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American National Standard

Physical Aspects of Watthour Meters—Safety Standard

Secretariat:

National Electrical Manufacturers Association

Approved June 28, 2011

American National Standards Institute

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Foreword (This Foreword is not part of American National Standard C12.10-2010)

There were relatively few changes made to this edition to bring it up to date with modern practice and with new editions of other ANSI C12 standards. To this edition Form 32S was added. Also the text was revised to allow disconnect links to be optional. There were minor changes to some of the figures to make them easier to read.

Dimensions and other relevant specifications given in this standard have been coordinated with the American National Standard Requirements for Watthour Meters Sockets, ANSI C12.7- 2005.

The Secretariat of the Accredited Standards Committee on Electricity Metering, C12, is held by the National Electrical Manufacturers Association (NEMA) and the National Institute of Standards and Technology. At the time the committee approved this standard, the C12 Committee had the following members:

Tom Nelson, Chairman

Paul Orr, Secretary

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Ameren Services	James West
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The following members of the 12.1 committee were actively involved in the revision of this standard:

Scott Weikel, Chairman
Paul Orr, Secretary

L. Barto
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J. DeMars
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A. Rashid
W. Rose
D. Scott
A. Snyder
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In addition the following comprised the Editorial Committee for the current revision of C12.1
D. Ellis
D. Nordell
S. Weikel

For Physical Aspects of Watthour Meters

1 Scope

This standard covers the physical aspects of both detachable and bottom-connected watthour meters and associated registers. These include ratings, internal wiring arrangements, pertinent dimensions, markings, and other general specifications. Refer to the latest version of ANSI C12.1 and ANSI C12.20 for performance requirements.

2 References

The following publications shall be used in conjunction with this standard. Use the latest published version of the document if no year is specified:

ANSI C12.1, *American National Standard for Electric Meters*

ANSI MH10.8.1- 2000, *Linear Bar Code and Two Dimensional Symbols Used in Shipping, Receiving, and Transport Applications*

The Handbook for Electricity Metering, 10th edition 2002, The Edison Electric Institute

3 Standards applicable to watthour meters

3.1 Mounting

Mounting arrangements shall be either detachable (socket or type "S") or bottom-connected (type "A").

3.2 Voltage and frequency

The typical voltage and frequency ratings are 120, 240, 277, or 480 V and 60 Hz.

3.3 Current classes and test amperes (TA)

The normal current classes and test amperes shall be as listed in Table 1:

Table 1 – Current classes and test amperes

Current Class	Test Amperes
2	0.25 A
10	2.5 A
20	2.5 A
100	15 A
200	30 A
320	50 A

Note: Current classes 200 and 320 in "S" type only.

Other values of test amperes may be used.

3.4 Typical form designations

The form designations for watthour meters are listed in Table 2 and Table 2A:

Table 2 – Typical form designations (socket type)

Form Designation	Elements	Current Circuits	External Circuit Wires	See Figure
1S	One	One	Two	10
2S	One	Two	Three	10
3S	One	One	Two	10
4S	One	Two	Three	10
5S	Two	Two	Three	11
6S	Two	Three	Four Wye	11
7S	Two	Three	Four Wye	11
8S	Two	Three	Four Delta	11
9S	Three	Three	Four	11
10S	Three	Three	Four	11
11S	Three	Three	Four Delta	11
12S	Two	Two	Three	11A
13S	Two	Two	Three	11A
14S	Two	Three	Four Wye	11A
15S	Two	Three	Four Delta	11A
16S	Three	Three	Four	11A
17S	Three	Three	Four Delta	11A
24S	Two	Three	Four Delta	11
25S	Two	Two	Three	11A
26S	Two	Two	Three	11
28S	Two	Four	Four	12A
29S	Two	Three	Four Wye	11
32S	Two	Two	Three	11A
35S	Two	Two	Three	11
36S	Two	Three	Four Wye	11
39S	Three	Four	Four	11
45S	Two	Two	Three	11
46S	Two	Three	Four Wye	11
56S	Two	Two	Three	11
66S	Two	Two	Three	11
76S	Two	Four	Four Wye	11

Table 2A – Typical form designations (bottom fed)

Form Designation	Elements	Current Circuits	External Circuit Wires	See Figure
1A	One	One	Two	16
2A	One	Two	Three	16
3A	One	One	Two	16
4A	One	Two	Three	16
5A	Two	Two	Three	17
6A	Two	Three	Four Wye	17
8A	Two	Three	Four Delta	17
9A	Three	Three	Four	17
10A	Three	Three	Four	17
11A	Three	Three	Four Delta	17
13A	Two	Two	Three	18
14A	Two	Three	Four Wye	18
15A	Two	Three	Four Delta	18
16A	Three	Three	Four	18
17A	Three	Three	Four Delta	18
18A	Two	Four	Five	18
29A	Two	Three	Four Wye	17
35A	Two	Two	Three	17
36A	Two	Three	Four Wye	17
45A	Two	Two	Three	17
46A	Two	Three	Four Wye	17
48A	Three	Three	Four	17

3.5 Rotor (electromechanical meters only, see Figure 2)

3.5.1 Direction of Rotation

Viewed from the top, the direction of the rotor's rotation shall be counter clockwise.

3.5.2 Provisions for Testing

Meters shall provide the following means for testing:

3.5.2.1 Radial Markings

Two rings of radial markings shall be placed on the top outer surface of the rotor disk. The outer ring shall have 100 equally spaced marks, and the inner ring shall have 180 equally spaced marks.

3.5.2.2 Index Markings

Index markings shall be provided on the rotor disk.

3.5.2.3 Holes

1) For single-stator watthour meters, two holes 180° apart and equidistant from the center of the rotor disk shall be provided.
2) For multi-stator meters, one or two holes shall be provided. When two holes are used, they shall be as described in subclause 3.5.2.3(1).

3.6 Calibration Adjustments (electromechanical meters only)

3.6.1 Means required for making calibration adjustments shall be readily accessible.

3.6.2 The direction of control of light load and full load adjustments shall be marked with "F" for fast and "S" for slow.

3.6.3 All calibration adjustments shall be loaded to prevent change in meter adjustment during normal handling or vibration.

3.7 Meter Nameplate

The nameplate shall contain the following information:

1. Form designation(s) or circuit description
2. Watthour meter or other description
3. Manufacturer's name or trademark
4. Manufacturer's serial number
5. Manufacturer's type
6. Current class
7. Rated voltage
8. Number of wires
9. Frequency
10. Test amperes
11. Watthour meter constant
12. Watthour meter test constant (where applicable)

Transformer rated meters shall contain space for the following additional information:

1) Multiply By
2) Current transformer ratio (e.g., 200:5)
3) Voltage transformer ratio (e.g., 20:1)

3.7.1 Permissible abbreviations

FM	=	Form designation(s)
CL	=	Current class
V	=	Rated voltage
W	=	Wires
Hz	=	Hertz
TA	=	Test amperes

Kh	=	Watthour meter constant
PKh	=	Primary watthour meter constant
CTR	=	Current transformer ratio
VTR	=	Voltage transformer ratio
Kt	=	Watthour meter test constant
Mult. By	=	Multiply By
CA	=	Accuracy Class

Note: Accuracy class and Primary watthour meter constant are optional

3.7.2 Marking

Items 6 through 8 in subclause 3.7 should preferably be placed in a row, in the order listed. Such row may run from left to right at the top of the nameplate or from top to bottom at the left side of the nameplate. On self-contained meter nameplates, the figures in these items shall be at least 0.100 inch high.

On the nameplates for transformer rated meters, the space allowed for marking of primary ratings shall be adequate for numerals of at least 0.125 inch high and shall be a sufficient width for the highest current and voltage ratings in normal use.

The manufacturer's serial number shall be bold faced and shall be at least 0.187 inches high.

3.7.3 Location of Nameplate

The nameplate shall be readily readable from the front of the meter.

3.7.4 Material

Nameplates shall be made of durable material that will remain legible when exposed to sunlight.

3.7.5 Space for Utility Data or Company (utility) Number

3.7.5.1 Space for Company Number

Slots for holding a 2.50 -2.75 in long and a 0.500 in wide company number badge may be provided. This same space can be used for utility data specified in subclause 3.7.5.2.

3.7.5.2 Space for Utility Data

A space on the nameplate shall be provided for bar coded information as specified below. Specifications for bar coding are provided in ANSI MH10.8.1-2000 (2).

3.7.5.3 Barcoding Specifications

3.7.5.3.1 The bar code shall be Bar Code 39 using the 43 character ASCII set, printed 9.4 characters per in.

3.7.5.3.2 There shall be three lines in the bar code in the following order:

1) Line 1 (top line): free text, specified in the buyer's purchase order (e.g., utility name)
2) Line 2 (middle line): Bar Code 39
3) Line 3 (bottom line): bar code interpretation line

3.7.5.3.3 The height dimensions of the three lines should be as follows:

1) Line 1: 0.090 to 0.140 in
2) Line 2: 0.187 to 0.250 in
3) Line 3: 0.070 to 0.100 in

The minimum spacing between lines should be 0.020 in. The sum of the three line heights, plus the spaces between the text, should not exceed 0.600 in.

3.7.5.3.4 There shall be 19 characters composed of 17 characters and two start/stop asterisks, plus a quiet zone (0.200 in minimum) at the beginning and at the end of the characters.

3.7.5.3.5 The format of the characters shall be as follows:

@ 1 2 3	@ 4 5 6 7 8 9 10 11 12	@ 13 14 15 16 17 @
user	@ serial number	@ user
specified	@ (manufacturer serial	@ specified
	@ number or utility	@
	@ number)	@

Positions 1-3 are user specified, positions 4-12 are for manufacturer serial number or utility meter number, and positions 13-17 are user specified.

3.8 Displays

All displays on the meter that are essential for billing purposes shall be readable from the front of the meter.

A register constant, when required, shall be preceded by "Multiply By" or "Mult. By." This wording may be contained on a removable plate that shall provide a minimum space of 0.5 x 0.185 in for insertion of a multiplier.

3.8.1 Pointer Type Register

3.8.1.1 A pointer type register shall divide each dial into ten equal parts, the division marks being numbered from zero to nine, starting at the top. The gearing between the dial pointers shall be such that the relative movements of adjacent dial pointers are in opposite directions and in a 10:1 ratio.

3.8.1.2 The fastest moving dial pointer shall turn clockwise and shall be to the right when viewed from the front.

3.8.1.3 The finish of the register dial face shall be non-gloss white, aluminum, or the equivalent.

3.8.1.4 The dial circle printing, etching, or equivalent, and the dial pointers shall be black.

3.8.1.5 The dial centers shall lie on a horizontal straight line or on the arc of a circle whose chord is a horizontal straight line.

3.8.1.6 The minimum diameter of the dial circle shall be 0.5 in. for four and five dial registers.

3.8.1.7 The register ratio shall be clearly marked in numbers no less than 0.125 in high and shall be visible from the front of the meter without removing the cover.

3.8.1.8 The word "kilowatt hours," or the abbreviation "kWh" or "KWHR," shall appear immediately above or below the dial circles on the front of the register.

3.8.1.9 Registers for current classes below and including class 20 meters shall be provided with four or five dials. Registers may be of such ratio that the required register constant will be equal to the ratio of the current transformers, or to the product of the ratios of the current and voltage transformers, to which the meter is connected.

3.8.2 Drum Type Cyclometer Register

3.8.2.1 Cyclometer registers shall be provided with four or five indicating drums.

3.8.2.2 Each drum shall be divided into 10 parts with divisions of zero through nine. The gearing between indicating drums shall produce relative motion between adjacent indicating drums of 10 to 1.

3.8.2.3 The fastest moving indicating drum shall be to the right.

3.8.2.4 The indicating drums shall feature high contrast numerals, such as white-on-black. The centers of the numerals as presented for reading, shall be on a horizontal line. The minimum height of a numeral on the indicating drums shall be 0.200 in.

3.8.2.5 The finish of the register dial plate shall be non-gloss white, aluminum, or equivalent non-reflecting surface.

3.8.2.6 The register ratio shall be clearly marked in numbers no less than 0.125 in high and shall be visible from the front.

3.8.2.7 The word "kilowatt hours," or the abbreviation "kWh" or "KWHR," shall appear immediately above or below the indicating wheel numerals.

3.8.2.8 The registers shall be direct reading or of a ratio corresponding to the product of direct reading and the transformer ratios employed.

3.8.3 Solid State Type

3.8.3.1 Size of Digits

The digits for visual reading of measured quantities shall be no less than 0.195 in. high.

3.8.3.2 Number of Digits

A minimum of five digits shall be provided to display the measured quantities. The decimal point in the displayed demand quantities shall be programmable for up to three decimal places.

3.8.3.3 Code Indication

If a digital display is used to display several different quantities, a code shall be used to identify each quantity displayed. Annunciators with appropriate legends shall serve as an acceptable "code."

The code characters shall be in addition to the number of display digits in subclause 3.8.3.2.

3.8.3.4 Display Time of Measured Quantities

Display time of measured quantities may be programmable.

3.8.3.5 Display Modes

Registers are recommended to have a minimum of three display modes: normal, alternate, and test.

3.8.3.6 Indicator for Time of Use Period

Time of use registers should have a means to indicate the active time of use period.

3.9 Requirements for Solid-State Registers

3.9.1 Switch Points

The starting and ending switch points of a time of use period shall be capable of being set to within 60 minutes of each other.

3.9.2 Demand Interval (non-thermal)

Typical demand intervals are 5, 15, 30, or 60 min.

3.9.3 Power Outage

Program and data shall be maintained during a power outage.

3.9.3.1 Power Outage Carryover (when applicable)

Registers shall maintain time during a power outage for a minimum of 24 hrs, over a temperature range of –30°C to +70°C, and shall return to normal operating mode when power is restored.

3.9.4 Optical Communication Interface

The dimensions for the optical communication interface probe or coupler, exclusive of remote reading devices, shall be Type 2 (see ANSI C12.18 or **Figure 1**).

3.9.5 Security

Security shall be provided to prevent unauthorized access to programmable registers.

3.9.6 Register Nameplate Information

The register nameplates shall contain the following information:

1) Manufacturer
2) Serial number
3) Type or style number designation
4) Space for insertion of utility information

Note: Where the register is included as an integral part or parts of a meter assembly and is not wholly detachable, the information in subclause 3.9.6 shall be included on the meter nameplate.

3.9.7 Auxiliary Switching Outputs

Auxiliary switching outputs, when provided, may include the following functions:

1) Customer alerts
2) Load control
3) Pulse initiator
4) End of demand interval indicator
5) Demand threshold alert

4 Requirements Applicable to Detachable Watthour Meters

4.1 Dimensions

Dimensions to assure mounting and connecting interchangeability are shown in Figures 3 through 9.

4.2 Hanger

A hanging device shall be provided on the back of the base.

4.3 Sealing

Meters shall be provided with facilities for sealing the cover to the base, the demand reset lever, and the battery access port (when applicable). The hole in a meter base for the cover-seal shall not exceed 0.131 inch in diameter or the rectangular equivalent.

4.4 Connections

4.4.1 The internal connections shall be as indicated in Figures 10, 11, 11A, 12, and 12A.

For external connections, refer to reference (3), *Handbook for Electricity Metering* (the socket jaw position identification is shown in Figure 13).

4.4.2 When pulse initiator contact terminals are provided, they shall be located and may be identified as shown in Figures 11, 11A, and 12A. K and Z shall be used for two-wire contacts; K (common), Y, and Z shall be used for three-wire contacts.

5 Requirements Applicable to Bottom-Connected Meters

5.1 Dimensions

Dimensions to assure mounting and connecting interchangeability are shown in Figures 14 and 15.

5.2 Hanger

A hanging device shall be provided on the back of the base.

5.3 Sealing

5.3.1 Meters shall be provided with facilities for sealing as shown in Figures 14 and 15.

5.3.2 The meter cover shall be provided with separate sealing facilities to seal the cover to the base, the demand reset lever, and battery access port (when applicable).

5.3.3 The terminal cover seal shall seal both the terminal cover and the meter cover.

5.4 Connections

5.4.1 The terminal arrangement and internal connections shall be as indicated in Figures 16 through 18. For external connections, refer to reference (3), *The Handbook for Electricity Metering*.

5.4.2 When pulse initiator contact terminals are provided, they shall be located and may be identified as shown in Figures 17 and 18. K and Z shall be used for two-wire contacts; K (common), Y, and Z shall be used for three-wire contacts.

5.5 Terminal Blocks

Terminal blocks shall be of arc-resistant material.

5.6 Terminals

5.6.1 Current Terminals

The current terminals shall accommodate the following wire sizes:

1) Self-contained meters: from 14 to 2 AWG, inclusive
2) Transformer-rated meters: from 14 to 4 AWG, inclusive

5.6.2 Voltage Terminals

1) The voltage terminals of single-element meters shall accommodate wire sizes from 14 to 10 AWG, inclusive.
2) The voltage terminals of multi-element meters shall accommodate wire sizes from 14 to 6 AWG, inclusive.

5.6.2.1 Grounding Terminal

Grounding the exposed metal base of the meter shall be possible by one of the following methods:

1) A #10-32 tapped hole shall be provided on the front, lower right corner of the base (see **Figure 15** for the location). A #10-32 binding or washer head screw shall be provided in the tapped hole.
2) As an option, an untapped 3/16 in. hole entering the base from the right side and intersecting with the tapped hole may be provided.
3) Grounding terminal not required for non-conductive bases.

6 Procedure for Assigning Form Designations

The form designation system denotes the circuit arrangement to which the meter is applicable, with due consideration given to the variations in terminal arrangement and wiring. The purpose is to provide a system of meter nomenclature that will assist in the selection and installation of equivalent meters, independent of the make of the meter and of successive types of the same manufacturer.

Each form designation corresponds to an internal connection diagram in this publication and in The Handbook for Electricity Metering, reference [3], and is recorded at the National Electrical Manufacturers Association (NEMA). The suffix "A" or "S" in the form designation refers to bottom-connected or detachable meters, respectively.

Though the form designation relates to the wiring and terminal arrangement, it does not change with current or voltage ratings, the number of voltage disconnects used, or the addition of auxiliaries—such as demand indicators, detents, voltage indicators, pulse sending devices—and the like. Test link(s) can be included or not on any form that shows links without a change in the form number.

When a new variety of meter should be assigned a new form designation, a request for the assignment designation is filed with the Secretary of the Technical Committee of the NEMA Electricity Equipment Section, NEMA Headquarters, 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209. The Secretary of the NEMA Technical Committee shall assign the form designation, and advise the Accredited Standards Committee, C12. Upon counsel of this committee, the assigned new designation shall be considered approved.

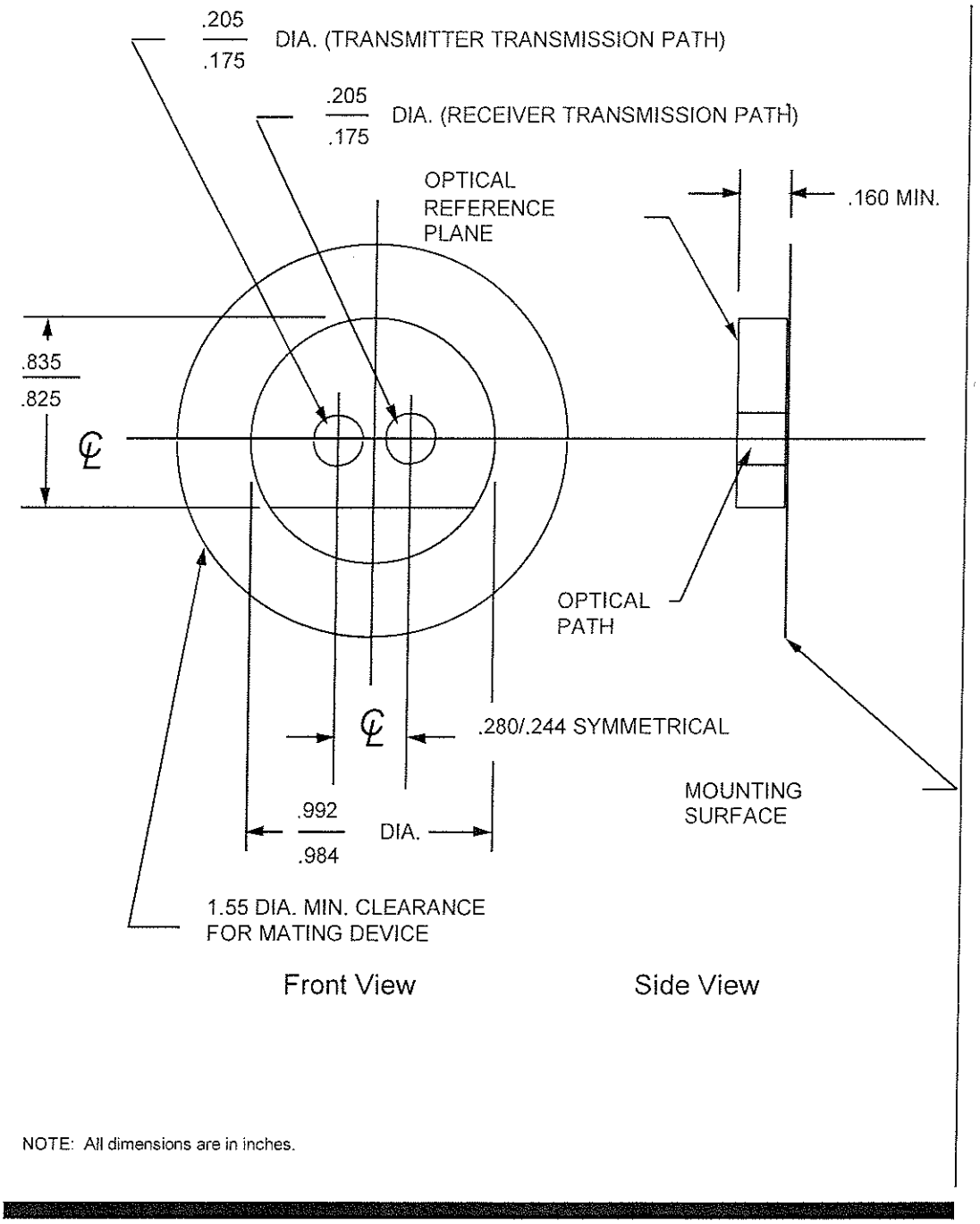


Figure 1 – External view of ANSI type 2 optical port

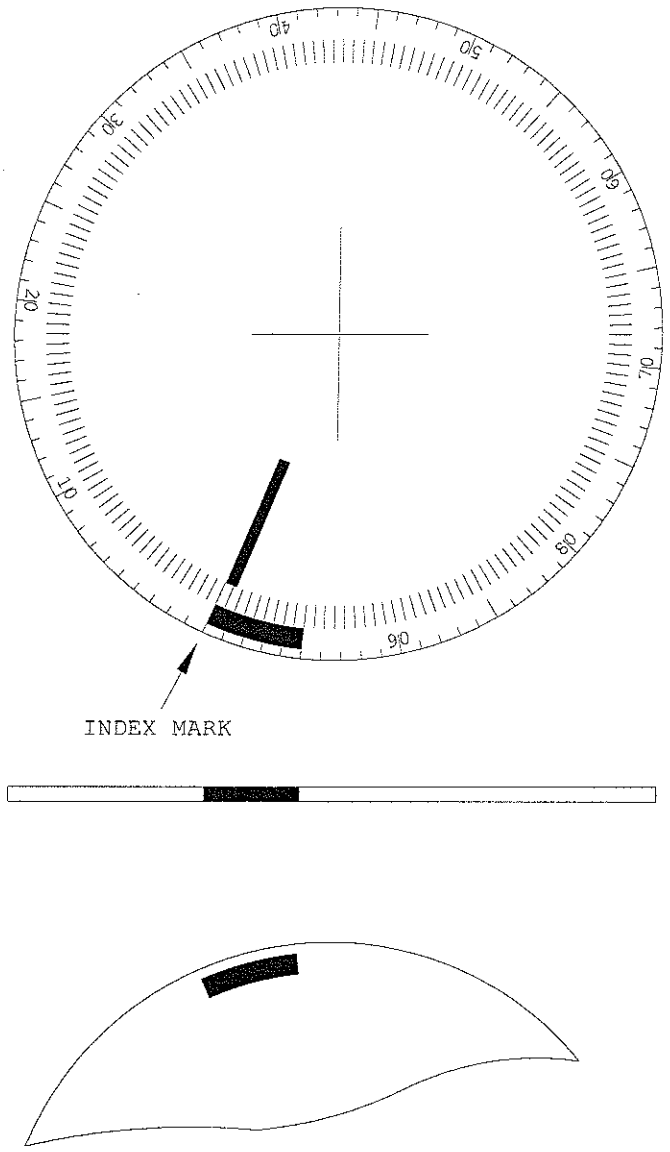


Figure 2 – Markings for watthour meter rotors

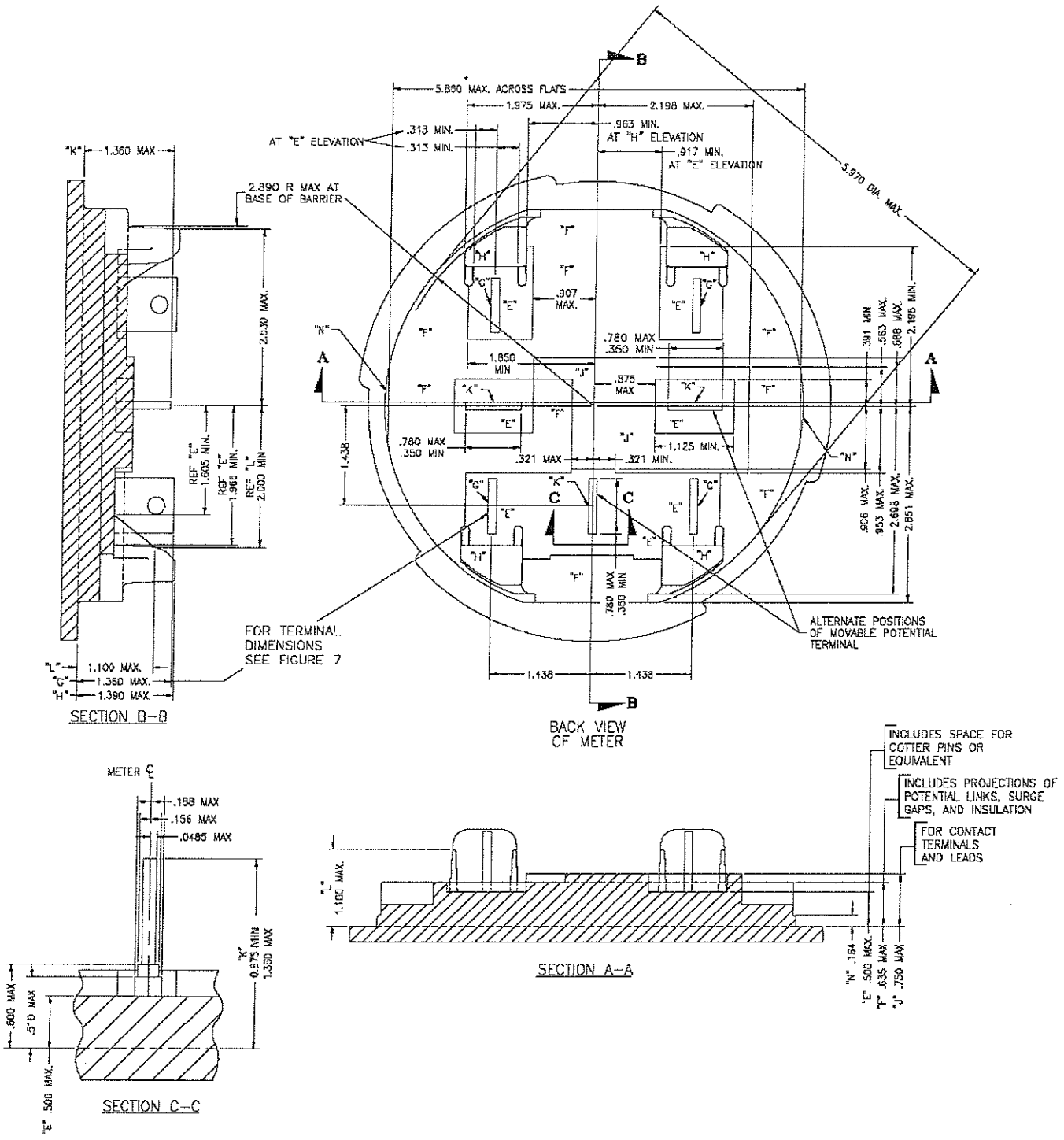


Figure 3 – Envelope of surfaces that project into socket for 4- to 6- terminal meters

Note 1: All dimensions are in inches. Unless otherwise specified, tolerances shall be ±0.016 inch on single dimensions and ±0.031 inch on cumulative dimensions.
Note 2: Symmetry should be assumed on dimensions from centerlines unless otherwise specified.
Note 3: For 5-terminal meters for use in 7-terminal socket, see **Figure 4**.

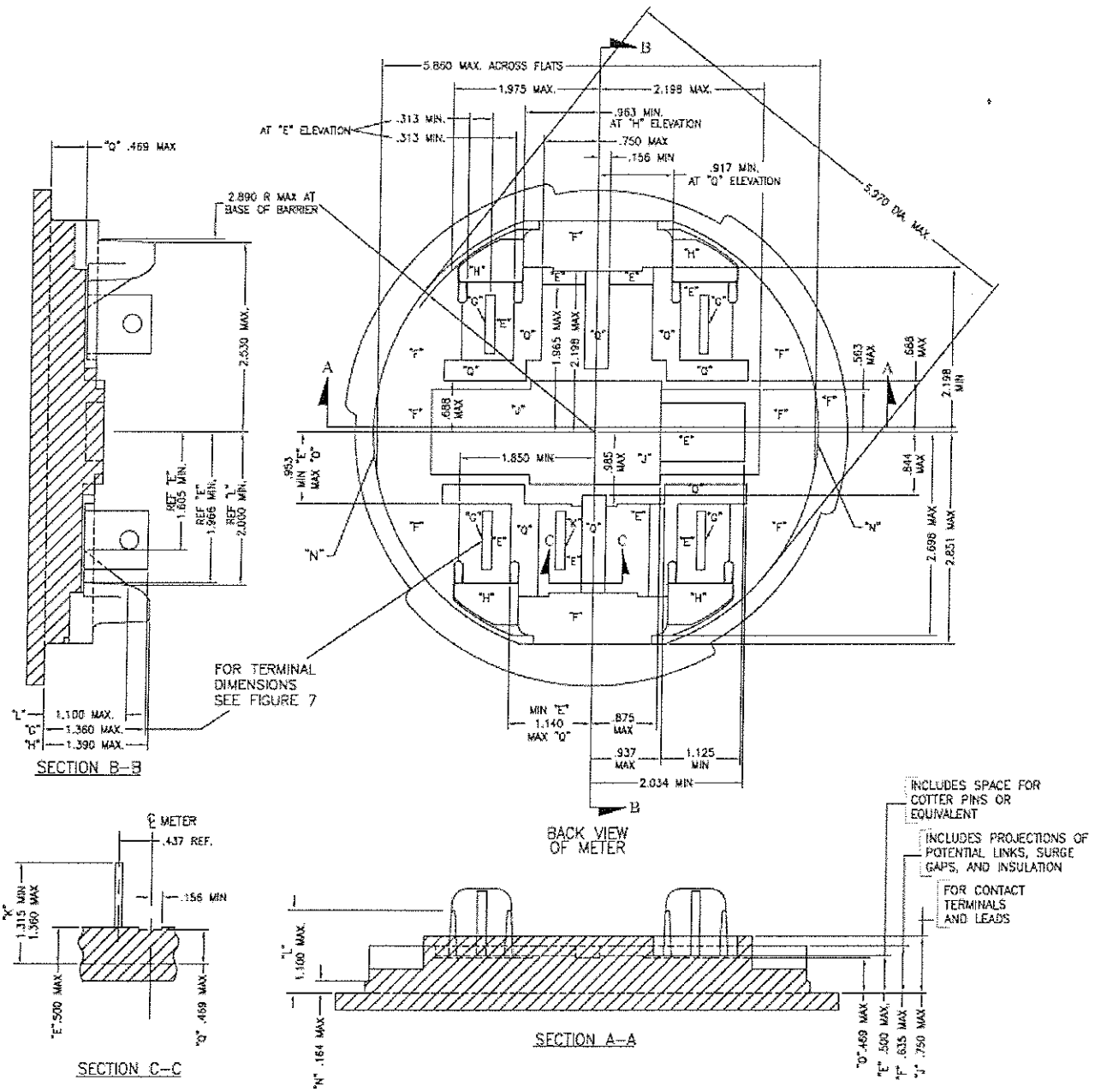


Figure 4 – Envelope of surfaces that project into socket for 5-terminal meters in 7-terminal sockets

Note 1: All dimensions are in inches. Unless otherwise specified, tolerances shall be ±0.016 inch on single dimensions and ±0.031 inch on cumulative dimensions.
Note 2: Symmetry should be assumed on dimensions from centerlines unless otherwise specified.

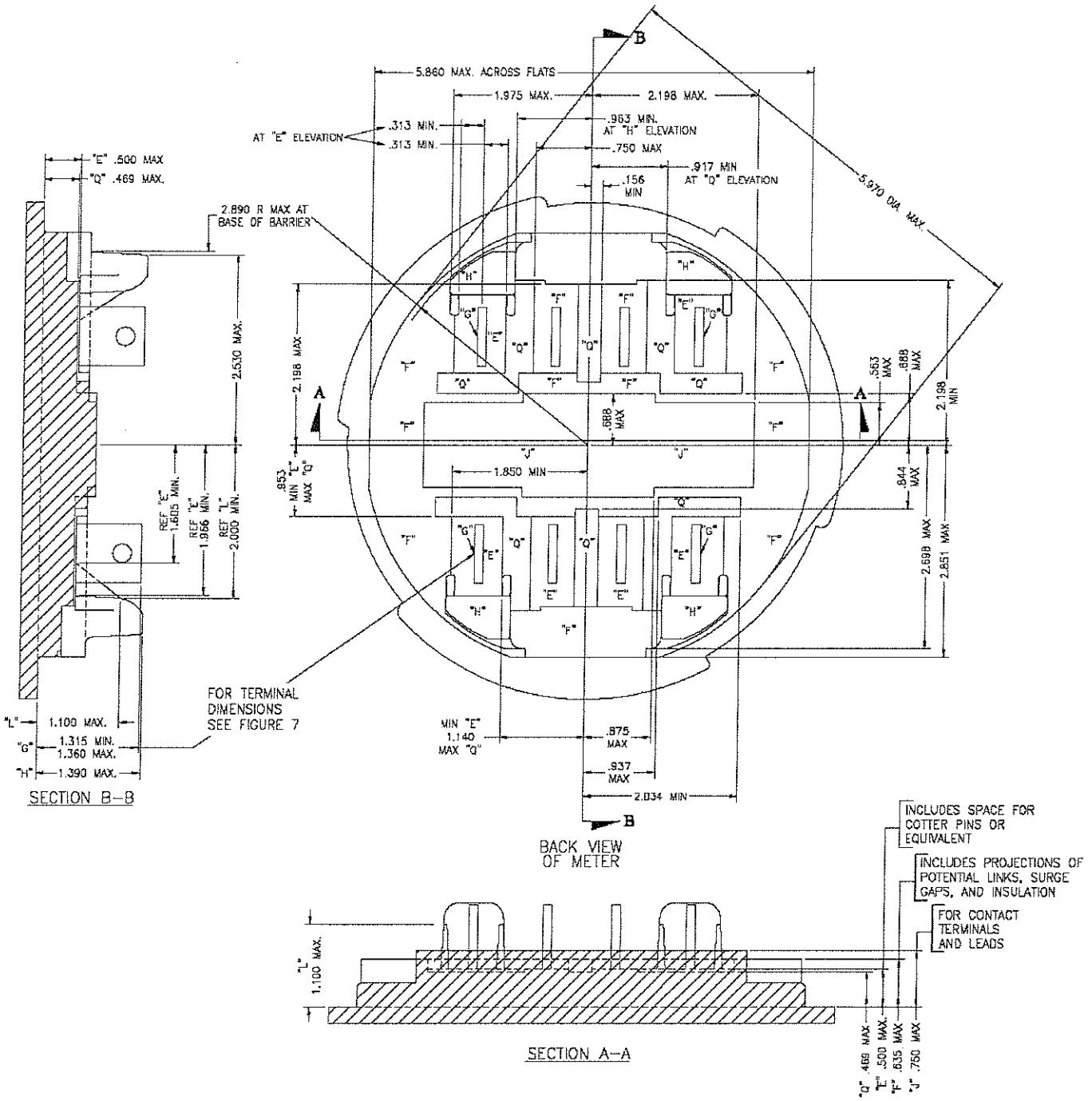


Figure 5 – Envelope of surfaces that project into socket for 7-terminal and 8-terminal meters

Note 1: All dimensions are in inches. . Unless otherwise specified, tolerances shall be ±0.016 inch on single dimensions and ±0.031 inch on cumulative dimensions.
Note 2: Symmetry should be assumed on dimensions from centerlines unless otherwise specified.

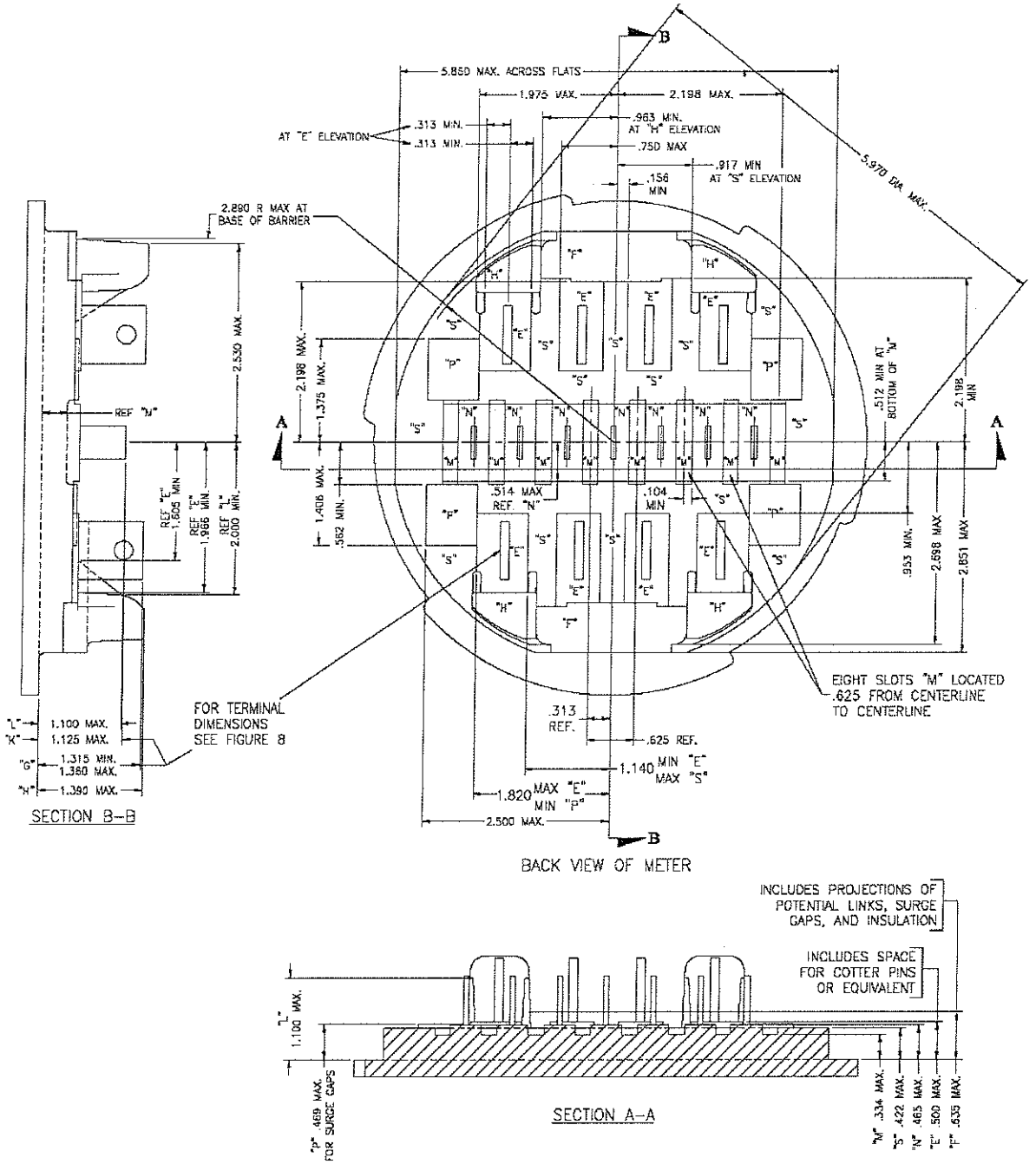


Figure 6 – Envelope of surfaces that project into socket for 8-terminal and 13- to 15-terminal meters

Note 1: All dimensions are in inches. . Unless otherwise specified, tolerances shall be ±0.016 inch on single dimensions and ±0.031 inch on cumulative dimensions.
Note 2: Symmetry should be assumed on dimensions from centerlines unless otherwise specified.

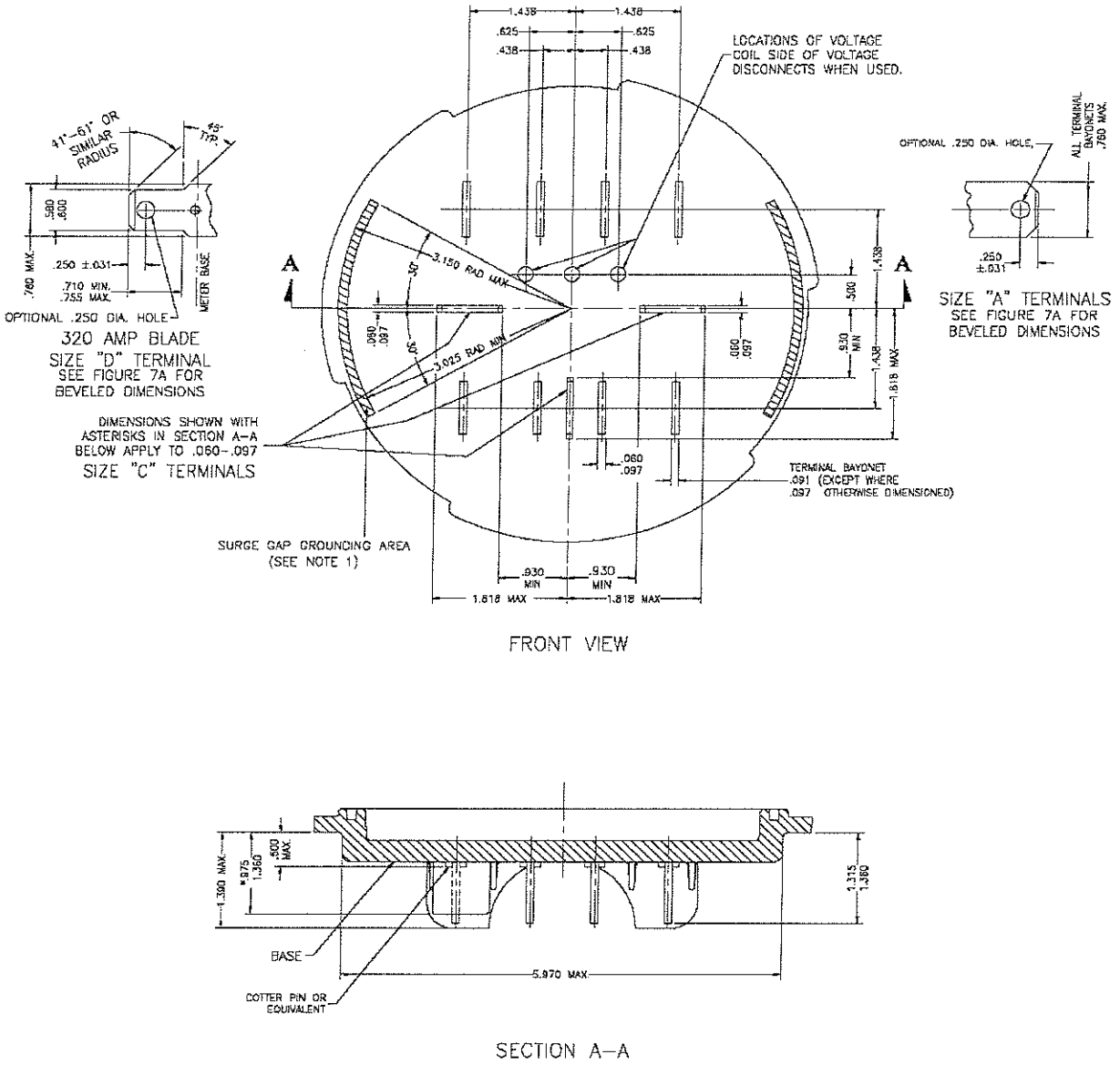


Figure 7 – Mounting and terminal dimensions for detachable single element and multi-element watthour meters with 4- to 8-terminals

Note 1: Grounding straps of surge gaps shall fall within the angle shown and be of sufficient length to provide contact surfaces from the minimum to the maximum radii. (Grounding means in the socket shall extend over the full angle shown and be located anywhere between the radii units).
Note 2: All dimensions are in inches. . Unless otherwise specified, tolerances shall be ±0.016 inch on single dimensions and ±0.031 inch on cumulative dimensions.
Note 3: Symmetry should be assumed on dimensions from centerlines unless otherwise specified.
Note 4: Refer to **Figure 13** for terminal sizes and placement.
Note 5: Dimensions for size D terminals are suggested.

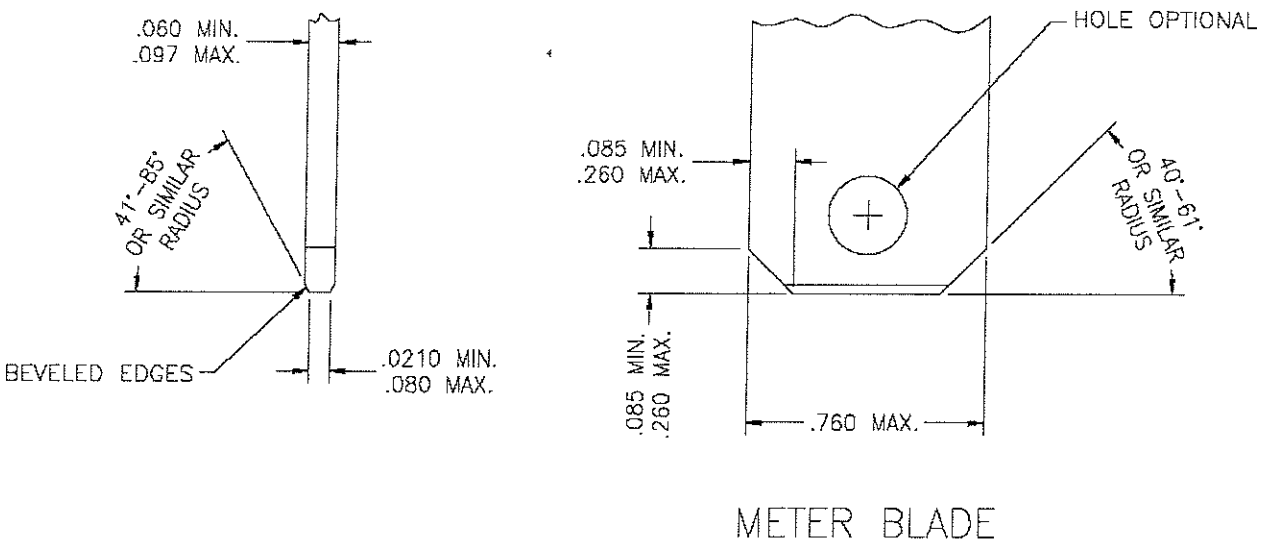
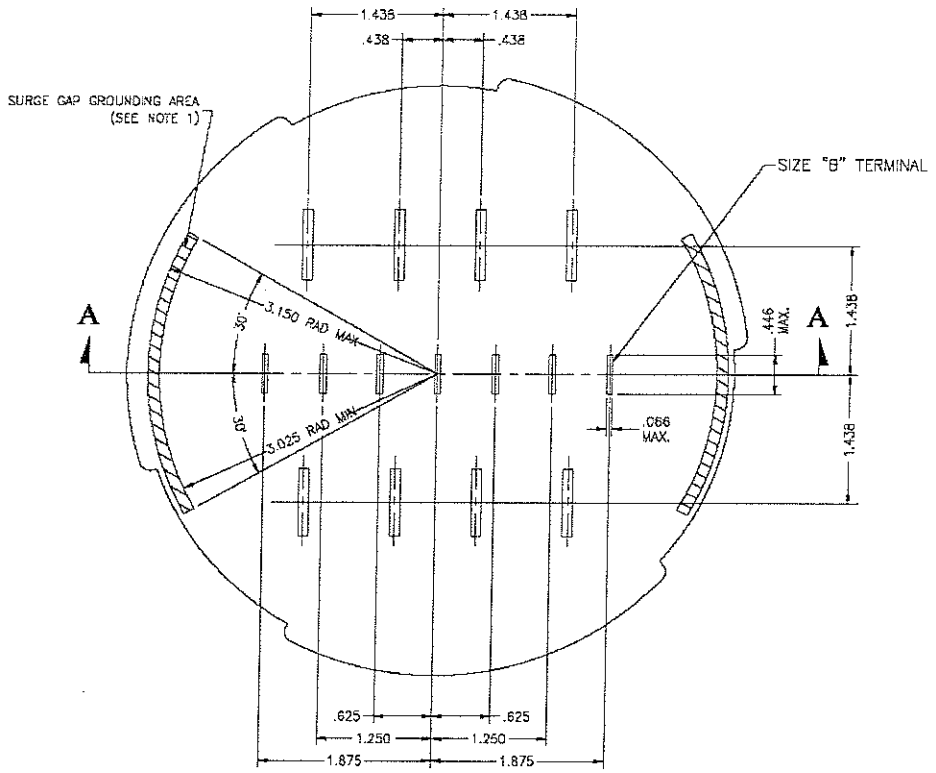
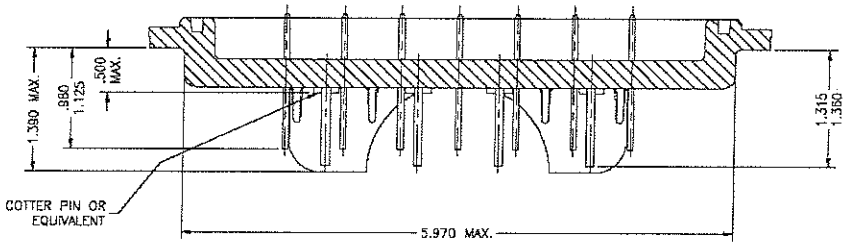


Figure 7A – Suggested dimensions for bevels for terminal blades



FRONT VIEW



SECTION A–A

Figure 8 – Mounting and terminal dimensions for detachable multi-element watthour meters with 8-terminals and 13- to 15-terminals

Note: 1. Grounding straps of surge gaps shall fall within the angle shown and be of sufficient length to provide contact surfaces from the minimum to the maximum radii. (Grounding means in the socket shall extend over the full angle shown and be located anywhere between the radii units).
Note 2: All dimensions are in inches. . Unless otherwise specified, tolerances shall be ±0.016 inch on single dimensions and ±0.031 inch on cumulative dimensions.
Note 3: Symmetry should be assumed on dimensions from centerlines unless otherwise specified.
Note 4: Refer to figure 13 for terminal sizes and placement.

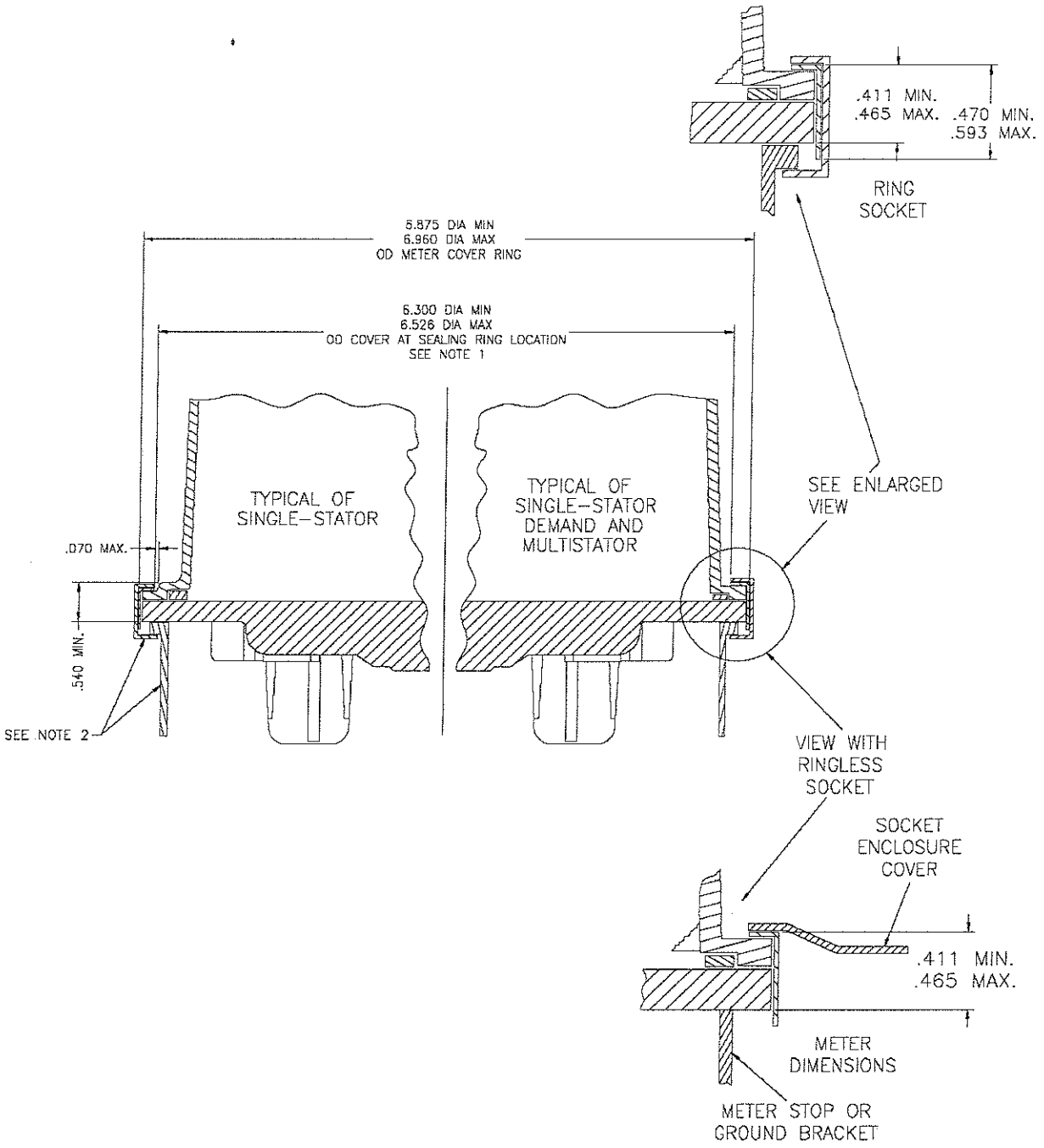


Figure 9 – Envelope of round covers for detachable single element and multi-element watthour meters

Note 1: Prior to 1965 some meter covers had a minimum OD as low as 6.087 inches.
Note 2: For socket and sealing ring dimensions refer to ANSI C12.7.
Note 3: All dimensions are in inches.

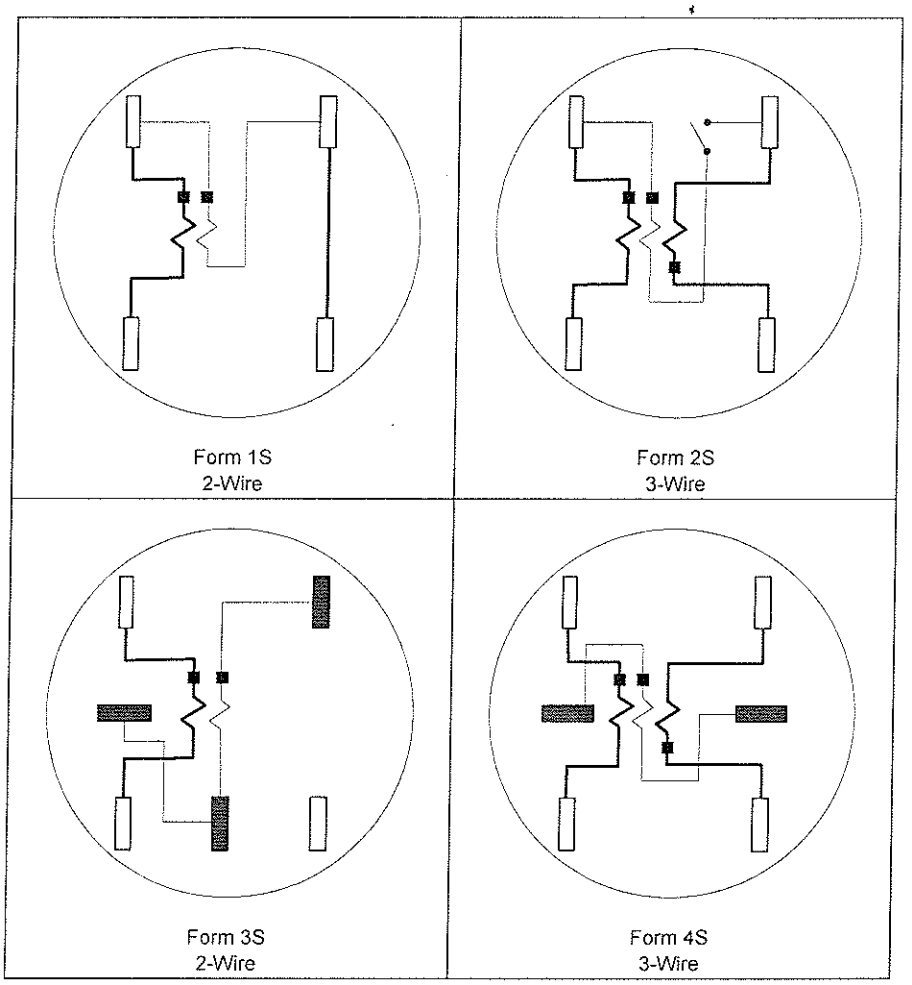


Figure 10 – Internal connections for detachable single element watthour meters (front views)

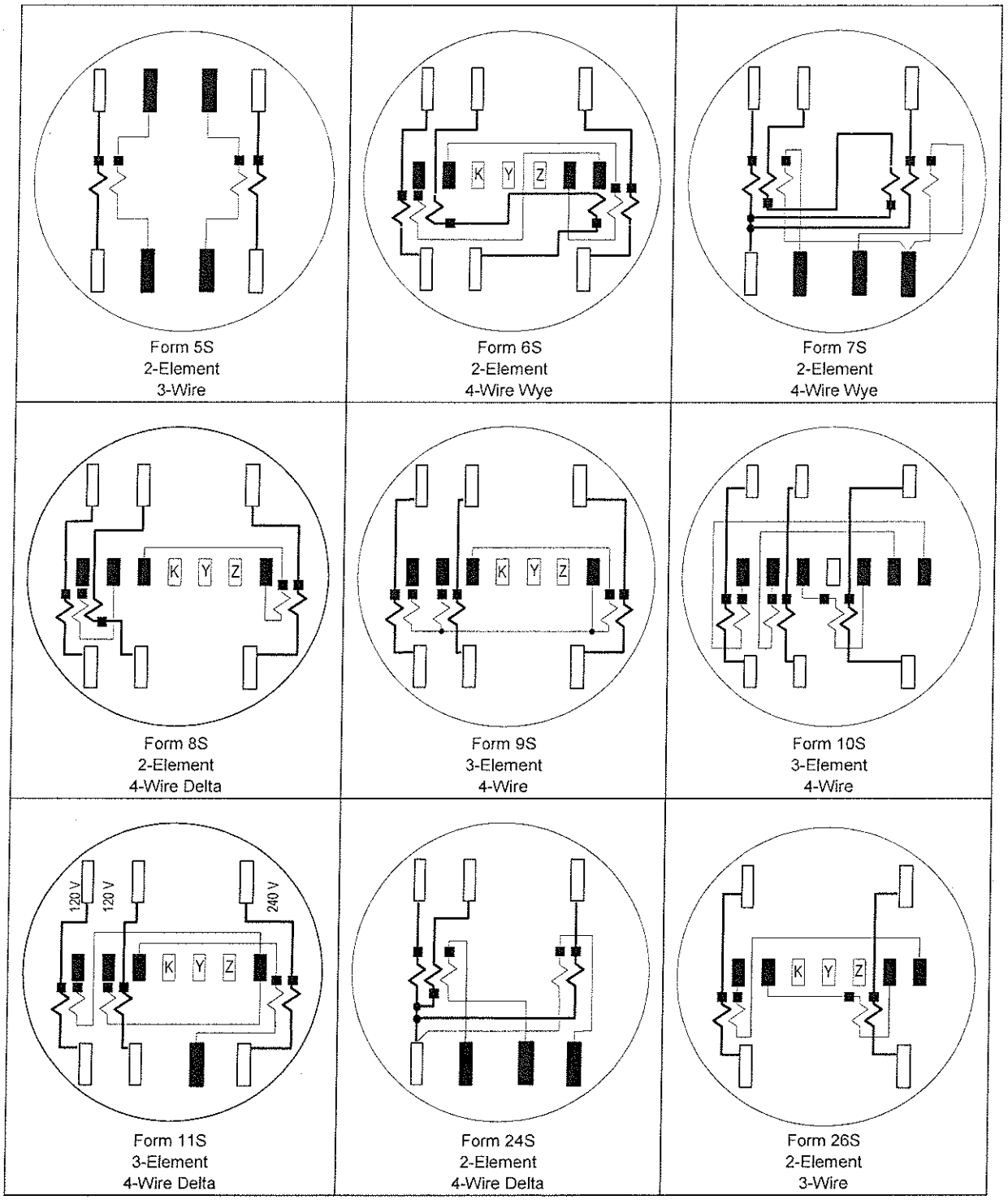


Figure 11 – Internal connections for transformer rated detachable multi-element watthour meters (front views)

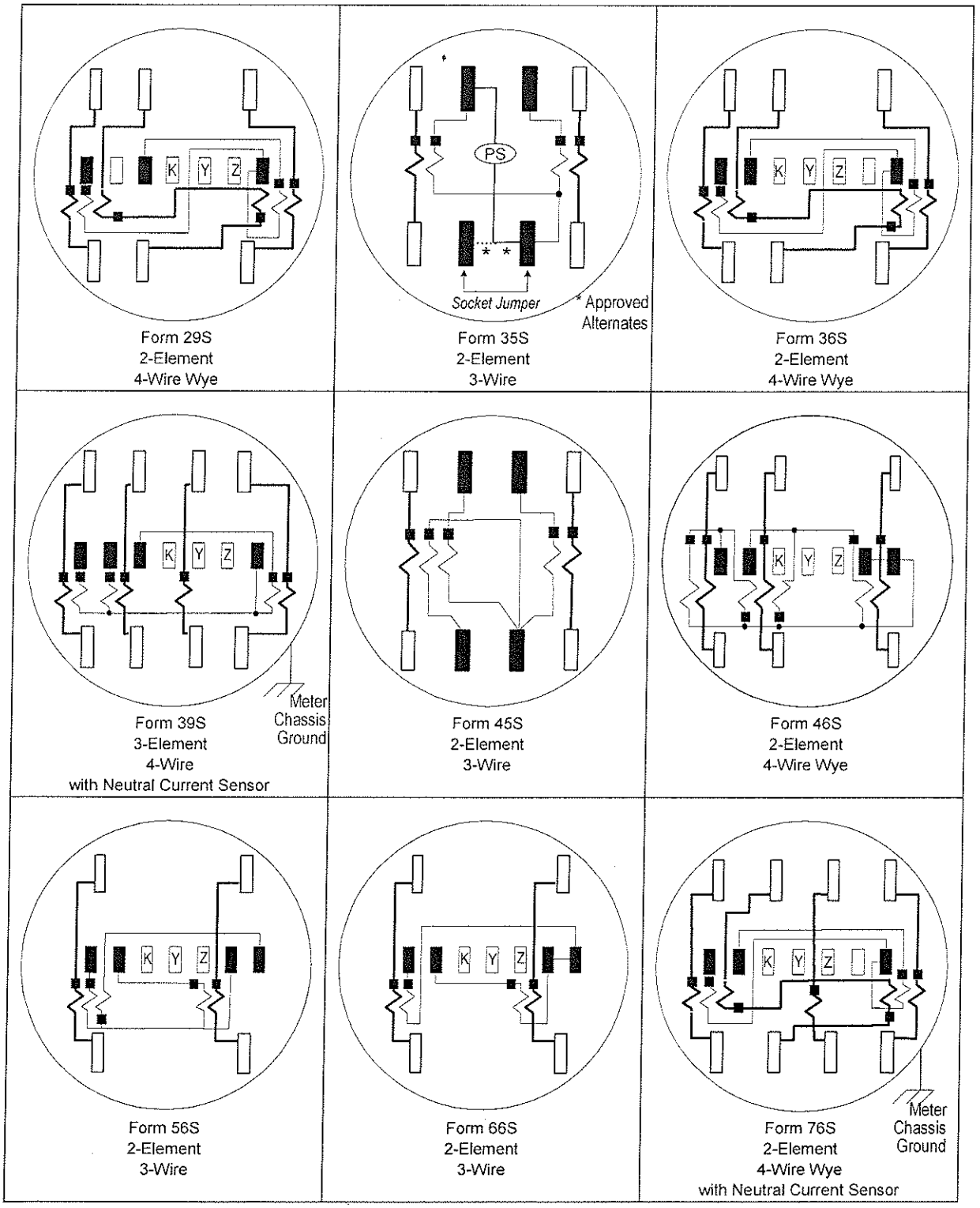


Figure 11A - Internal connections for transformer rated detachable multi-element watthour meters (front views)

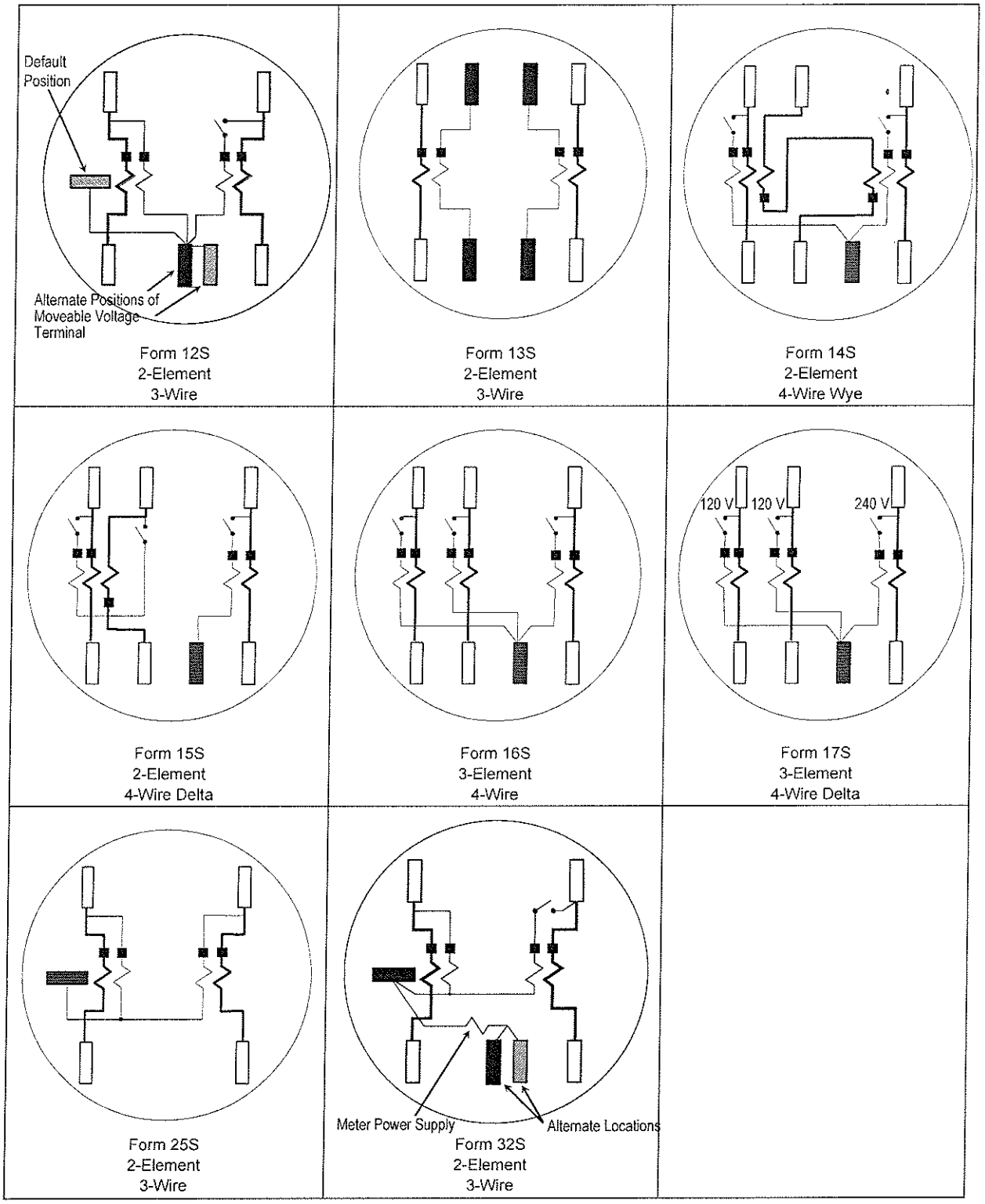
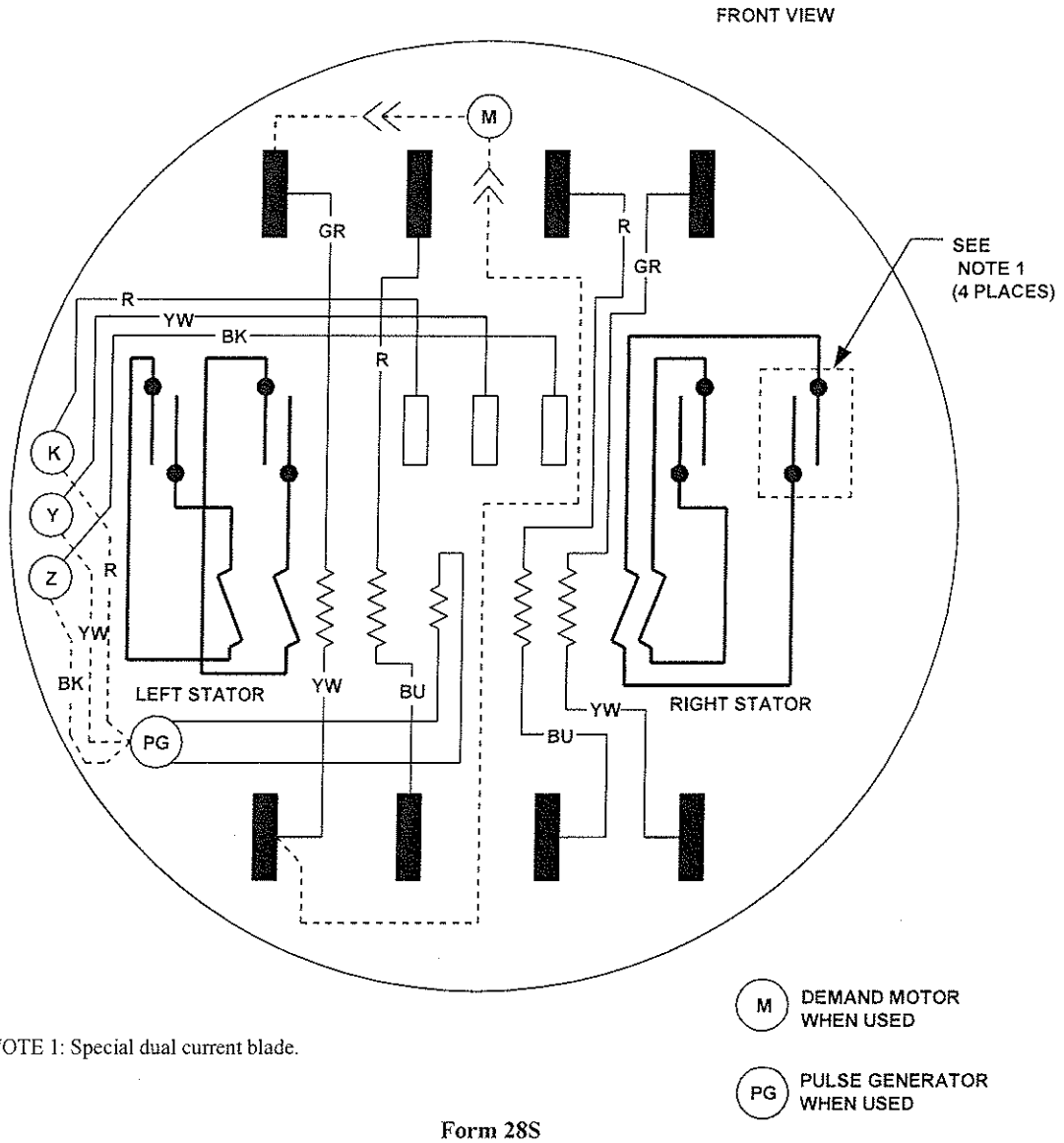


Figure 12 – Internal connections for self-contained detachable multi-element watthour meters (front views)



NOTE 1: Special dual current blade.

Form 28S

Figure 12A – 2-element, 4-wire (universal) form 28S

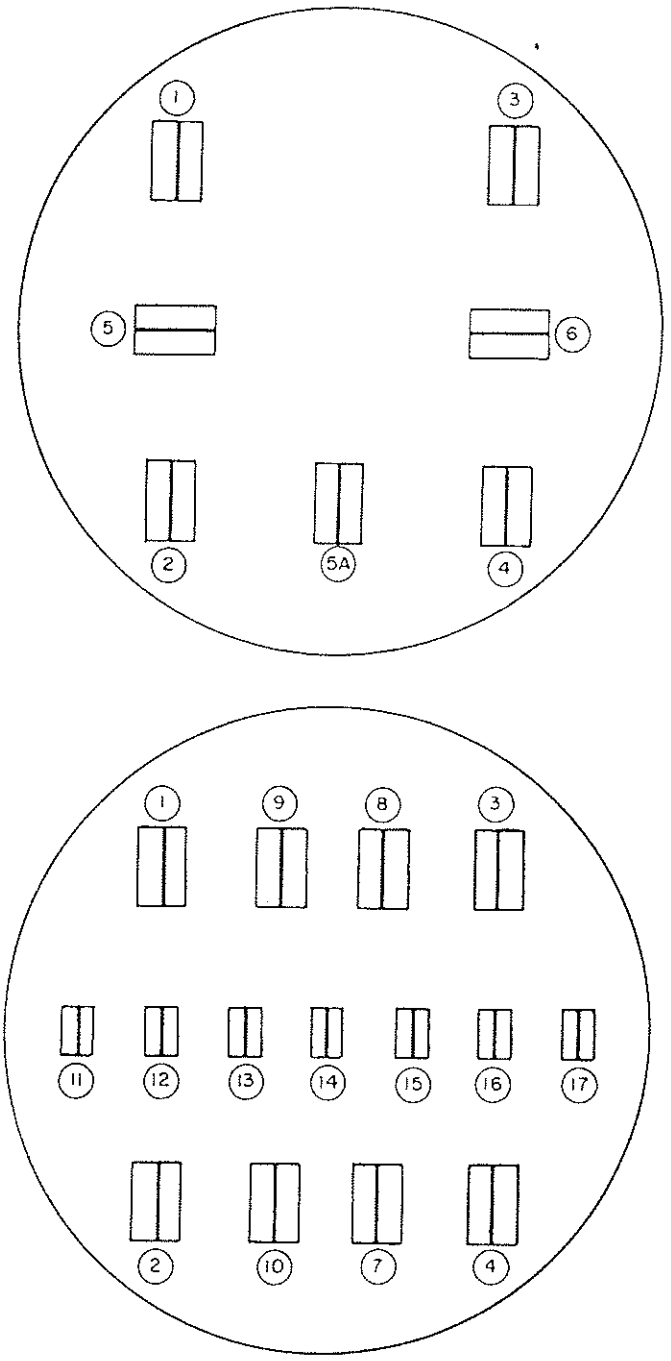


Figure 13 – Socket jaw position identification (front view of socket)

Notes:

1. Positions 1, 2, 3, 4, 7, 8, 9, and 10 use size "A" terminals as shown in **Figure 7**. (see also note 4)
2. Positions 11-17 use size "B" terminals as shown in **Figure 8.**
3. Positions 5, 5A, and 6 use size "C" terminals as shown in **Figure 7.**
4. Optionally position 3 uses a size "D" terminal for 320A applications.
5. Position 7 can optionally use a size "C" terminal when it is used for a potential connection.

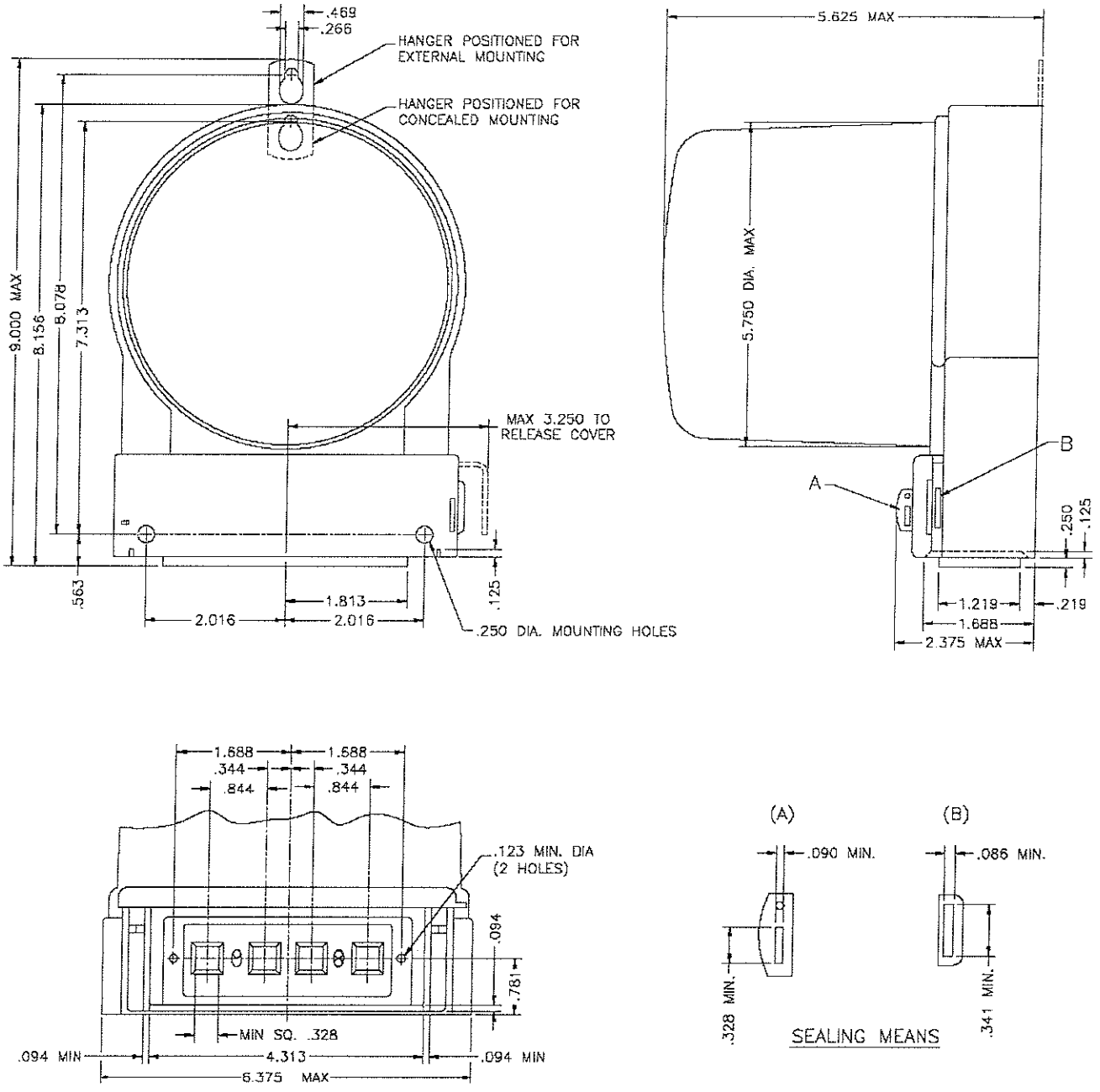


Figure 14 – Outline and terminal dimensions for bottom-connected single element watthour meters

Note 1: All dimensions are in inches.
Note 2: Unless otherwise specified, tolerances shall be ± .016 inch on single dimensions and ± .031 inch on cumulative dimensions.

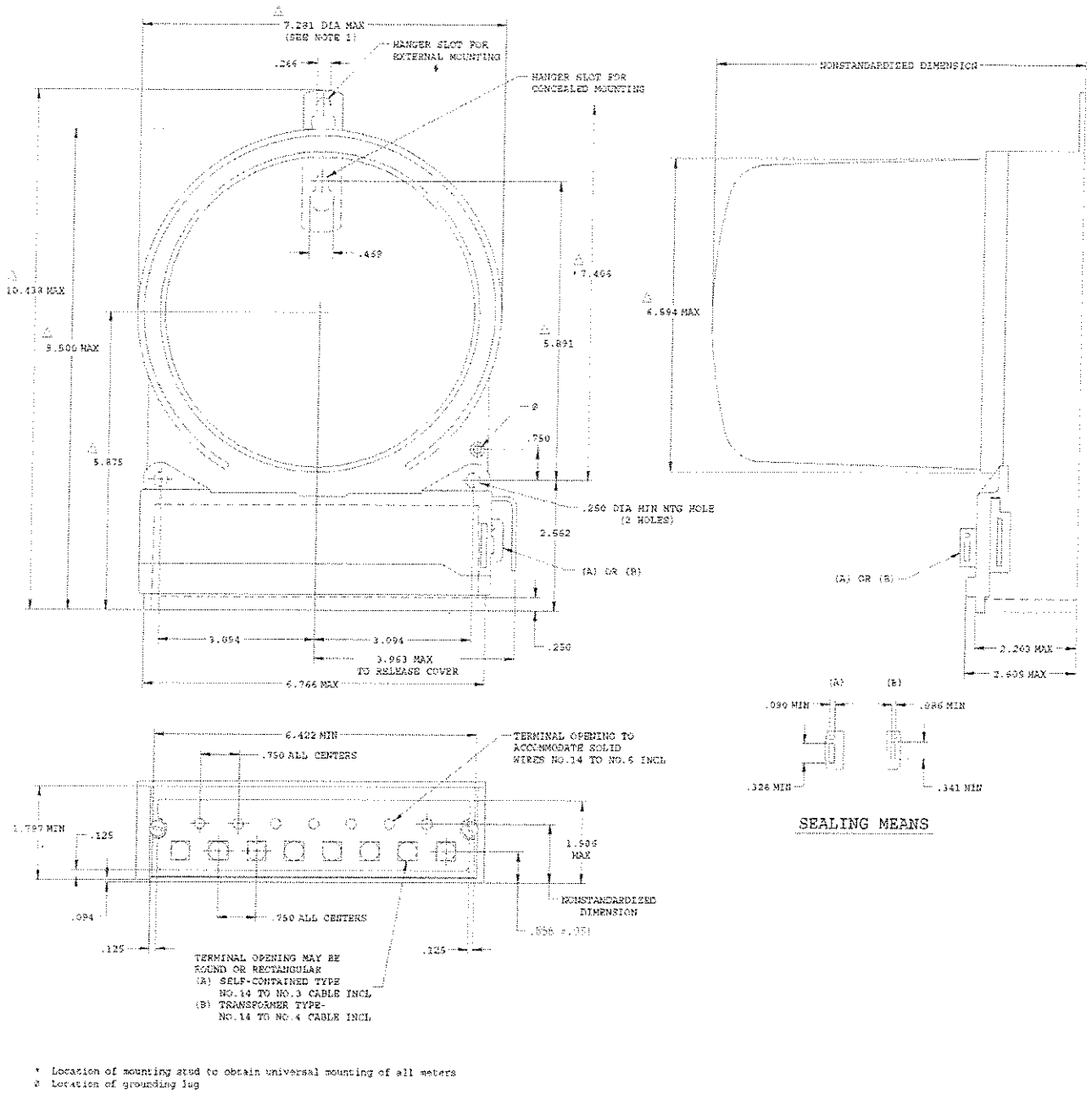


Figure 15 – Outline and mounting dimensions for bottom-connected multi-element watthour meters

Note 1: Dimensions marked △ apply only to 2-stator meters. These dimensions are not standardized for meters having more than two stators.
Note 2: All dimensions are in inches.
Note 3: Unless otherwise specified, tolerances shall be .016 of an inch on single dimensions and .031 of an inch on cumulative dimensions.

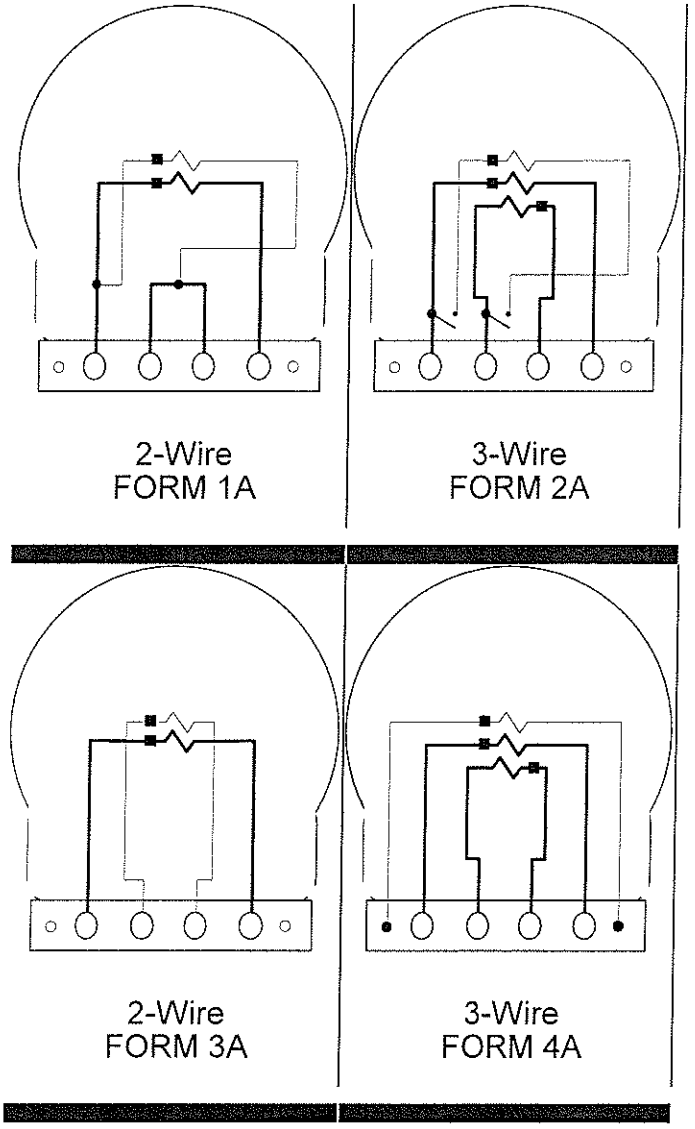


Figure 16 – Internal connections for bottom-connected single element watthour meters (front views)

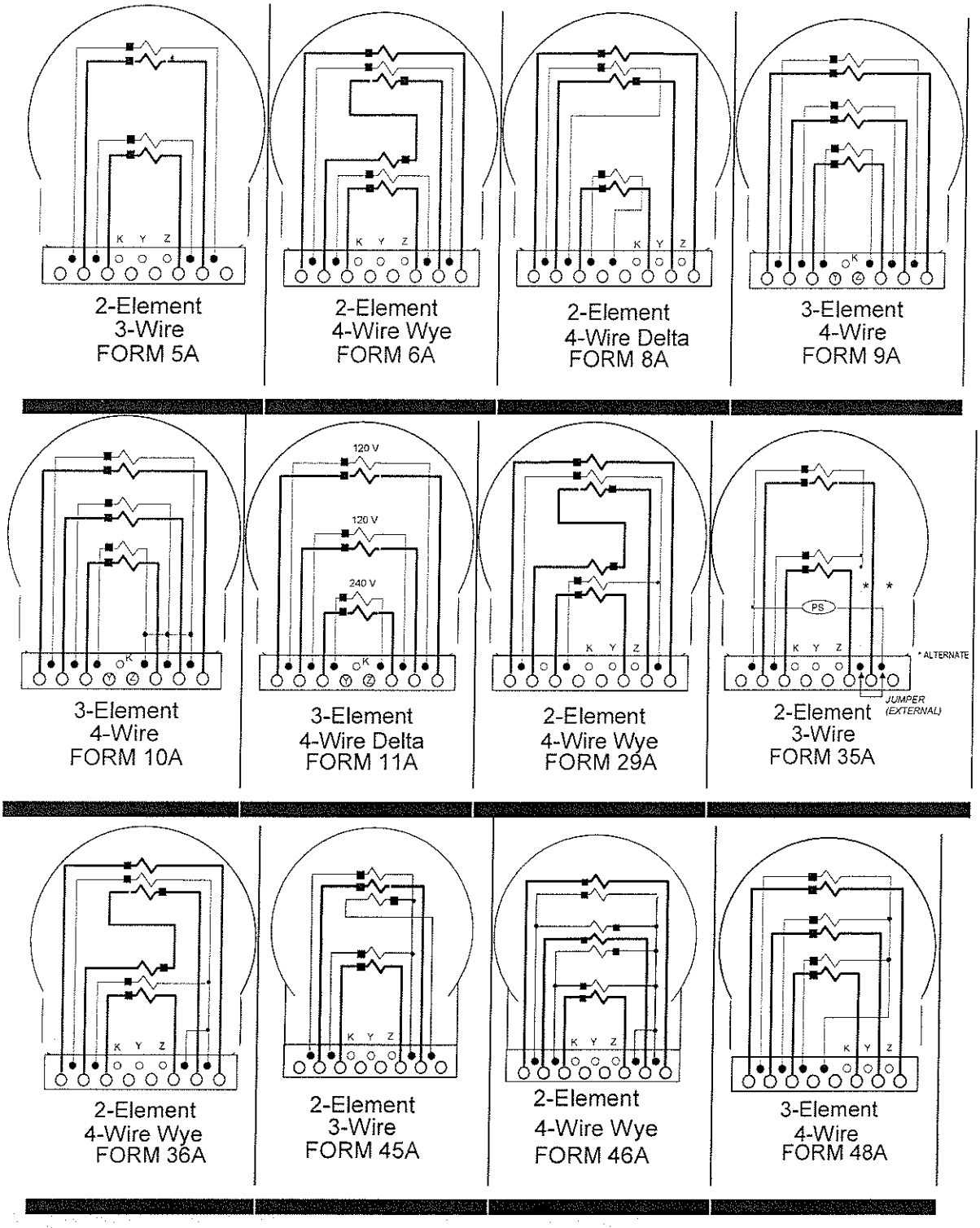


Figure 17 – Internal connections for transformers rated bottom-connected multi-element watthour meters (front views)

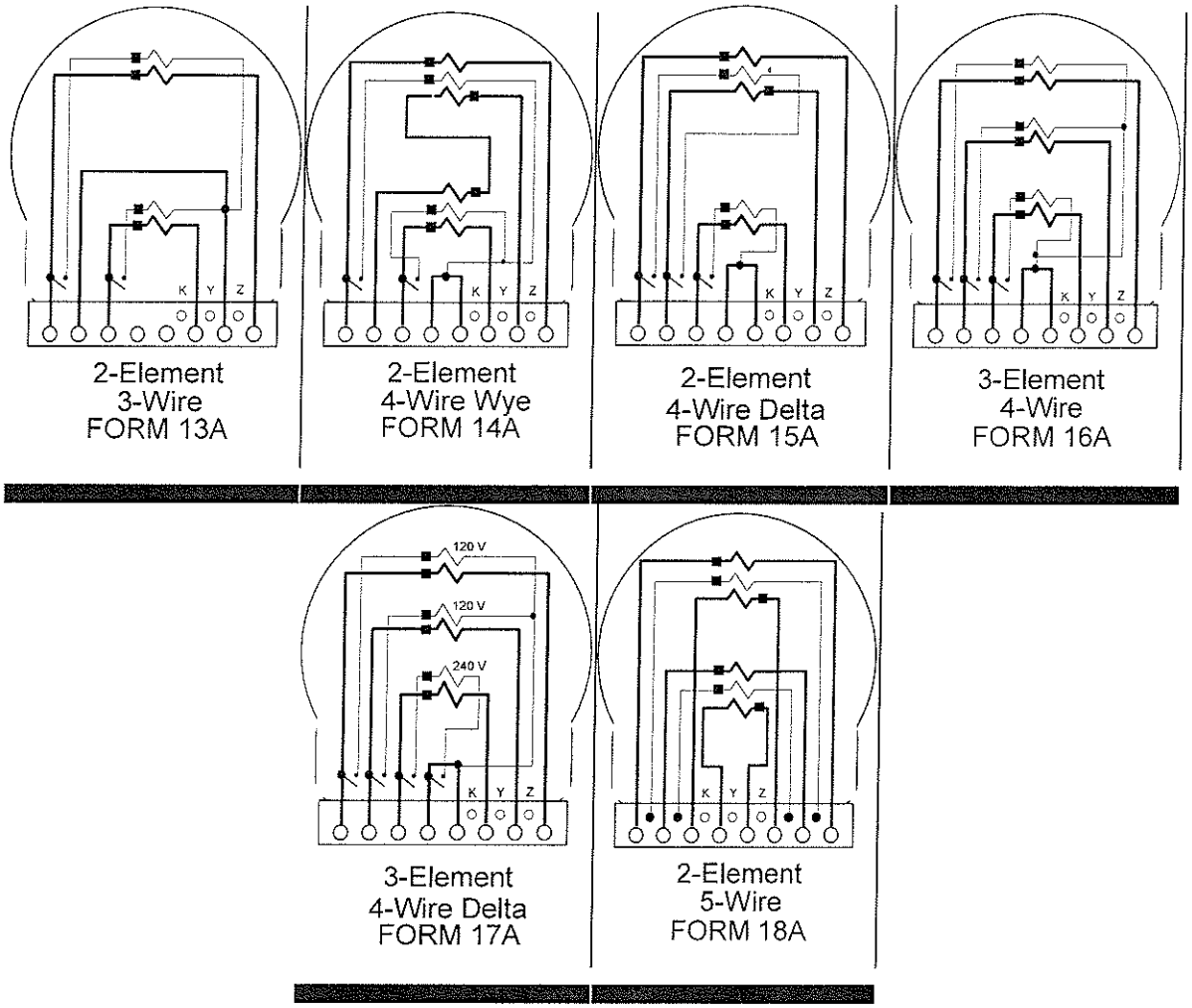


Figure 18 – Internal connections for self-contained bottom-connected multi-element watthour meters (front views)

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Annex A
(informative)
Historical Background

A.1 Foreword to First Edition (1978)

Foreword

(This Foreword is not a part of the American National Standard for Watthour Meters, ANSI C12.10-1978)

This American National Standard provides recommended minimum requirements for both detachable and bottom-connected watthour meters.

Except that performance requirements are now part of the American National Standard Code for Electricity Meters, ANSI C12-1975, this standard is equivalent to and supersedes the requirements of the former AEIC-EEI-NEMA standards for Watthour Meters, EEI Pub. No. MSJ-10-1974, NEMA Pub. No. EI-20-1975. For convenience in using this standard, the performance requirements are included as an Appendix.

This standard and other former AEIC-EEI-NEMA standards on meters and meter devices were referred to the American National Standards Committee on Electricity Metering, C12, for approval and publication as an American National Standard.

Suggestions for improvement of this standard will be welcome. They should be sent to the American National Standards Institute, 1430 Broadway, New York, NY 10018.

This standard was processed and approved for submittal to ANSI by American National Standards Committee on Electricity Metering, C12. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. At the time it approved this standard, the C12 Committee had the following members:

R.S. Turgel, *Chairman*
A.M. Salazar, *Secretary*

Organization Represented:	*Name of Representative:*
American Public Power Association	B. V. Palk C. E. Ringold
Canadian Standards Association (Liaison)	J.M. Vanderleck D. L. Smith (Alt)
Electric Light and Power Group (The Association of Edison Illuminating Companies and the Edison Electric Institute)	D. B. Berry A. Fini C. F. Mueller T. J. Pearson A.M. Salazar (Alt)
Institute of Electrical and Electronics Engineers	E. F. Blair F. J. Levitsky
National Bureau of Standards	R. S. Turgel
National Electrical Manufacturers Association	J. Anderson C. R. Collinsworth T. C. Drew D. McAuliff D. F. Becker (Alt) J. M. Lynch (Alt) F. A. Marta (Alt)
Public Service Commissions	C. F. Riederer C. J. Six

	G. F. Walsh
Rural Electrification Administration	J. C. Arnold, Jr
Technical Advisor SC13A, U.S. National Committee of the International Electrotechnical Commission (IEC) (Liaison)	E. W. Schwarz
Underwriters Laboratories, Inc.	E. J Huber

The editorial subcommittee that prepared this standard had the following members:

F.J. Levitsky, Chairman (New England Electric System)
J. Anderson (General Electric Company)
J. H. Malloy, Jr. (Philadelphia Electric Company
C. F. Mueller (Public Service Electric and Gas Company)
R. S. Turgel (National Bureau of Standards)

A.2 Foreword from the Second Edition (1987)

Foreword

(This Foreword is not part of ANSI C12.10-1987, American National Standard for Watthour Meters)

This standard was developed by the Accredited Standards Committee on Electricity Metering, C12, for full consensus approval as an American National Standard and provides recommended minimum requirements for both detachable and bottom-connected watthour meters. This revised edition supersedes ANSI C12.10-1978. Suggestions for improving this standard are welcome. They should be sent to the American National Standards Institute, 1430 Broadway, New York, NY 10018.

The Technical contents of this standard were brought up-to-date, and the appendices that had been included in the 1978 edition were omitted. The appendixes were removed because they contained material reprinted from ANSI C12.1 and, therefore, did not conform with the ANSI/IEEE standards policy of avoiding duplication of similar material in more than one standard.

Dimensions and other relevant specifications given in this standard have been coordinated with the American National Standard Requirements for Watthour Meter Sockets, ANSI C12.7-1987.

At the time this standard was processed and approved, the Accredited Standards Committee on Electricity Metering, C12, had the following members:

R. S. Turgel, Chairman
F. Huber, Jr., Secretary

Organization Represented:	*Name of Representative:*
Institute of Electrical and Electronics Engineers	F. J. Levitsky
	R. Hopkins
National Bureau of Standards	R. S. Turgel
National Electrical Manufacturers Association	T. C. Drew
	L. Struchtemeyer
	D. D. Elmore
	R. M. Walden (Alt)
	F. A. Marta
	R. H. Stevens (Alt)
	J. C. Reich
	H. L. Friend
	J. A. Gauthier (Alt)
	W. J. Zisa (Alt)
Electric Light and Power Group	W. C. Busch
	D. B. Berry
	D. Dassman

	C. R. Jones
	R. M. Reesey
	D. E. Soffrin (Alt)
Public Service Commissions	C. J. Six
	G. F. Walsh
Rural Electrification	J. C. Arnold, Jr.
American Public Power Association	C. R. Gomez
	H. Carey Jones
Underwriters Laboratories, Inc.	W. Menuz
	J. W. Hogg (Alt)

The following subcommittees of the C12 were actively involved in the revision of this standard:

Subcommittee 4, Acceptance of New Types of Watthour Meters
D. Dassmann, Chairman

A. G. Aschenbeck, Jr.	D. D. Elmore	L. Harris
C. J. Cook	M. R. Hajny	L. Struchtemeyer
T. C. Drew	C. F. Walsh	

Subcommittee 10, Editorial
F. J. Levitsky, Chairman

D. Dassman	D. D. Elmore	D. Scott
R. S. Turgel		

A.3 Foreword to Third Edition (1997)

Foreword (This Foreword is not part of ANSI C12.10-1997)

This standard was developed by the Accredited Standards Committee on Electricity Metering, C12, for full consensus approval as an American National Standard and provides recommended minimum requirements for both detachable and bottom-connected watthour meters. This revised edition supersedes ANSI C12.10-1987.

Suggestions for improvement to this standard are welcome. They should be sent to:

National Electrical Manufacturers Association
Vice President of Engineering
1300 North 17th Street
Suite 1847
Rosslyn, VA 22209

The technical contents of this standard were brought up-to-date, all definitions in section two were moved to ANSI C12.1-1995, all specifications in ANSI C12.13, C12.15, and C12.16 were included in this edition, and all sections were modified and updated.

Dimensions and other relevant specifications given in this standard have been coordinated with the American National Standard Requirements for Watthour Meters Sockets, ANSI C12.7-1993.

At the time this standard was processed and approved, the Accredited Standards Committee on Electricity Metering, C12, had the following members:

Tom Drew, *Chairman*
Christopher Merther, *Secretary*

Organization Represented:	*Name of Representative:*
ABB Power T&D Company	Drew, T.

APTECH, Inc.	Beverly, W.
Arizona Public Service	Cook, B.
Arizona Public Service	Ensor, G.
AVO International	Williams, D.
Consumers Power	Blackmer, J.
Edison Electric Institute	Miller, G.
Florida Power & Light	McEvoy, J.
Florida Power & Light	Malemezian, E.
General Electric	Germer, W.
Georgia Power Company	McDonald, K.
Itron	Buckley, B.
Mississippi Power	Buckner, E.
NIST	Oldham, N.
Pacific Gas & Electric	Nguyen, D.Y.
Pacific Gas & Electric	Vahlstrom, T.
Pacificorp	Pananen, L.
Pacificorp	Smith, C.
Public Service Electric & Gas	Powers, G.
Siemens	Voisine, J.
Siemens PT&D	Jannelli, R.
Scientific Columbus	Martin, J.
Schlumberger	Purc, M.
Schlumberger	Stevens, R.
Tampa Electric	Malich, S.
TU Electric	Johnson, B.
TU Electric	Mining, J.
Watthour Electric Institute	Weimer, C.

This standard was developed by the Accredited Standards Committee on Electricity Metering, C12, for full consensus approval as an American National Standard and provides recommended minimum requirements for both detachable and bottom-connected watthour meters. This revised edition supersedes ANSI C12.10-1997.

Suggestions for improvement to this standard are welcome. They should be sent to:

National Electrical Manufacturers Association
Vice President of Engineering
1300 North 17th Street
Suite 1847
Rosslyn, VA 22209

A.4 Foreword to Fourth Edition (2004)

There were relatively few changes made to this edition to bring it up to date with modern practice and with new editions of other ANSI C12 standards. The title was modified to more accurately reflect the contents of this edition. The last of the performance specifications for solid state registers on electro-mechanical meters that were in section 6, have been moved to C12.1-2001 and thus this standard now contains physical specifications. To this edition Forms 39S and 76S were added, as was the reference to class 2 ampere meters. The drawing for figure 6 was corrected.

Dimensions and other relevant specifications given in this standard have been coordinated with the American National Standard Requirements for Watthour Meters Sockets, ANSI C12.7-1993. At the time the committee approved this standard, the C12 Committee had the following members:

Tom Nelson, Chairman
Carin Bernstiel, Secretary

Organization Represented:	*Name of Representative:*
American Public Power Association	C. Gomez
Edison Electrical Institute	L. Kotewa J. McEvoy J. Mining T. Morgan D. Y. Nguyen L. Pananen
Institute of Electrical and Electronics Engineers	H. Millican
Measurement Canada (Liaison No Vote)	V. Nguyen
National Electrical Manufacturers Association	M. Anderson E. Beroset C. Crittenden F. Marta S. Weikel
National Institute of Standards and Technology	T. Nelson
NARUC	J. Ruehl
Underwriters Laboratory	R. Breschini
Independent Members:	B. Hughes A. Moise A. Snyder

The members of Subcommittee ANSI C12.1 who contributed to the development of this standard are:

Organization Represented:	*Name of Representative:*
Arizona Public Service	B. Cook
Austin Energy	H. Millican
Baltimore Gas & Electric	J. Thurber
Central Hudson Gas & Electric Co	R. Lokys
City of L.A. Water & Power	C. Gomez
Duke Power Company	T. Morgan
Duke Power Company	W. Ray
Elster Electric Co	S. Weikel
Florida Power & Light	J. DeMars
Florida Power & Light	J. McEvoy
Ed Malemezian Consulting	E. Malemezian
General Electric	C. Crittenden
Invensys Metering Systems	N. Balko
Landis+Gyr	M. Anderson
NIST	T. Nelson
Pacific Gas & Electric	D. Y. Nguyen
Pacificorp	L. Pananen
Public Service Electric & Gas	D. Ellis
Radian Research	G. Mayfield
Schlumberger Electricity Inc	A. Snyder

Schweitzer Engineering Labs	B. Hughes
Watthour Engineering Co	C. Weimer

In addition, the following comprised the Editorial Committee for the current revision of C12.10:

D. Ellis
E. Malemezian
D. Y. Nguyen
A. Snyder
S. Weikel