, A.C. Model 47M. Wattmeters Model 47, A.C., Rectifier type Model 47X. Thermo type Model 47T.

Scale length, Model 47 and 47M 2-1/32". Model 46, 47X, 47T 2-13/32". Approximate weight model 47 and 47M, 7 oz. Model 46, 47X, 47T, 12 oz. See consolidated price lists, pages 21, 22, 23 and 24.

CASES: Black polished molded phenolic cases per American Standards Association drawing number C39.2-2 will be supplied unless surface or metal (steel) cases are ordered. Cases other than black including chromium plated metal can be supplied. A typical metal case is illustrated on page 20.

If instruments are to be used on steel panels, specify panel thickness when ordering.

SHIELDING: When it is desired to shield the instrument from external magnetic fields, steel cases may be used, or the instruments with bakelite cases may be encased in model 46 soft iron cup shields. (Diameter increased to 2-27/32".)

POINTERS AND DIALS:

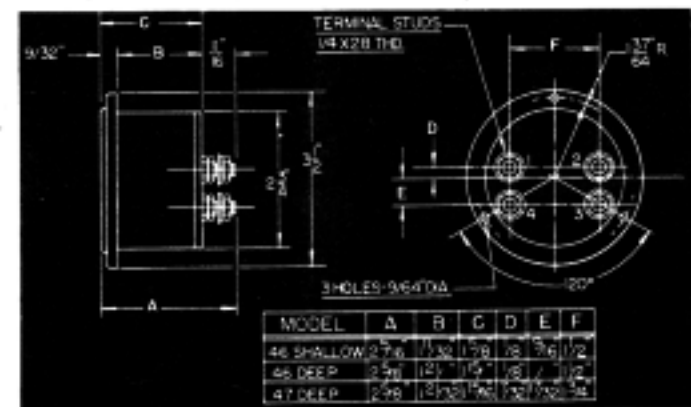
Standard pointers of small spade construction as illustrated, knife edge pointers \$1.00 additional. Dials in all standard ranges are supplied metal with etched silver plated finish. Special dial designs supplied on quantity orders at no extra charge, including internal illumination by means of bulb inserted in a socket through the instrument base.



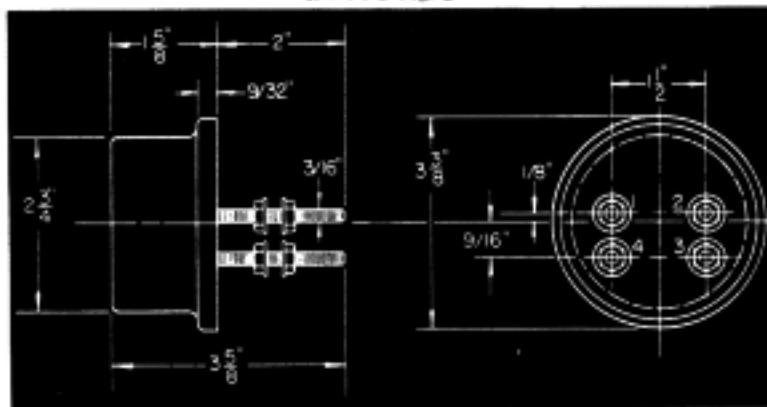
American War Standard C39.2-2B Case. (Molded phenolic) JAN-I-6 Fig. 3



American War Standard C39.2-2B Case. (Molded phenolic) JAN-I-6 Fig. 3



Molded Phenolic Surface Case Used on Three Inch Surface Meters



Instruments will be built to manufacturer's requirements on quantity orders. The price will be based on the instrument sensitivity and range. For example, special zero center differential voltmeters, high sensitivity millivoltmeters, meters with special stops or contacts on the pointers, combination meters and relays, etc.

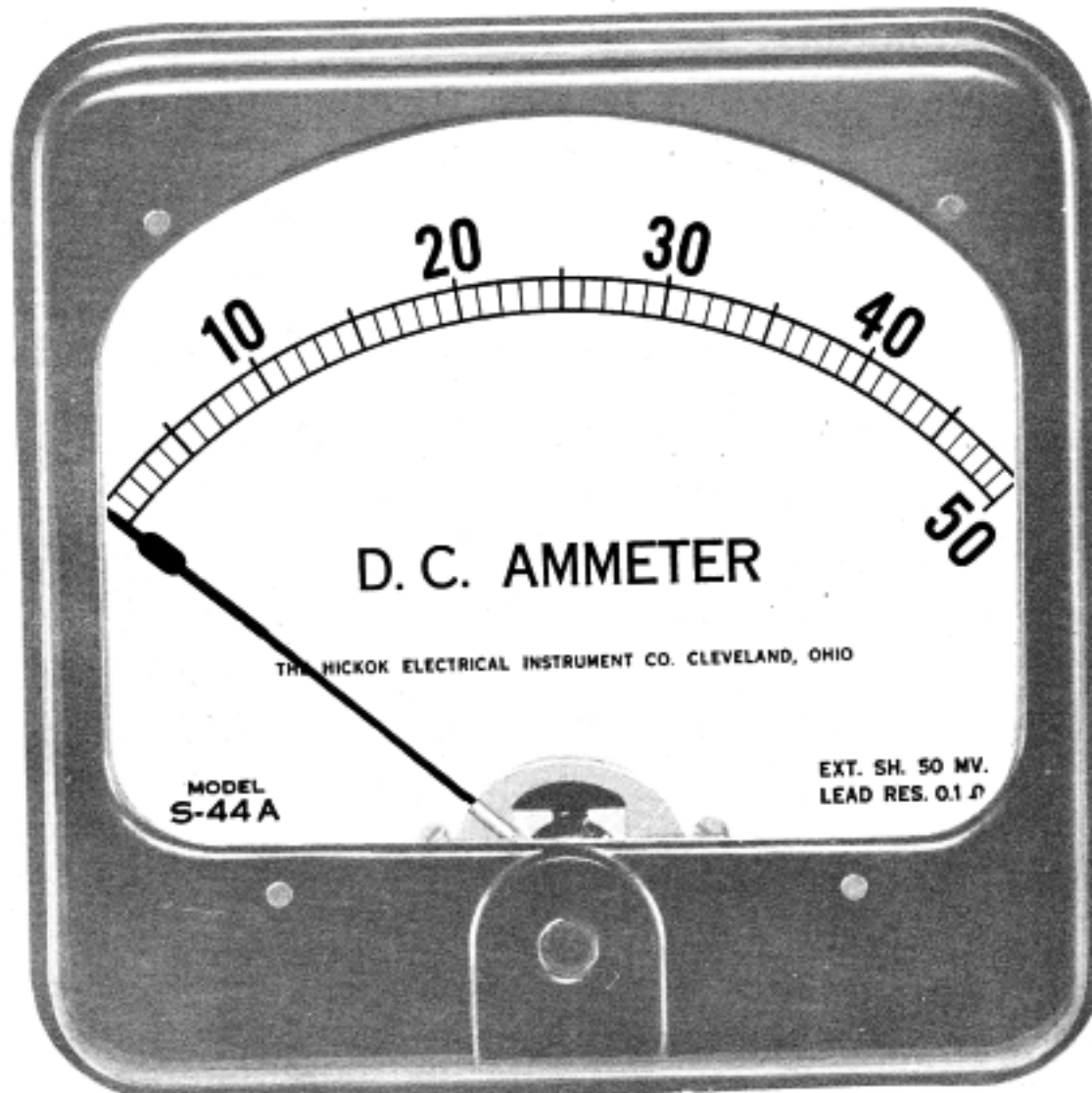
THE STANDARD OF QUALITY

HICKOK
INSTRUMENTS

FOR A THIRD OF A CENTURY

Five Inch Rectangular

MODELS S44 D.C., S43M, S43, S43T, S43X A.C.



Large Dial Area. Accurate within 1½%. Molded Bakelite Cases—Furnished Shielded or Unshielded. Dull Black Finish Standard, Other Colors Available.

FLUSH MOUNTING.
D.C. Scale Length 4¾".
A.C. Scale Length 4". Illuminated Dials Available.

Companion instruments to the other Hickok rectangular models but having proportionately larger dials, and ideally suitable for use in electronic testing equipment where multiple scale arcs are needed. The longest scale can be made to have a length of nearly five inches. Also suitable for switch-board requirements as single purpose meters, and can be supplied to measure all the electrical invisibles found in power distribution installments: Watts, Power Factor, Frequency, Kilowatts, etc.

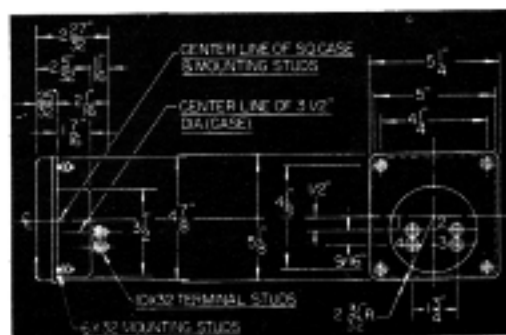
The case is designed so mounting can be either from the front or rear of the panel, as a flange is supplied on the base to facilitate rear mounting. The dust and moistureproof cases can be supplied in all the colors obtainable in "bakelite" or "durez" phenolic compounds; the standard finish is polished instrument black. They are insulated in accordance with applicable specifications and can be supplied on special request shielded from the effect of external magnetic fields. Polyphase wattmeters and power factor meters are 2" deeper than

illustrated in the dimensional diagram. Frequency meters have no external reactor.

Movements are permanent magnet and moving coil in the D.C. and magnetic vane in the A.C. types except wattmeters, power factor meters and frequency meters which are electro-dynamometer design; and are especially designed for this size of instrument. In common with all Hickok Magnetic Vane Panel Instruments, the Model S43M has lower jewel mounted in a flexible spring. This absorbs magnetic hum, resulting in an absolutely noiseless A.C. meter.

Lance shaped pointers as illustrated are standard, but other styles can be supplied. Standard dials are matte silver finish, although other finishes and colors are available on quantity orders. External dial illumination is available; detailed requirements should be stated. Pointer reflecting mirrors can be furnished at an extra charge on the dials on quantity orders where special scales are required.

Prices on pages 21, 22, 23 and 24.



PRECISION CALIBRATED . LASTING ACCURACY

PANEL MOUNTING TYPES

DIRECT CURRENT INSTRUMENTS

D.C. MILLIAMMETERS

Ranges	Approx. Res.	3 1/2 Inch Models 46 S46 Accur. 1 1/2%	3 1/2 Inch Portable Model P46 Accur. 1 1/2%	4 Inch Model S48 Accur. 1 1/2%	Edgewise Model 50 Accur. 1 1/2%	5 Inch Model S44 Accur. 1%	9 Inch Model S2244 Accur. 2%
1	100	\$14.25	\$17.50	\$21.00	\$26.00	\$31.00	\$36.00
2	60	14.25	17.50	21.00	26.00	31.00	36.00
3	40	14.25	17.50	21.00	26.00	31.00	36.00
5	25	14.25	17.50	21.00	26.00	31.00	36.00
10	7	14.25	17.50	21.00	26.00	31.00	36.00
15	5	14.25	17.50	21.00	26.00	31.00	36.00
25	2.5	14.25	17.50	21.00	26.00	31.00	36.00
50		14.25	17.50	21.00	26.00	31.00	36.00
75		14.25	17.50	21.00	26.00	31.00	36.00
100		14.25	17.50	21.00	26.00	31.00	36.00
150		14.25	17.50	21.00	26.00	31.00	36.00
300		14.25	17.50	21.00	26.00	31.00	36.00
500		14.25	17.50	21.00	26.00	31.00	36.00
750		14.25	17.50	21.00	26.00	31.00	36.00

Double, triple ranges, etc.: Add \$3.50 for each range to the list price of the highest priced single range. Milliammeters with lower internal resistances available for special requirements. For resistance $\pm 2\%$, add \$3.00.

D.C. AMMETERS

Ranges	Approx. Res.	3 1/2 Inch Models 46 S46 Accur. 1 1/2%	3 1/2 Inch Portable Model P46 Accur. 1 1/2%	4 Inch Model S48 Accur. 1 1/2%	Edgewise Model 50 Accur. 1 1/2%	5 Inch Model S44 Accur. 1%	9 Inch Model S2244 Accur. 2%
1		\$14.25	\$21.00	\$21.00	\$26.00	\$31.00	\$36.00
1.5		14.25	21.00	21.00	26.00	31.00	36.00
2		14.25	21.00	21.00	26.00	31.00	36.00
3		14.25	21.00	21.00	26.00	31.00	36.00
5		14.25	21.00	21.00	26.00	31.00	36.00
10		14.25	21.00	21.00	26.00	31.00	36.00
15		14.25	21.00	21.00	26.00	31.00	36.00
25		14.25	21.00	21.00	26.00	31.00	36.00
50		14.25	21.00	21.00	26.00	31.00	36.00
*100		22.50		29.25	34.25	39.25	44.25
*150		22.50		29.25	34.25	39.25	44.25
*200		22.50		29.25	34.25	39.25	44.25
*250		22.50		29.25	34.25	39.25	44.25
*300		23.25		30.00	35.00	40.00	45.00
*400		25.50		32.25	37.25	42.25	45.25
*500		27.75		34.50	39.50	44.50	49.50
*600		30.50		37.25	42.25	47.25	52.25
*750		31.50		38.25	43.25	48.25	53.25
**40-0-90		14.25		21.00	26.00	31.00	36.00
**75-0-75		17.00		23.75	28.75	33.75	38.75

*External shunt with 50 M. V. drop. 50 M. V. meters scaled to suit shunt, same price as 1 ampere meter. Double, triple ranges, etc.: Add shunt prices to 0-1 ampere meter. **Other zero center ranges available.

D.C. MICROAMMETERS

Ranges	Approx. Res.	3 1/2 Inch Models 46 S46 Accur. 1 1/2%	3 1/2 Inch Portable Model P46 Accur. 1 1/2%	4 Inch Model S48 Accur. 1 1/2%	Edgewise Model 50 Accur. 1 1/2%	5 Inch Model S44 Accur. 1%	9 Inch Model S2244 Accur. 2%
2	10000	\$90.00*	\$94.00		\$100.00		
5	8000	80.00*	84.00		90.00		
10	4000	51.00	54.25	\$57.75*	57.75	\$66.50*	
25		30.00	33.25	34.00	34.00	40.00	
50		26.75	28.50	29.25	29.25	35.00	\$43.00
100		23.50	26.75	27.50	28.00	35.00	42.00
200		18.00	21.25	24.75	28.00	33.50	39.50
300		18.00	21.25	24.75	28.00	33.50	39.50
500		18.00	21.25	24.75	28.00	33.50	39.50
750		15.75	19.00	22.50	27.50	31.75	37.75

Above microammeters high torque design. If resistance important, specify. *For use in horizontal position only.

D.C. VOLTMETERS

Ranges	Approx. Res.	3 1/2 Inch Models 46 S46 Accur. 1 1/2%	3 1/2 Inch Portable Model P46 Accur. 1 1/2%	4 Inch Model S48 Accur. 1 1/2%	Edgewise Model 50 Accur. 1 1/2%	5 Inch Model S44 Accur. 1%	9 Inch Model S2244 Accur. 2%
1		\$14.25	\$17.50	\$21.00	\$26.00	\$31.00	\$36.00
3		14.25	17.50	21.00	26.00	31.00	36.00
5		14.25	17.50	21.00	26.00	31.00	36.00
7.5		14.25	17.50	21.00	26.00	31.00	36.00
10		14.25	17.50	21.00	26.00	31.00	36.00
15		14.25	17.50	21.00	26.00	31.00	36.00
20		14.25	17.50	21.00	26.00	31.00	36.00
25		14.25	17.50	21.00	26.00	31.00	36.00
50		14.25	17.50	21.00	26.00	31.00	36.00
80		14.25	17.50	21.00	26.00	31.00	36.00
100		14.25	17.50	21.00	26.00	31.00	36.00
150		14.25	17.50	21.00	26.00	31.00	36.00

For ranges above 150 volts, use 1000 ohm per volt meter. See next page. Double, triple ranges, etc.: Add \$3.50 for each range to the list price of the highest single range.

NOTE—RANGES NOT LISTED AVAILABLE. FLUSH MOUNTING CASES WILL BE SUPPLIED UNLESS ORDER REQUESTS SURFACE MOUNTING.



PANEL MOUNTING TYPES (Cont.)

DIRECT CURRENT INSTRUMENTS—(Cont.)

D.C. VOLTMETERS

Res. 1000 Ohms Per Volt (Higher Resistance Supplied on Special Order)

Ranges	3 1/2 Inch Models 46 - S46 Accur. 1 1/2%	3 1/2 Inch Portable Model P46 Accur. 1 1/2%	4 Inch Model S48 Accur. 1 1/2%	Edgewise Model 50 Accur. 1 1/2%	5 Inch Models 44 - S44 Accur. 1%	9 Inch Model S2244 Accur. 2%
1	\$15.00	\$18.25	\$21.75	\$26.75	\$31.75	\$36.75
3	15.00	18.25	21.75	26.75	31.75	36.75
5	15.00	18.25	21.75	26.75	31.75	36.75
7.5	15.00	18.25	21.75	26.75	31.75	36.75
10	15.00	18.25	21.75	26.75	31.75	36.75
15	15.00	18.25	21.75	26.75	31.75	36.75
25	15.00	18.25	21.75	26.75	31.75	36.75
50	15.00	18.25	21.75	26.75	31.75	36.75
75	15.00	18.25	21.75	26.75	31.75	36.75
100	15.75	19.00	22.50	27.50	32.50	37.50
150	16.50	19.75	23.25	28.25	33.25	38.25
250	17.25	20.50	24.00	29.00	34.00	39.00
300	18.75	22.00	25.50	30.50	35.50	40.50
500	23.50	26.75	30.25	35.25	40.25	45.25
600	25.00	28.25	31.75	36.75	41.75	46.75

For ranges above 600 volts, use external resistors with 150 volt meter. Double, triple ranges, etc.: Add \$3.50 to highest priced single range for each additional ranges.

RECTIFIER INSTRUMENTS

A.C. RECTIFIER INSTRUMENTS

Permanent magnet and moving coil movement used in conjunction with a copper oxide rectifier. For use in circuits where the power consumed by the instruments must be less than magnetic vane types. Accuracy better than 5% at ordinary room temperatures.

A.C. MICROAMMETERS, RECTIFIER TYPE

Ranges	3 1/2 Inch Size Models 47X, S47X	4 Inch Size Model S49X	Edgewise Model 51X	5 Inch Size Models 43X, S43X	9 Inch Size Model S2243X
100	\$34.50	\$41.25	\$46.25	\$51.25	\$56.25
200	25.50	32.25	37.25	42.25	47.25
500	25.50	32.25	37.25	42.25	47.25

A.C. MILLIAMMETERS, RECTIFIER TYPE

1	\$21.75	\$28.50	\$33.50	\$38.50	\$43.50
2	21.75	28.50	33.50	38.50	43.50
3	21.75	28.50	33.50	38.50	43.50
5	21.75	28.50	33.50	38.50	43.50

A.C. VOLTMETERS, RECTIFIER TYPE

Resistance 1000 Ohms per volt. (Higher Resistances Furnished on Request)

1	\$25.50	\$32.25	\$37.25	\$42.25	\$47.25
3	22.50	29.25	34.25	39.25	44.25
5	22.50	29.25	34.25	39.25	44.25
10	22.50	29.25	34.25	39.25	44.25
50	22.50	29.25	34.25	39.25	44.25
150	24.00	30.75	35.75	40.75	45.75
300	26.25	33.00	38.00	43.00	48.00
600	29.75	36.50	41.50	46.50	51.50

Rectifier voltmeters supplied double range at \$3.50 additional to list price of highest single range.

POWER LEVEL INDICATORS—DB METERS

For Measuring Sound Level in Audio Amplifiers

Copper Oxide Rectifier Type

HIGH SPEED (HIGHLY DAMPED) MOVEMENTS

Ranges	Volts at 0	Line Imped.	Int. Res.	3 1/2 Inch Size Models 47X, S47X	3 1/2 Inch Portable Model P47X	4 Inch Size Model S49X	Edgewise Model 51X
-12, 0, + 6db	1.73	500	5000	\$33.00	\$36.25	\$39.75	

SLOW SPEED TYPE, Same price as above

MEDIUM SPEED MOVEMENTS (GENERAL PURPOSE)

-12, 0, + 6db	1.73	500	5000	\$25.50	\$28.75	\$32.25	\$37.25
-10, 0, + 40 db	1.73	500	5000				40.25

Other db ranges to order.

VU (VOLUME UNIT) METERS

Scale A	\$40.50	\$48.00
Scale B	40.50	48.00

Custom-built Power Level and V U Meters available.

NOTE—RANGES NOT LISTED AVAILABLE. FLUSH MOUNTING CASES WILL BE SUPPLIED UNLESS ORDER REQUESTS SURFACE MOUNTING.

PANEL MOUNTING TYPES (Cont.)

THERMO INSTRUMENTS

HIGH FREQUENCY INSTRUMENTS—THERMOCOUPLE TYPE

Power Consumption Approximately .2 Watts per Ampere. Accuracy 2%. High Overload Type.
Supplied with Internal Couples. Instruments with External Couples Furnished on Request.

THERMO MILLIAMMETERS

Ranges	3 1/2 Inch Size Models 47T, S47T	4 Inch Size Model S49T	Edgewise Model 51T	5 Inch Size Models 43T, S43T	9 Inch Size Model S2243T
2*	\$52.50	\$59.25	\$64.25	\$69.25	
5*	52.50	59.25	64.25	69.25	
10*	52.50	59.25	64.25	69.25	
25*	52.50	59.25	64.25	69.25	
50*	52.50	59.25	64.25	69.25	
100	24.00	30.75	35.75	40.75	
150	24.00	30.75	35.75	40.75	
300	24.00	30.75	35.75	40.75	\$45.75
500	24.00	30.75	35.75	40.75	45.75
*Vacuum Type					
1	\$21.00	\$27.75	\$32.75	\$37.75	\$42.75
5	21.00	27.75	32.75	37.75	42.75
10	21.00	27.75	32.75	37.75	42.75
25	21.00	27.75	32.75	37.75	42.75

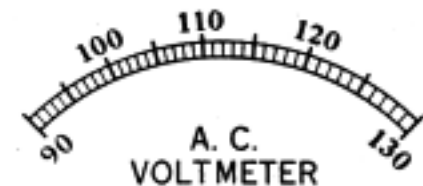
Prices of double range thermo ammeters quoted on request.

SUPPRESSED ZERO INSTRUMENTS

Nearly all catalogue numbers listed in this bulletin can be supplied on special order with zero depressed. Special ranges with depressed zero will be supplied.

The amount of suppression which can be obtained depends on the style of movement, sensitivity and nature of the currents or potentials to be measured.

Suppressed zero instruments provide a means to read values between particularly close limits with accuracy. They can be supplied critically damped, if desired. Give complete details of installation on which the instrument will be used.



ALTERNATING CURRENT INSTRUMENTS

A.C. MILLIAMMETERS

Ranges	Approx. Res.	3 1/2 Inch Size Models 47M S47M Accur. 1 1/2%	3 1/2 Inch Size Portable Model P47M Accur. 1 1/2%	4 Inch Size Model S49M Accur. 1 1/2%	Edgewise Model 51M Accur. 1 1/2%	5 Inch Size Models 43M S43M Accur. .1%	9 Inch Size Model S2243M Accur. 2%
10	1800	\$16.00	\$19.25	\$22.75	\$27.75	\$32.75	
15	900	14.25	17.50	21.00	26.00	31.00	
25	400	14.25	17.50	21.00	26.00	31.00	\$36.00
50	100	14.25	17.50	21.00	26.00	31.00	36.00
100	25	14.25	17.50	21.00	26.00	31.00	36.00
150	9	14.25	17.50	21.00	26.00	31.00	36.00
300	2.5	14.25	17.50	21.00	26.00	31.00	36.00
500	1.0	14.25	17.50	21.00	26.00	31.00	36.00

Double Range A.C. Milliammeters available. Send us your requirements.

A.C. AMMETERS

1	.25	\$14.25	\$17.50	\$21.00	26.00	\$31.00	\$36.00
2		14.25	17.50	21.00	26.00	31.00	36.00
3		14.25	17.50	21.00	26.00	31.00	36.00
*5		14.25	17.50	21.00	26.00	31.00	36.00
10		14.25	17.50	21.00	26.00	31.00	36.00
25		14.25	17.50	21.00	26.00	31.00	36.00
50		14.25	17.50	21.00	26.00	31.00	36.00
75				31.00	36.00	41.00	46.00
100				37.25	42.25	47.25	52.25

*When ordered for use with current transformers having 5 ampere secondary, will be scaled to suit primary of current transformer.

DOUBLE RANGE A.C. AMMETERS

3/15	\$25.00	\$28.25	\$31.75	\$36.75	\$41.75
5/15	25.00	28.25	31.75	36.75	41.75
5/30	28.50	31.75	35.25	40.25	45.25

MULTIPLE RANGE A.C. AMMETERS

Use Ammeter with one ampere coil in connection with 47CTMR Current Transformer. See page 27.

A.C. VOLTMETERS

1.5	5	\$14.25	\$17.50	\$21.00	\$26.00	\$31.00	\$36.00
5	25	14.25	17.50	21.00	26.00	31.00	36.00
10	64	14.25	17.50	21.00	26.00	31.00	36.00
15	165	14.25	17.50	21.00	26.00	31.00	36.00
25	270	14.25	17.50	21.00	26.00	31.00	36.00
50	1300	14.25	17.50	21.00	26.00	31.00	36.00
100	5100	15.00	18.25	21.75	26.75	31.75	36.75
130	6800	15.75	19.00	22.50	27.50	32.50	37.50
150	7800	15.75	19.00	22.50	27.50	32.50	37.50
250	19000	17.25	20.50	24.00	29.00	34.00	39.00
300	23000	18.00	21.25	24.75	29.75	34.75	39.75

For higher ranges, use external multipliers with 150 volt meter. See Page 26. Scaled to fit multipliers. Double range A.C. voltmeters \$3.50 additional to list price of highest single range.

NOTE—RANGES NOT LISTED AVAILABLE. FLUSH MOUNTING CASES WILL BE SUPPLIED UNLESS ORDER REQUESTS SURFACE MOUNTING.

PANEL MOUNTING TYPES (Cont.)

ALTERNATING CURRENT INSTRUMENTS

A.C.-D.C. WATTMETERS. Single Phase. Electro-dynamometer Movements.

Ranges Watts	Volt Limit	Amp. Limit	3 1/2 Inch Size	3 1/2 Inch Size	4 Inch Size	Edgewise	5 Inch Size
			Models 47 S47 Accur. 1 1/2%	Portable Model P47 Accur. 1 1/2%	Model S49 Accur. 1 1/2%	Model 51 Accur. 1 1/2%	Models 43 S43 Accur. 1%
75	150	.75	\$29.25	\$32.50	\$36.75	\$41.75	\$46.75
150	150	1.5	29.25	32.50	36.75	41.75	46.75
300	150	3	29.25	32.50	36.75	41.75	46.75
750	150	7.5†	29.25	32.50	36.75	41.75	46.75
1500	150	15	32.50	35.75	40.00	45.00	50.00
1500	300	7.5†	34.25	37.50	41.75	46.75	51.75
3000	300	15	37.50	40.75	45.00	50.00	55.00
3000	150	30	54.00	57.25	61.50	66.50	71.50
6000	300	30	59.50	62.75	67.00	72.00	77.00
5000	150	50	62.50	65.75	70.00	75.00	80.00
10KW	300	50	67.50	70.75	75.00	80.00	85.00

Low power factor wattmeters supplied on special order.

DOUBLE RANGE WATTMETERS—Wattmeters having both 150 and 300 voltages, priced at \$9.75 above 300 volt.

MULTIPLE RANGE WATTMETERS—To obtain multiple voltage limits, use external multipliers with switching arrangement. To obtain multiple current limits, use wattmeter with 1.5 ampere current limit coil (1 ampere normal) in connection with catalog number 47CTMR multiple winding current transformer listed on page 27. Example: Wattmeter having 150 volt potential coil, and 1.5 ampere current coil, the ampere ranges become 1.5, 3, 7.5, 15, 30 amperes, giving readings of 150, 300, 750, 1500 and 3000 watts.

POLYPHASE WATTMETERS—Electro Dynamometer Movements. Accurate Within 1 1/2%.

For 3 phase 3 wire, 2 phase 3 wire, 2 phase 4 wire circuits. Specify circuit on order.

Range K. W.	Norm. Volts	Volt Limit	Norm. Amp.	Amp. Limit	List Price Model S-49	List Price Model 51	List Price Models 43-S43
1.5	100-130	150	5†	7.5	\$100.00	\$100.00	\$115.00
3	100-130	150	10	15	100.00	100.00	115.00
3	220-240	300*	5†	7.5	110.00	110.00	125.00
6	220-240	300*	10	15	110.00	110.00	125.00

*Supplied with external resistor. For higher voltage ranges, use external multipliers.

†Scale ranges will be changed to match transformers if desired.

Instruments will be supplied with less than 5 ampere current coils at same price as 5 ampere.

Above wattmeters for use on direct current and at commercial frequencies.

Above wattmeters constructed with two current and two potential elements only.

FREQUENCY METERS (ELECTRODYNAMOMETER MOVEMENTS)

CROSS COIL IRON CORE TYPE, accuracy within 1/3 of 1%. Ambient temperature compensated, -10 to +40°C. Power consumption, 0.8 VA at 115V., 97% P. F. Self-contained, no external reactors necessary. Prices and ranges listed on page 37. Also illustrated on page 16.

POWER FACTOR METERS

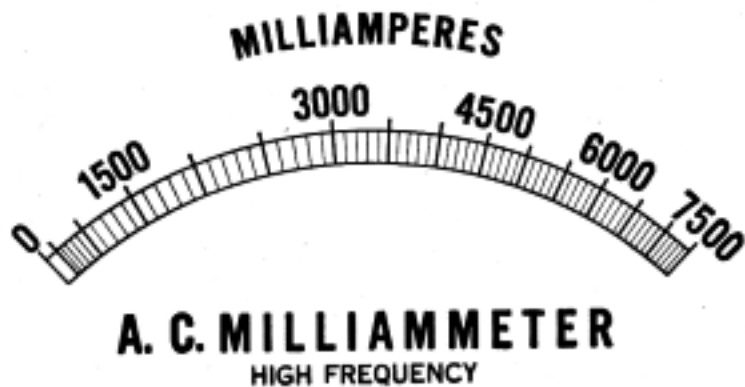
Electrodynamometer Movements. Accuracy conforms to N.E.M.A. Specifications for power factor meters. For balanced systems.

Ranges and Scales	Phase	Amperes*	Volts	Frequency†	List Price Model S49	List Price Models 43-S43
As Specified	3	5	100-125	25-133	\$100.00	\$115.00
	3	5	200-250	25-133	110.00	125.00

*Current ranges less than 5 amperes same price. Above 5 amperes use current transformers.

†Specify frequency when ordering.

NOTE—RANGES NOT LISTED AVAILABLE. FLUSH MOUNTING CASES WILL BE SUPPLIED UNLESS ORDER REQUESTS SURFACE MOUNTING.



INSTRUMENTS WITH SCALES MODIFIED

Often it is desired to "shade" the curve of a permanent magnet and moving coil meter to expand any desired portion of the scales. Hickok is able to supply various curves including logarithmic: send for drawings.

As an example, figures at left illustrate how the modified curve doubles the range on thermo meters; but similar results can be obtained with rectifier type meters and straight D.C. movements.

Instruments with modified scales are made to customer's individual requirements; for that reason are not catalogued according to range, but are ordinarily sold at \$7.50 additional.

THE STANDARD OF QUALITY

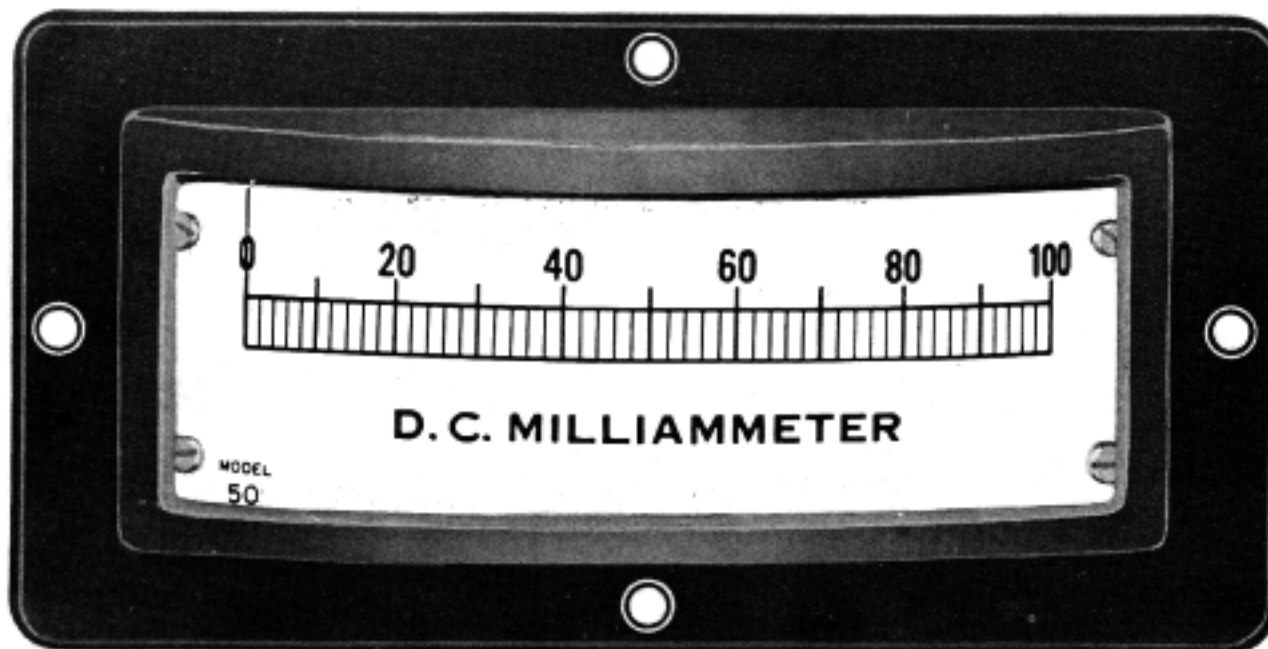
HICKOK
INSTRUMENTS

FOR A THIRD OF A CENTURY

Panel Mounting Edgewise Instruments

MODELS 50, 51M, 51, 51T, 51X

Accurate within 1 1/2 %



D.C. Milliammeter
Actual Size

Made as D.C. Ammeters, Milliammeters, Microammeters, Voltmeters, Thermo Meters, Rectifier Meters; A.C. Ammeters, Milliammeters, Voltmeters; Wattmeters, Polyphase and Single Phase; Power Factor Meters, Micromhometers (for measurement of Dynamic Mutual Conductance). See price list page 21.

EXTRA LONG SCALE—3 1/4 INCHES

Owing to their unique design the Hickok Edgewise Indicating Instruments have a longer scale for a given body cross section area than any round or square electrical instrument made. Panel space is half that required by a round or square meter of equal scale length. Cases are made from molded phenolic material, and mounted by screws through the flange.

ILLUMINATED DIALS—MIRROR SCALES

Translucent dials for illumination available on special order at \$1.50 list extra. Lamps (furnished by user) can be placed outside the case at the sides directly behind the flange. Light shines through two plastic windows specially provided in the case. Pointer reflecting mirrors for precision readings supplied on special order at additional cost.

RUGGEDNESS AND SUPER SENSITIVITIES

In horizontal edgewise instruments the forces tending to unbalance the movement are much less effective than in a round or square type mounted upright on a panel, and their performance is comparable to the latter when used flat. Edgewise design is especially adapted for highly sensitive low torque movements, owing to greatly reduced bearing friction. Hickok Models 50 and 51 are highly efficient in D.C. Microammeters, D.C. Millivoltmeters and Micromhometers. Information regarding Horizontal Edgewise Precision Super-sensitive Movements will be supplied upon request.

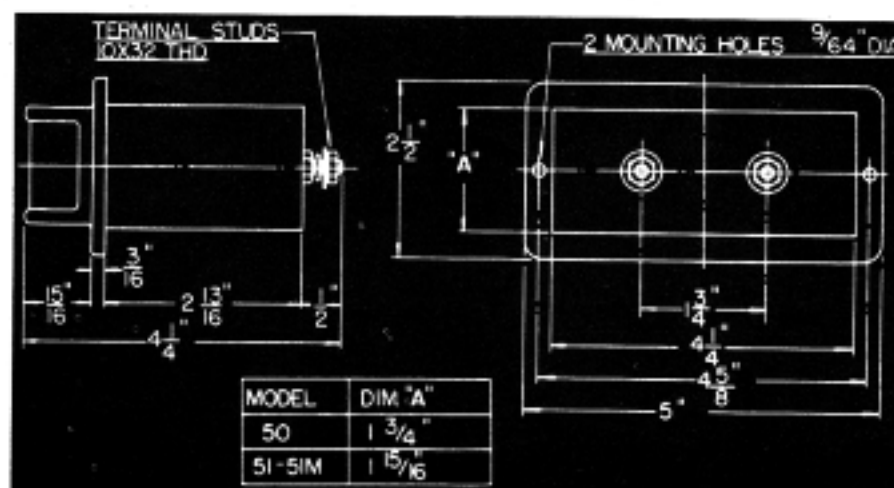
VERTICAL OPERATION

Edgewise Meters are sometimes used vertically, but are not recommended for all applications. The vertical scale enhances the appearance of extreme simplicity, and the altogether difference artistic design looks well in many styles of apparatus.

DIMENSIONS

Polyphase wattmeters are 3 1/8" thick instead of 1-15 16" and flange is 3 3/4" wide instead of 2 1/2". All other dimensions approximately the same as diagram below.

Prices on pages 21, 22, 23 and 24.



PRECISION CALIBRATED . LASTING ACCURACY

EXTERNAL SHUNTS FOR HICKOK PANEL MOUNTING INSTRUMENTS

Shunts listed on this page are for use with any Hickok millivoltmeter except portable and laboratory standard instruments.

Resistance material in the shunt is shunt manganin fitted into copper terminal blocks. All shunts are adjusted to an accuracy of 1/2 of 1% at their rated capacity. The thermal electromotive force produced by continuous operation of the shunt will not affect the guaranteed accuracy of the instrument with which it is used. The shunt manganin has negligible temperature coefficient at the limits of temperature rise of the shunts. The temperature rise of all Hickok shunts is approximately 40 degrees which is within the limits of paragraph E14-60 N.E.M.A. standards.

The list prices are for shunts only. In this catalog where ampere ranges which require shunts are listed, the price includes the shunt. Regular leads have a resistance of .1 ohm; are made 8 feet long from 18 gauge wire.

50 MILLIVOLTS DROP

Panelboard Style

Capacity Amperes	List Price	Capacity Amperes	List Price
1	\$ 8.25	800	\$ 17.25
5	8.25	1000	25.00
15	8.25	1500	40.00
30	8.25	2000	50.00
50	8.25	2500	65.00
75	8.25	3000	76.50
100	8.25	5000	153.00
150	8.25	6000	178.50
200	8.25	7000	204.00
300	9.00	7500	228.00
400	11.25	10000	304.50
500	13.50	15000	450.00
600	16.25		

Current ratings not listed available.

TABLE OF DIMENSIONS

(Blueprints supplied on request)

Range	Center Distance of Conductor Holes	Overall Length	Width
1 to 150	3 3/8"	4 7/8"	1"
200 to 800	3 3/8"	4 7/8"	1 1/2"
1000 to 3000	5 5/8" (2 holes ea. end, 1 3/4" C. to C.)	7 1/8"	3"
4000 to 7000	7 3/8" (2 holes ea. end, 1 3/4" C. to C.)	8 7/8"	3"
7500 to 20,000	Dimensions furnished on application		

Special sizes of shunts can be furnished.

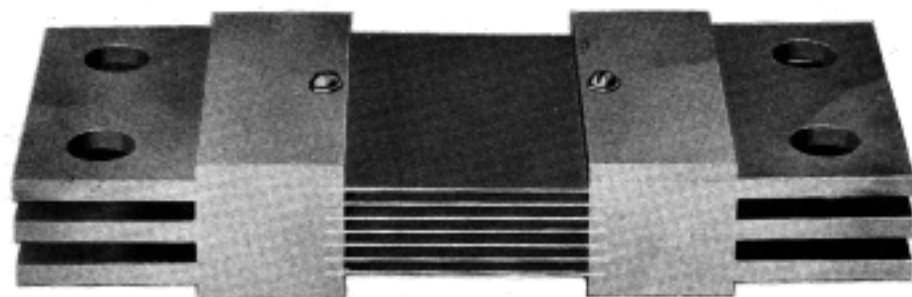
MULTIPLIERS FOR PANEL MOUNTING MODELS

The multipliers listed are for use with Hickok panel mounting instruments. The bottom and top of the boxes are made of molded bakelite and contain holes to insure ventilation. The resistors consist of asbestos ebony slabs wound with non-temperature coefficient wire, and the resistors have a wide air space between them for adequate ventilation. The accuracy of the multiplier will not change with changes in humidity. Over-all accuracy of the meter in combination with the external multiplier, is the same as the listed accuracy of the meter.

Dimensions are dependent on voltage capacity. Drawings furnished on application.

Prices below are for multipliers used in conjunction with A.C. or D.C. meters, all catalogued ohms-per-volt.

Multipliers are calibrated to operate with meters having range 0-150 volts.



WAR STANDARD SHUNTS

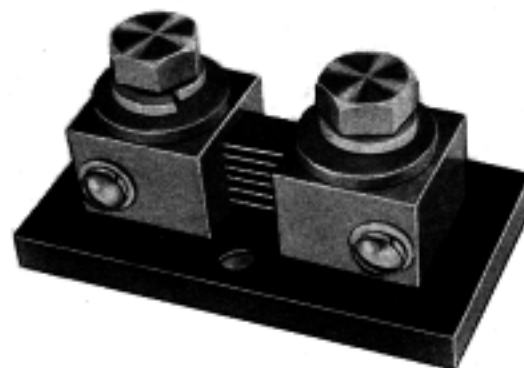
American Standard Association Specifications
C39.5—1943

Small shunts for panel board mounting use, which are approved by the U. S. Navy, and Signal Corps for use in connection with the design of all aircraft radio, radar and underwater sound equipment, etc., where a small lightweight shunt is required.

Manufactured as types MSA, MSB and MSC as illustrated in the American War Standard.

Prices on application.

Rated Current in Amperes	Type Designation	Rated Current in Amperes	Type Designation
50	MSA500	300	MSB301
80	MSA800	500	MSB501
100	MSA101	600	MSB601
150	MSA151	800	MSC801
200	MSB201	1000	MSC102
250	MSB251	1200	MSC122



Volts	List Price
500	\$15.00
600	16.50
750	20.25
1000	26.75
1500	42.00

Tubular Resistors—Per JAN-R-29		
Types MFA, MFB, MFC—Partial List		
KV	Type	List Price
0.5	MFC-504	\$ 30.00
1.0	MFC-105	33.50
2.0	MFB-205	55.00
3.5	MFB-355	75.00
5.0	MFA-505	115.00



All above multipliers are made to conform with NEMA specifications class A insulation.

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