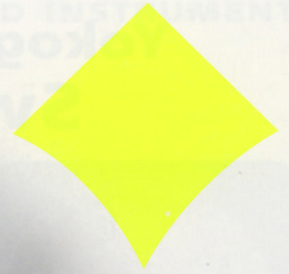


SWITCHBOARD INSTRUMENTS  
6W5901



YOKOGAWA

ACCURACY

RELIABILITY

PERFORMANCE

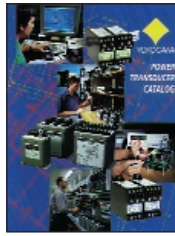
YOKOGAWA

SWITCHBOARD  
INSTRUMENTS



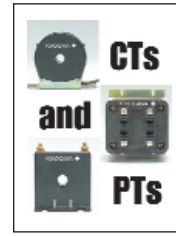
**ADDITIONAL YOKOGAWA PRODUCTS**

**POWER TRANSDUCERS**



Yokogawa Juxta Power Transducers are featured in this catalog. They are UL recognized and enclosed in a rugged metal case with either 0.2% or 0.5% accuracy. For complete information, including other models and ratings, request catalog BU-JAC-05E.

**CURRENT & POTENTIAL TRANSFORMERS**



Yokogawa CT's and PT's are also featured in this catalog and provide high accuracy inputs to our transformer-rated AC switchboard instruments and power transducers. Request bulletin 500CTPT-B for additional models and specifications.

**HYBRID ELECTRONIC METER**



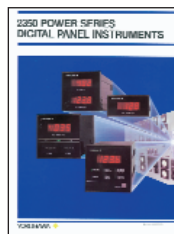
The 2302 hybrid electronic meter was designed for a variety of applications where both analog and digital display information is required. Available with either yellow or green bargraph and backlighting, or monochromatic LCD bargraph with backlighting. For information please request bulletin 2302-E.

**PANEL METERS**



Yokogawa has the broadest line of panel meters available today. In many cases, our panel meters are completely interchangeable with other manufacturer's products. UL and IP54 splash resistant models available. For more information, request catalog 250260PM-B.

**2350 POWER SERIES DIGITAL METERS**



The 2350 Series Digital Panel meters provide high accuracy readout of AC and DC inputs and are capable of re-transmitting analog signals to remote monitors, recorders and control systems. Available in 1/8 and 1/4 DIN case with single and multifunction capability. Request bulletin 2350PS-C for more information.

**PORTABLE TESTERS**



Catalog BU-INST-3E features digital multimeters and clamp-on testers, earth and ground resistance testers, thermometers, insulation testers, digital light meters and tachometers, decade resistance boxes, and wheatstone bridges.

To obtain additional catalogs or bulletins, please use the business reply card inserted in this catalog, or call 1-800-258-2552x575 for immediate assistance and technical support.

## SWITCHBOARD INSTRUMENT SELECTOR GUIDE

Model Type	AB/DB40	AB/DB40	AB/DB16	AB/DB17	AB/DB14	T/180	T/2180	T/2491
Case style	4¼" Metal	4¼" Plastic	8¼"	Illuminated	High-shock	6" Edgewise	Mini-swbd.	4¼" Digital
	See AB/DB general specifications below					See contents below		
Input rating								
AC Milliamperes	X	X	X	X†	X	X	X	N/A
AC Amperes	X	X	X	X†	X	X	X	X
AC Voltage	X	X	X	X†	X	X	X	X
DC Microamperes	X	X	X	N/A	X	X	X	N/A
DC Milliamperes	X	X	X	X	X	X	X	N/A
DC Amperes	X	X	X	X	X	X	X	N/A
DC Millivolts	X	X	X	X	X	X	X	N/A
DC Voltage	X	X	X	X	X	X	X	N/A
Frequency	X	*	X	*	*	*	X	X
AC Watts	X	*	X	*	*	*	*	X
AC VARS	X	*	X	*	*	*	*	X
Power Factor	X	*	X	*	*	*	X	X
RTD Temperature	X	*	X	*	*	*	*	N/A
AC Synchroscope	X	N/A	X	N/A	N/A	N/A	N/A	N/A
RPM Indicator	X	X	X	X	X	X	X	N/A
Process indicator	X	X	X	X	X	X	X	N/A
Ground detector	X	X	X	X	N/A	X	X	N/A

Notes: \* Requires external transducer, X = available, N/A = Not available in this model, † = rectifier type.

### AB/DB Switchboard specifications in accordance with ANSI C39.1

**Accuracy:** ±1.0% of full scale basic accuracy class.

*Specific accuracies:*

*Rectifier type meter-* ±1.5% @ 25°C calibrated to sine wave.

*Expanded Scale Voltmeter-* 0.3% of mid-scale.

*Power factor meter-* ±1% of scale length from 20-100% of rated current on balanced system models; ±3% of scale length on unbalanced system model types.

*Synchroscope-* ±1% of scale length.

*Frequency meters-* ± .15Hz @45-55Hz and 55-65Hz, ±0.093Hz @ 58-62Hz, ±1.5Hz @350-450Hz.

**Position of use:** Vertical (scale)

**Full scale deflection angle:** 250°, except synchroscope is 360°

**Full scale length:**

AB/DB40, AB/DB14, AB/DB17- 6.9 inches.

AB/DB16- 13.8 inches.

**Scale plate:** AB/DB40, AB/DB14 platform type 2 piece scale with graduations on the outer scale; numerals and legends on the inner scale. AB/DB16, has a one piece platform scale, AB/DB17 see page 8.

**Case:** All AB/DB switchboard instruments have drawn steel case with zinc chromate coating except AB/DB40 plastic case which is ABS.

**Cover:** AB/DB14, AB/DB17 metal cover with polycarbonate window. AB/DB16, AB/DB40 polycarbonate-UL94V-0 cover and window.

**Terminal plate:** phenol resin material.

**Mounting studs:** 1/4" x 28 thread.

**Terminal studs:** 10-32 thread.

**Operating temperature range:** 0 to 40°C (32 to 104°F).

**Storage temperature range:** -10 to 50°C (14 to 122°F).

**Extreme temperature range:** -20°C to 65°C (-4 to 149°F).

**Dielectric level:** 2300VAC for 1 minute between the electrical circuit and mounting studs.

**Overload rating:** Voltmeter and potential coils-1.2 x rating (continuous).

AC Ammeters- 2 x rating (continuous), and 10 x rating for one second.

Current coils (other than ammeters) 1.5 x rating (continuous), and 10 x rating for one second.

**Response time:** Approximately 2.5 seconds (except AB/DB16)

### CONTENTS

#### AB/DB Switchboard Instruments

Page 2 Selector guide, general specifications, catalog contents.

Page 3 Key to Switchboard numbering system, how to order, shipping and storage weights.

Page 4-7 AC/DC Ammeters, Voltmeters, Tach. indicators.

Page 8 AB/DB17 general ratings and specifications.

Page 9 Power Factor, Frequency meters, Synchrosopes, Temperature meters.

Page 10 AC Wattmeters and Varmeters.

Page 11-16 Application guide for selection of Wattmeters and Varmeters.

Page 17 Optional features for AB/DB40 and AB/DB16.

Page 18 Switchboard minimum / maximum ratings.

Page 19 Switchboard specification and burden data.

Page 20-22 Standard connection drawings for AB/DB40 and AB/DB16.

Page 23-24 Dimensions and panel cutout drawings.

#### Type 180 Edgewise Instruments.

Page 25-27 General specifications, catalog numbers, Optional features, dimensions and cutouts.

#### Type 2180 Miniature Switchboard Instruments

Page 28-29 General specifications, ordering information, dimensions and panel cutout.

#### Type 2491 Digital Switchboard Instruments

Page 30-33 General specifications, ordering information, outline and panel cutout dimensions, connection diagrams.

#### Type 2469/2489 Power Transducers

Page 34-35 General specifications and catalog numbers.

#### Current and Potential transformers, DC Shunts, Multipliers

Page 36-37 Ordering information

Key to AB/DB Switchboard Numbering System (See Notes)

**Digits 1, 2, & 3 Type**  
 101-TB-AB/DB14  
 102-P&J AB/DB17  
 103-TB-AB/DB40  
 106-P&J-AB40 Synch.  
 120-P&J-AB16 Synch.  
 121-TB-AB/DB16

**Digits 4 & 5 Measured Qty.**  
 01-DC Volts  
 02-AC Volts  
 07 Voltmeter (expanded scale)  
 11-DC Amps  
 12-DC Millivolts  
 16-AC Amps, 400 Hz  
 19-Supp. Zero  
 21-2W1P Watts 1 EL  
 22-3W3P Watts 2 EL  
 25-4W3P Watts 2½ EL  
 28-3W3P Vars (cross phase) 2 EL  
 29-4W3P Vars (cross phase) 2½ EL  
 31-2W1P Vars 1 EL  
 32-3W3P Vars (external phase shifter) 2 EL  
 34-4W3P Vars (external phase shifter) 2½ EL  
 37-Freq. Meter  
 40-Power Factor 3W3P & 4W3P (balanced)  
 41-Power Factor 2W1P  
 45-Synchroscope  
 46-Power Factor-3W3P (unbalanced)  
 47-Power Factor-4W3P (unbalanced)  
 50-Temp. Ind.  
 62-DC Tach. Ind.  
 63-AC Tach. Ind.  
 70-2W1P Watts • 1 EL  
 71-3W3P Watts • 2 EL  
 73-4W3P Watts • 2 ½ EL  
 74-4W3P Vars • (cross phase) 2½ EL  
 76-2W1P Vars • 1 EL  
 77-3W3P Vars • (for use w/external phase shifter) 2 EL  
 79-4W3P Vars • (for use w/external phase shifter) 2½ EL  
 81-3W3P Vars • 2 EL (cross PH)

**Digit 6 Mechanical Features**  
 1-Zero left, black cover  
 2-Zero center, black cover  
 3-Zero left, gray cover  
 4-Zero center, gray cover  
 5-Zero left, antiglare, black cover  
 6-Zero center, antiglare, black cover

**Digits 7 & 8 - Elec. Rtg.**  
 Ex: LA = 1A  
 LE = 2A  
 LS = 5A  
 (see note 2)

**Digits 9 & 10 - Scale**  
 Ex: FA = 0–1mA  
 FX = 0–5mA  
 (see note 2)

**Digit 11 - Factory Style No. For factory use.**

**Digits 12, 13 & 14-Spcl Units**  
 When used, these denote unique models. Refer to factory for details. For Wattmeters & Varmeters, see pages 11-16.

- NOTES:**
- This tabulation is not all inclusive, to be used for defining cat. nos. only
  - For watt & var cat. nos. digits 7–10 & 12–14 designate rating-cal watts-scale & legend information
  - TB = taut band movement
  - P&J = pivot & jewel movement
  - "P" suffix denotes plastic case
  - Low Cal Watts, Zero Center

**How to Order — Specify the following:**

- Complete catalog number, or;
- Provide significant portion of catalog number with word description for differences (e.g. "Similar to 103111FAFA, except scale 0-100 kilovars"), or
- Provide word description including the following information:  
 Type: AB/DB-14, 16, or 40  
 Rating (Input):.....Amperes AC or DC .....  
 Volts AC or DC .....  
 Frequency: 60 Hz, 50 Hz, 400 Hz .....Hz  
 Scale: Min. Value - Max. Value, Zero left, Zero-center or offset zero  
 Legend: Specify words and/or symbols exactly  
 Potential Transformer Ratio: .....to 120 volts or .....to .....volts  
 Current Transformer Ratio: .....to 5 amperes or .....to .....amperes  
 Circuit: 2-wire/single-phase, 3-wire/3 phase.  
 3-phase/4-wire.....other  
 External Devices; phase Shifting transformers, shunts transducers, etc.....  
 Other Options:.....  
 Special features .....

**Shipping & Storage Weights**

Instrument	*AB/DB-40				AB/DB-16				
	Net		Ship		Net		Ship		
	(lbs)	(kg)	(lbs)	(kg)	(lbs)	(kg)	(lbs)	(kg)	
DC-A/V	1.5	.70	2.4	1.1	3.0	1.4	5.0	2.2	
AC	V	1.7	.79	2.7	1.2	3.4	1.5	5.0	2.2
	A	1.8	.84	2.7	1.2	3.4	1.5	5.0	2.3
WATT/ VAR	1ø	2.8	1.3	3.6	1.7	4.4	2.0	6.0	2.8
	3ø3W	3.0	1.4	3.9	1.8	4.6	2.1	6.3	2.9
	3ø4W								
Power Factor	2.0	.95	3.0	1.4	3.6	1.7	5.3	2.4	
Frequency	1.8	.82	2.7	1.2	3.3	1.5	5.0	2.3	
Temperature	2.0	.95	3.0	1.4	3.6	1.7	5.3	2.4	
Tachometer	1.6	.80	2.7	1.2	3.3	1.5	5.0	2.3	
Synchroscope	3.9	1.8	4.8	2.2	5.5	2.4	7.1	3.2	

\*Subtract 0.5 lbs. for plastic case amp & volt.

**Approximate Package Size in Inches / Centimeters**

All AB/DB (Except AB/DB-16)	.....6 x 6 x 11 / 15 x 15 x 28
Shipping	.....7 x 7 x 13 / 18 x 18 x 33
AB/DB-16	.....10 x 10 x 11 / 25 x 25 x 28
Shipping	.....11 x 11 x 13 / 28 x 28 x 33

## SWITCHBOARD INSTRUMENTS



**AB-40  
Metal Case**



**AB-40  
Plastic Case**

## AC Ammeters

Rating (Amperes)	Scale (Amperes)	AB-14 Cat. No.	AB-40 Metal Case	AB-40 Plastic Case	AB-16 Cat. No.
<b>Self-Contained, 40/70 Hz</b>					
1	0-1	101 133 LALA	103 131 LALA	103 131 LALA7/P	121 131 LALA
1.5	0-1.5	101 133 LCLC	103 131 LCLC	103 131 LCLC7/P	121 131 LCLC
2	0-2	101 133 LELE	103 131 LELE	103 131 LELE7/P	121 131 LELE
3	0-3	101 133 LJLJ	103 131 LJLJ	103 131 LJLJ7/P	121 131 LJLJ
5	0-5	101 133 LSL5	103 131 LSL5	103 131 LSL57/P	121 131 LSL5
7.5	0-7.5	101 133 MFMF	103 131 MFMF	103 131 MFMF7/P	121 131 MFMF
10	0-10	101 133 MTMT	103 131 MTMT	103 131 MTMT7/P	121 131 MTMT
15	0-15	101 133 NDND	103 131 NDND	103 131 NDND7/P	121 131 NDND
20	0-20	101 133 NGNG	103 131 NGNG	103 131 NGNG7/P	121 131 NGNG
30	0-30	101 133 NLNL	103 131 NLNL	103 131 NLNL7/P	—
<b>Transformer-Rated, 40/70Hz (see Current Transformers on page 36)</b>					
5	0-10	101 133 LSMT	103 131 LSMT	103 131 LSMT7/P	121 131 LSMT
5	0-15	101 133 LSND	103 131 LSND	103 131 LSND7/P	121 131 LSND
5	0-20	101 133 L5NG	103 131 L5NG	103 131 L5NG7/P	121 131 L5NG
5	0-25	101 133 L5NJ	103 131 L5NJ	103 131 L5NJ7/P	121 131 L5NJ
5	0-30	101 133 L5NL	103 131 L5NL	103 131 L5NL7/P	121 131 L5NL
5	0-40	101 133 L5NP	103 131 L5NP	103 131 L5NP7/P	121 131 L5NP
5	0-50	101 133 L5NT	103 131 L5NT	103 131 L5NT7/P	121 131 L5NT
5	0-75	101 133 L5PB	103 131 L5PB	103 131 L5PB7/P	121 131 L5PB
5	0-100	101 133 L5PK	103 131 L5PK	103 131 L5PK7/P	121 131 L5PK
5	0-150	101 133 L5PZ	103 131 L5PZ	103 131 L5PZ7/P	121 131 L5PZ
5	0-200	101 133 L5RL	103 131 L5RL	103 131 L5RL7/P	121 131 L5RL
5	0-250	101 133 L5RS	103 131 L5RS	103 131 L5RS7/P	121 131 L5RS
5	0-300	101 133 L5RX	103 131 L5RX	103 131 L5RX7/P	121 131 L5RX
5	0-400	101 133 L5SC	103 131 L5SC	103 131 L5SC7/P	121 131 L5SC
5	0-500	101 133 L5SF	103 131 L5SF	103 131 L5SF7/P	121 131 L5SF
5	0-600	101 133 L5SJ	103 131 L5SJ	103 131 L5SJ7/P	121 131 L5SJ
5	0-800	101 133 L5SN	103 131 L5SN	103 131 L5SN7/P	121 131 L5SN
5	0-1000	101 133 L5SS	103 131 L5SS	103 131 L5SS7/P	121 131 L5SS
5	0-1200	101 133 L5SV	103 131 L5SV	103 131 L5SV7/P	121 131 L5SV
5	0-1500	101 133 L5TC	103 131 L5TC	103 131 L5TC7/P	121 131 L5TC
5	0-2000	101 133 L5TM	103 131 L5TM	103 131 L5TM7/P	121 131 L5TM
5	0-2500	101 133 L5TV	103 131 L5TV	103 131 L5TV7/P	121 131 L5TV
5	0-3000	101 133 L5UA	103 131 L5UA	103 131 L5UA7/P	121 131 L5UA
5	0-4000	101 133 L5UE	103 131 L5UE	103 131 L5UE7/P	121 131 L5UE
5	0-5000	101 133 L5UJ	103 131 L5UJ	103 131 L5UJ7/P	121 131 L5UJ
5	0-6000	101 133 L5UP	103 131 L5UP	103 131 L5UP7/P	121 131 L5UP
5	0-7000	101 133 L5US	103 131 L5US	103 131 L5US7/P	121 131 L5US
5	0-8000	101 133 L5UW	103 131 L5UW	103 131 L5UW7/P	121 131 L5UW
<b>Instruction Book: 4555K10P0701, Outline Dimensions: See pages 23 and 24</b>					



**AB-40  
Metal Case**



**AB-40  
Expanded Scale**

**AC Voltmeters**

Rating (Volts)	Scale (Volts)	AB-14 Cat. No.	AB-40 Metal Case	AB-40 Plastic Case	AB-16 Cat. No.
<b>Self-Contained, 50/60 Hz</b>					
150	0-150	101 023 PZPZ	103 021 PZPZ	103 021 PZPZ7/P	121 021 PZPZ
250	0-250	101 023 RSRS	103 021 RSRS	103 021 RSRS7/P	121 021 RSRS
300	0-300	101 023 RXRX	103 021 RXRX	103 021 RXRX7/P	121 021 RXRX
500	0-500	101 023 SFSF	103 021 SFSF	103 021 SFSF7/P	121 021 SFSF
600	0-600	101 023 SJSJ	103 021 SJSJ	103 021 SJSJ7/P	121 021 SJSJ
750 <sub>s</sub>	0-750	**	103 021 SMSM	103 021 SMSM7/P	121 021 SMSM
<b>Transformer-Rated, 50/60 Hz (see Potential Transformers on page 37)</b>					
150	0-300	101 023 PZRX	103 021 PZRX	103 021 PZRX7/P	121 021 PZRX
150	0-600	101 023 PZSJ	103 021 PZSJ	103 021 PZSJ7/P	121 021 PZSJ
150	0-750	101 023 PZSM	103 021 PZSM	103 021 PZSM7/P	121 021 PZSM
150	0-3000	101 023 PZUA	103 021 PZUA	103 021 PZUA7/P	121 021 PZUA
150	0-5250	101 023 PZUL	103 021 PZUL	103 021 PZUL7/P	121 021 PZUL
150	0-6000	101 023 PZUP	103 021 PZUP	103 021 PZUP7/P	121 021 PZUP
150	0-9000	101 023 PZUY	103 021 PZUY	103 021 PZUY7/P	121 021 PZUY
150	0-15kV	101 023 PZWZ	103 021 PZWZ	103 021 PZWZ7/P	121 021 PZWZ
150	0-18kV	101 023 PZXE	103 021 PZXE	103 021 PZXE7/P	121 021 PZXE
150	0-45kV	101 023 PZXU	103 021 PZXU	103 021 PZXU7/P	121 021 PZXU
150	0-150kV	101 023 PZYR	103 021 PZYR	103 021 PZYR7/P	121 021 PZYR
250	0-600V	101 023 RSSJ	103 021 RSSJ	103 021 RSSJ7/P	121 021 RSSJ
<b>Expanded Scale, Self-Contained, 50/60 HZ</b>					
110-130	110-130	**	103 071 PNP	103 071 PNP7/P	121 071 PNP
<b>Expanded Scale, Transformer Rated, 50/60 HZ</b>					
110-130	†	**	103 071 PN . . *	103 071 PN..7/P*	121 071 PN . . *
<b>Rectifier Type, 1.5% Accuracy, 20 to 3000 Hz</b>					
15	0-15	**	*	*7/P	*
30	0-30	**	*	*7/P	*
150	0-150	**	*	*7/P	*
150	†	**	*	*7/P	*
300	0-300	**	*	*7/P	*
600	0-600	**	*	*7/P	*
<b>Ground Detector Type — Single-Phase 50/60 Hz</b>					
150	0-150	**	103 021 PZPZ	103 021 PZPZ7/P	121 021 PZPZ
150	†	**	103 021 PZ . *	103 021 PZ . *7/P	121 021 PZ . *
300	0-300	**	103 021 RXRX	103 021 RXRX7/P	121 021 RXRX
600	0-600	**	103 021 SJSJ	103 021 SJSJ7/P	121 021 SJSJ
<b>Instruction Book: 4555K10P0701, Outline Dimensions: see pages 23 and 24</b>					

Ⓢ UL version not available.

\* Order by description. Specify P.T. (Potential Transformer) ratio if used, and scale desired.

\*\* High shock version not available.

† Scale per requisition. AB/DB models have maximum 4 digits as standard.

## SWITCHBOARD INSTRUMENTS

### DC Ammeters Self-Contained

Scale and Rating	DB-14 Cat. No.	DB-40 Metal Case	DB-40 Plastic Case	DB-16 Cat. No.
<b>Microammeters — Zero-Left</b>				
0-200	**	103 111 EAEA	103 111 EAEA7/P	—
0-300	101 113 EGEG	103 111 EGEG	103 111 EGEG7/P	121 111 EGEG
0-500	101 113 EMEM	103 111 EMEM	103 111 EMEM7/P	121 111 EMEM
<b>Milliammeters — Zero-Left</b>				
s 0-1	101 113 FAFA	103 111 FAFA	103 111 FAFA7/P	121 111 FAFA
0-2	101 113 FGFG	103 111 FGFG	103 111 FGFG7/P	121 111 FGFG
0-5	101 113 FFX	103 111 FFX	103 111 FFX7/P	121 111 FFX
0-10	101 113 GZGZ	103 111 GZGZ	103 111 GZGZ7/P	121 111 GZGZ
0-30	101 113 HMHM	103 111 HMHM	103 111 HMHM7/P	121 111 HMHM
0-50	101 113 HYHY	103 111 HYHY	103 111 HYHY7/P	121 111 HYHY
0-100	101 113 JRJR	103 111 JRJR	103 111 JRJR7/P	121 111 JRJR
0-200	101 113 KAKA	103 111 KAKA	103 111 KAKA7/P	121 111 KAKA
0-300	101 113 KGKG	103 111 KGKG	103 111 KGKG7/P	121 111 KGKG
0-500	101 113 KMKM	103 111 KMKM	103 111 KMKM7/P	121 111 KMKM
<b>Milliammeters — Suppressed-Zero (No zero set unless otherwise specified)</b>				
s 10-50	101 193 HX...†	103 191 HX...†	103 191 HX...†7/P	121 191 HX...†
4-20	101 193 HE...†	103 191 HE...†	103 191 HE...†7/P	121 191 HE...†
1-5	101 193 FY...†	103 191 FY...†	103 191 FY...†7/P	121 191 FY...†
<b>Ammeters — Zero-Left</b>				
0-1	101 113 LALA	103 111 LALA	103 111 LALA7/P	121 111 LALA
0-5	101 113 LSLS	103 111 LSLS	103 111 LSLS7/P	121 111 LSLS
0-10	101 113 MTMT	103 111 MTMT	103 111 MTMT7/P	121 111 MTMT
0-15	101 113 NDND	103 111 NDND	103 111 NDND7/P	121 111 NDND
0-20	101 113 NNGG	103 111 NNGG	103 111 NNGG7/P	121 111 NNGG
0-30	101 113 NLNL	103 111 NLNL	103 111 NLNL7/P	121 111 NLNL

**Instruction Book: 4555K10P0701, Outline Dimensions: see pages 23 and 24**

s See page 34 and 35 for Matching Power Transducer or Isolator.

† Scale per requisition. (AB/DB-40/16) have a maximum of 4 digits as standard.

\*\* High shock version not available.

**DB-40 Metal Case**



**DB-40 Plastic Case**



### DC Ammeters Shunt-Rated

Rating (Millivolts)	Scale (Amperes)	DB-14 Cat. No.	DB-40 Metal Case	DB-40 Plastic Case	DB-16 Cat. No.
<b>With Lead Length Compensator, Catalog Number Does Not Include Shunt or Shunt Leads</b>					
50	*	**	103 121 AB...	103 121 AB...7/P	121 121 AB...
50-0-50	*	101 124 AB...	103 122 AB...	103 122 AB...7/P	121 122 AB...
100	*	101 123 AE...	103 121 AE...	103 121 AE...7/P	121 121 AE...
100-0-100	*	101 124 AE...	103 122 AE...	103 122 AE...7/P	121 122 AE...
<b>Zero-Left for Use with 50mV Shunts and 0.05-Ohm Shunt Leads, (Standard 5-Foot Leads). s</b>					
<b>See page 37 for External Shunts (Shunts and Leads are not included with meter).</b>					
50	0-15	101 123 CAND	103 121 CAND	103 121 CAND7/P	121 121 ECND
50	0-20	101 123 CANG	103 121 CANG	103 121 CANG7/P	121 121 ECNG
50	0-30	101 123 CANL	103 121 CANL	103 121 CANL7/P	121 121 ECNL
50	0-40	101 123 CANP	103 121 CANP	103 121 CANP7/P	121 121 ECNP
50	0-50	101 123 CANT	103 121 CANT	103 121 CANT7/P	121 121 ECNT
50	0-75	101 123 CAPB	103 121 CAPB	103 121CAPB7/P	121 121 ECPB
50	0-100	101 123 CAPK	103 121 CAPK	103 121 CAPK7/P	121 121 ECPK
50	0-150	101 123 CAPZ	103 121 CAPZ	103 121 CAPZ7/P	121 121 ECPZ
50	0-200	101 123 CARL	103 121 CARL	103 121 CARL7/P	121 121 ECRL
50	0-300	101 123 CARX	103 121 CARX	103 121 CARX7/P	121 121 ECRX
50	0-400	101 123 CASC	103 121 CASC	103 121 CASC7/P	121 121 ECSC
50	0-500	101 123 CASF	103 121 CASF	103 121 CASF7/P	121 121 ECSF
50	0-750	101 123 CASM	103 121 CASM	103 121 CASM7/P	121 121 ECSM
50	0-1000	101 123 CASS	103 121 CASS	103 121 CASS7/P	121 121 ECSS
50	0-1200	101 123 CASV	103 121 CASV	103 121 CASV7/P	121 121 ECSV
50	0-1500	101 123 CATC	103 121 CATC	103 121 CATC7/P	121 121 ECTC
50	0-2000	101 123 CATM	103 121 CATM	103 121 CATM7/P	121 121 ECTM
50	0-3000	101 123 CAUA	103 121 CAUA	103 121 CAUA7/P	121 121 ECUA

**Instruction Book: 4555K10P0701, Outline Dimensions: see pages 23 and 24**

\*\* High shock not available

\* Scale marked in terms of shunt current. When ordering specify rating of shunt to be used, scale and legend. AB/DB meter scales have a maximum of 4 digits.

‡ Shunt-rated instruments are normally calibrated for 5-foot shunt leads (0.050 Ohms). They can be calibrated for maximum

resistances as follows:  $\frac{50\text{mV}}{2.0 \text{ Ohms}}$   $\frac{100\text{mV}}{5.0 \text{ Ohms}}$

## DC Voltmeters

Rating and Scale (Volts)	DB-14 Cat. No.	DB-40 Metal Case	DB-40 Plastic Case	DB-16 Cat. No.
<b>Zero-Left (Sensitivity is 1000 OHMS / Volt)</b>				
0-15	101 013 NDND	103 011 NDND	103 011 NDND7/P	121 011 NDND
0-30	101 013 NLNL	103 011 NLNL	103 011 NLNL7/P	121 011 NLNL
0-50	101 013 NTNT	103 011 NTNT	103 011 NTNT7/P	121 011 NTNT
0-75	101 013 PBPB	103 011 PBPB	103 011 PBPB7/P	121 011 PBPB
0-150	101 013 PZPZ	103 011 PZPZ	103 011 PZPZ7/P	121 011 PZPZ
0-300	101 013 RXRX	103 011 RXRX	103 011 RXRX7/P	121 011 RXRX
0-400	101 013 SCSC	103 011 SCSC	103 011 SCSC7/P	121 011 SCSC
0-500	101 013 SFSF	103 011 SFSF	103 011 SFSF7/P	121 011 SFSF
0-600	101 013 SJSJ	103 011 SJSJ	103 011 SJSJ7/P	121 011 SJSJ
<b>Zero-Center (Sensitivity is 2000 OHMS / Volt)</b>				
150-0-150	101 014 PZPZ	103 012 PZPZ	103 012 PZPZ7/P	121 012 PZPZ
300-0-300	101 014 RXRX	103 012 RXRX	103 012 RXRX7/P	121 012 RXRX
500-0-500	101 014 SFSF	103 012 SFSF	103 012 SFSF7/P	121 012 SFSF
600-0-600	101 014 SJSJ	103 012 SJSJ	103 012 SJSJ7/P	121 012 SJSJ
<b>Ground Detector Type — Zero-Center for 2-Wire Circuits (Standard Sensitivity is 1000 OHMS/Volt) ‡</b>				
150-0-150	**	103 012 PZ†	103 012 PZ†7/P	121 012 PZ†
300-0-300	**	103 012 RX†	103 012 RX†7/P	121 012 RX†
500-0-500	**	103 012 SF†	103 012 SF†7/P	121 012 SF†
600-0-600	**	103 012 SJ†	103 012 SJ†7/P	121 012 SJ†
<b>Instruction Book: 4555K10P0701, Outline Dimensions pages 23 and 24</b>				

† Specify scale by order.

‡ Includes (2) 2227 External Resistors.

\*\* High shock version not available.

## Tachometer Indicators

### DC Volts

Select nearest higher rated DC Voltmeter from above and specify requirements.

### AC Volts

Select nearest higher rated rectifier type AC voltmeter from Page 5 and specify requirements.

**Instruction Book 4555K15P0003**

**DB-40 Tachometer**



**DB-40 Metal Case**



**DB-40 Plastic Case**



## SWITCHBOARD INSTRUMENTS

### AB/DB17 Switchboard Meters



These internally illuminated meters are used primarily in railway locomotive applications for load and speed indication. They are suited to all applications where scale lighting and high accuracy is required. The wide radius pivot and jewel movement ensures accuracy and stability in the toughest environments. Standard lamps furnished with AB/DB17 are 2 GE #44 (6VDC) Lamps.

## GENERAL SPECIFICATIONS

### BASIC SPECIFICATION

In accordance with American National Standards Institute Specifications C39.1

### SCALE LENGTH AND ARC

6.9" 250°

#### Scale Type:

White numerals, black platform scale is standard

### NET WEIGHT

Approximately 990 gr. (2.2 lbs)

### OVERSHOOT

Approximately 10%

### ACCURACY

± 1% of full scale D.C. Meters

± 1.5% of full scale A.C. Meters

### RESPONSE TIME

2.5 Seconds Maximum

### METER MECHANISM

Moving coil type pivot and sapphire jewel

### DIELECTRIC LEVEL

4000 Volts A.C. for 1 minute (case to input terminals)

### Outline Dimensions

See page 24

## AB/DB17 MODELS AVAILABLE

Description	Rating and scale	Model type
DC Milliammeter	0-1mA	102117FAFA
DC Milliammeter	0-10mA	102117GZGZ
DC Ammeter	†	102117*
DC Millivolts	0-50mV	102127ECEC
DC Voltmeter	†	102017*
AC Ammeter	†	102117*
AC Voltmeter	†	102117*

**Note:** \*Specify full scale rating, scale color, type, legend, etc.

† Contact factory for minimum / maximum ratings.



**POWER FACTOR SCALE FOR BALANCED SYSTEM**

### Power-Factor Meters

Rating (Amperes)	Rating (L-L Volts)	Scale	AB-40 Cat. No.	AB-16 Cat. No.
<b>Single-Phase/2-Wire, 60Hz</b>				
5	120	.5-1-.5	103 412 FCAD	121 412 FCAD
<b>3-Phase 3- &amp; 4-Wire, 50/60Hz Balanced System Only</b>				
5	120	.5-1-.5	103 402 FCAD	121 402 FCAD
5	208	.5-1-.5	103 402 FDAD	—
5	240	.5-1-.5	103 402 FEAD	121 402 FEAD
5	480	.5-1-.5	103 402 FFAD	—
5	600	.5-1-.5	103 402 FGAD	—
<b>3-Phase 3-Wire, 60Hz Unbalanced Systems</b>				
5	120	.5-1-.5	103 462 FCAD	—
5	240	.5-1-.5	103 462 FEAD	—
<b>3-Phase 4-Wire, 60Hz Unbalanced Systems</b>				
5	120	.5-1-.5	103 472 FCAD	—
5	208	.5-1-.5	103 472 FDAD	—
5	416*	.5-1-.5	103 472 FEAD	—
<b>Instruction Book: 4555K35P0701 (For Unbalanced), Outline Dimensions: See page 23</b>				
<b>Instruction Book: 4555K25P0001 (For Balanced), Outline Dimensions: See page 23</b>				

\*240 V L-N



### Frequency Meters, 120V

Scale (Hz)	Center Frequency (Hz)	Accuracy (Hz)	AB-40 Cat. No.	AB-16 Cat. No.
45-55	50	±0.15	103 372 AGAG	121 372 AGAG
45-65	55	±0.25	103 372 AJAJ	121 372 AJAJ
48-52	50	±0.093	103 372 AKAK	121 372 AKAK
50-70	60	±0.25	103 372 ALAL	121 372 ALAL
55-65	60	±0.15	103 372 ANAN	121 372 ANAN
58-62	60	±0.093	103 372 ATAT	121 372 ATAT
59-61	60	±0.047	103 372 ASAS	121 372 ASAS
350-450	400	±1.3	103 372 BHBH	121 372 BHBH
390-410	400	±0.492	103 372 BLBL	121 372 BLBL
<b>Instruction Book: 4555K24P0001, Outline Dimensions: See page 23</b>				



### Synchrosopes — Pivot & Jewel, 120 Volt

Scale	Normal Frequency	AB-40 Cat. No.	AB-16 Cat. No.
"Slow-Fast"	50	106 452 ABAA	120 452 ABAA
"Slow-Fast"	60	106 452 AAAA	120 452 AAAA
"Slow-Fast"	400	106 452 ACAA	120 452 ACAA
<b>Instruction Book: 4555K20P0701, Outline Dimensions: See page 23</b>			



### Temperature Indicators (Lead Resistance = 0.3 ohms)

Rating (Volts)	Scale	DB-40 Cat. No.	DB-16 Cat. No.
<b>1-Percent of Span for 10-ohm copper RTDs (Resistance Temperature Detectors) 50-600 Hz</b>			
120	20 -140°C	103 502 CAAB†	121 502 CAAB†
120	0-180°F	103 502 CDAD†	121 502 CDAD†
<b>Instruction Book: 4555K12P0001, Outline Dimensions: See page 23</b>			

† Catalog number includes calibrated test resistor

**AC Wattmeters Non-Isolated** (cannot be used with external Phase Shifter for Vars)

Rating (Amperes)	Rating (Volts)	Scale	AB-40 Cat. No.	AB-16 Cat. No.
<b>Single-Phase/2-Wire, 1-Element, Transformer-Rated, 50/60 Hz</b>				
5	120	†	103 21 □ A .....	121 21 □ A .....
<b>3-Phase/3-Wire, 2-Element, Transformer-Rated, 50/60Hz ■</b>				
5	120	†	103 22 □ A .....	121 22 □ A .....
5	240	†	103 22 □ C .....	121 22 □ C .....
5	480*	†	103 22 □ D .....	—
5	600*	†	103 22 □ E .....	—
<b>3-Phase/4-Wire, 2½-Element, Transformer-Rated, 50/60Hz, (Voltage balanced) ■</b>				
5	69	†	103 25 □ F	121 25 □ F
5	120	†	103 25 □ A .....	121 25 □ A .....
5	240	†	103 25 □ C .....	121 25 □ C .....
<b>Instruction Book: 4555K26P0701, Outline Dimensions: See page 23</b>				

- † Order by description. Specify CT (Current Transformer) and/or PT (Potential Transformer) ratios if used and scale desired.
- \* UL version in short case, non-UL version in long case.
- Sixth digit signifies pointer deflection (1-zero-left, 2-zero-center).



**Varmeters are usually zero-center and scaled for half the scale values of the accompanying wattmeters. Example: If the Wattmeter is scaled 0-100 Kilowatts, the Varmeter is scaled 50-0-50 Kilovars.**

**NOTE:**

See Application Guide and Tables on the following six pages for selection of commonly used Watt and Var Meters.

**Varmeters** (Voltages must be balanced for all polyphase Varmeters)

Rating (Amperes)	Rating (Volts)	Scale	AB-40 Cat. No.	AB-16 Cat. No.
<b>Single-Phase/2-Wire, 1-Element, Transformer Rated, 60Hz</b>				
5	120	†	103 31 □ A .....	121 31 □ A .....
5	120	†	103 762 A .....	121 762 A.....*
<b>3-Phase/3-Wire, 2-Element, Transformer-Rated, 50/60Hz (Cannot be used with External Phase Shifter) ■</b>				
5	120	†	103 28 □ A	121 28 □ A....
5	120	†	103 812 A .....	121 812 A....•
<b>3-Phase/3-Wire, 2-Element, Transformer-Rated, 60Hz For Use With External Phase Shifters</b>				
5	120	†	103 32 □ A .....	121 32 □ A
5	120	†	103 772 A .....	121 77 2 A*
<b>3-Phase/4-Wire, 2½-Element, Transformer-Rated, 50/60Hz (Cannot be used with External Phase Shifter) ■</b>				
5	208 H	†	103 29 □ B....	121 29 □ B....
5	208 H	†	103 742 B.... s	121 742 B.... s
<b>3-Phase/4-Wire, 2½-Element, Transformer-Rated, 60Hz For Use with External Phase Shifters</b>				
5	120	†	103 34 □ A .....	121 34 □ A .....
5	120	†	103 792 A .....	121 792 A .....
<b>Instruction Book: 4555K27P0701, Outline Dimensions: See page 23</b>				

- † Order by description. Specify CT (Current Transformer) and/or PT (Potential Transformer) ratios if used and scale desired.
- \* Used for 0-Center when calibrating watts are less than ±380.
- Used for 0-Center when calibrating watts are less than ±658.
- s Used for 0-Center when calibrating watts are less than ±760.
- H The 2½-element varmeters used on 4-wire 3-phase 120V L-N systems are rated 208V because they are connected line-to-line.
- Sixth digit signifies pointer deflection (1-zero left, 2-zero center).



## APPLICATION GUIDE FOR SELECTION OF WATTMETERS AND VARMETERS

**1.** For polyphase applications, see Selector Tables II-V. These tables display complete catalog numbers for use with commonly used combinations of CT and PT ratios. For single phase applications, order by description.

For 3-wire 3-phase wattmeters rated 120 volts, 5A see TABLE II on page 13.

For 3-wire 3-phase varmeters rated 120 volts, 5A see TABLE IV on page 15.

For 4-wire 3-phase wattmeters rated 120 volts, 5A see TABLE III on page 14.

For 4-wire 3-phase varmeters rated 208 volts, 5A see TABLE V on page 16.

**2.** If scale is required to be higher or lower than the pre-selected scale shown in the above tables, see TABLE I on page 12. Choose a scale value between the maximum and minimum shown on this table for the combination of CT and PT ratios. Order by description, giving CT and PT ratios

and choice of scale.

**3.** For transformer ratios and/or ratings not shown in the above tables, see Scale Watts Formula on page 12. This table shows minimum and maximum calibrating watts for various applications and ratings.

Minimum scale = CT ratio x PT ratio x minimum CW x K  
 Maximum scale = CT ratio x PT ratio x maximum CW x K  
 Choose a scale between the maximum and minimum. Order by description, giving rating, transformer ratios, and choice of scale.

“PT Ratio x CT Ratio” is sometimes expressed as “TR”.  
 Example: If CT Ratio is 400/5 and PT Ratio is 480/120; then TR = 320.

**4.** See tables below for scale and legend keys to catalog number (digits 12, 13, 14).

### Key to Watt/Varmeter Scales

This table shows letter combinations assigned to end-scale values to be used for digits 12 & 13 in Catalog number.

Cat. Digit 12, 13	Scale	Cat. Digit 12, 13	Scale	Cat. Digit 12, 13	Scale	Cat. Digit 12, 13	Scale	Cat. Digit 12, 13	Scale
AA	1	BA	10	CA	100	DA	1000	EA	BLANK
AC	1.2	BC	12	CC	120	DC	1200	EC	1.2
AD	1.4	BD	14	CD	140	DD	1400	EE	1.6
AE	1.5	BE	15	CE	150	DE	1500	FC	12.5
AF	1.8	BF	18	CF	180	DF	1800	FD	13
AG	2	BG	20	CG	200	DG	2000	FE	16
AH	2.4	BH	24	CH	240	DH	2400	FG	17.5
AJ	2.5	BJ	25	CJ	250	DJ	2500	FJ	26
AK	3	BK	30	CK	300	DK	3000	GB	115
AL	3.2	BL	32	CL	320	DL	3200	GC	125
AM	3.5	BM	35	CM	350	DM	3500	GD	130
AN	4	BN	40	CN	400	DN	4000	GE	160
AP	4.5	BP	45	CP	450	DP	4500	GG	175
AR	5	BR	50	CR	500	DR	5000	GH	230
AS	5.5	BS	55	CS	550	DS	5500	GJ	260
AT	6	BT	60	CT	600	DT	6000	HC	1250
AU	6.5	BU	65	CU	650	DU	6500	HD	1300
AW	7	BW	70	CW	700	DW	7000	HE	1600
AX	7.5	BX	75	CX	750	DX	7500	HG	1750
AY	8	BY	80	CY	800	DY	8000		
AZ	9	BZ	90	CZ	900	DZ	9000		

### Key to Watt/Varmeter Legends

This table shows letters assigned to inner scale legends to be used for digit 14 in Catalog number.

Digit 14	Wattmeters	Varmeters	Digit 14	Wattmeters	Varmeters	Digit 14	Wattmeters	Varmeters
A	None	None	D	AC Megawatts	Megavars	G	AC MW/Var* <sub>s</sub>	—
B	AC Watts	Vars	E	AC Watts/Vars*	—	T	Percent Horsepower	—
C	AC Kilowatts	Kilovars	F	AC KW/Var* <sub>s</sub>	—	U	Horsepower	—

\*For wattmeters that are to be used with phase shifting transformer for measuring vars.  
 s Standard Legends AC Kilowatts/Kilovars and AC Megawatts/Megavars

**TABLE I**  
**Selection of Wattmeter Scales**  
 (AB/DB-40/16 have a maximum of 4 digits as standard.)

Scale Selection	CT Primary Current	PT PRIMARY VOLTAGE											
		240	480	600	2400	3600	4200	4800	6000	7200	12000	14400	
Normal Max Min	25	10	20	25	100	150	175	200	250	300	500	600	Kilowatts
		15	30	35	150	200	250	300	350	450	750	900	
		8	16	20	80	120	150	160	200	250	400	500	
Normal Max Min	50	20	40	50	200	300	350	400	500	600	1000	1200	
		30	60	75	300	450	500	600	750	900	1500	1750	
		16	35	40	160	250	300	350	400	500	800	1000	
Normal Max Min	75	30	60	75	300	450	500	600	750	900	1500	1750	
		45	90	100	450	650	750	900	1000	1200	2000	2500	
		25	50	60	250	350	400	500	600	700	1200	1500	
Normal Max Min	100	40	80	100	400	600	700	800	1000	1200	2000	2500	
		60	120	150	600	900	1000	1200	1500	1750	3000	3500	
		35	65	80	350	500	600	650	800	1000	1600	2000	
Normal Max Min	150	60	120	150	600	1000	1000	1200	1500	1750	3000	3500	
		90	175	200	900	1200	1500	1750	2000	2500	4500	5000	
		50	100	100	500	700	800	1000	1200	1500	2500	3000	
Normal Max Min	200	80	150	200	800	1200	1500	1500	2000	2500	4000	5000	
		120	200	300	1200	1750	2000	2000	3000	3500	6000	7000	
		65	125	160	650	1000	1200	1200	1600	2000	3500	4000	
Normal Max Min	300	120	250	300	1200	1750	2000	2500	3000	3500	6000	7500	
		175	350	450	1750	2500	3000	3500	4500	5000	9000	10Mw	
		100	200	250	1000	1500	1600	2000	2500	3000	5000	6000	
Normal Max Min	400	150	300	400	1500	2500	3000	3000	4000	5000	8000	10Mw	
		200	450	600	2000	3500	4000	4500	6000	7000	12Mw	14Mw	
		120	250	350	1200	2000	2500	2500	3500	4000	6500	7500	
Normal Max Min	600	250	500	600	2500	3500	4000	5000	6000	7500	12	15	
		350	700	900	3500	5000	6000	7000	9000	10Mw	17.5	20	
		200	400	500	2000	3000	3500	4000	5000	6000	10	12	
Normal Max Min	800	300	600	800	3000	5000	5000	6000	8000	10Mw	15	20	
		450	900	1200	4500	7000	8000	9000	12Mw	12Mw	20	25	
		250	500	650	2500	4000	4500	5000	6500	7500	15	15	
Normal Max Min	1200	500	1000	1200	5000	7500	8000	10Mw	12	15	25	30	
		700	1200	1750	7000	10Mw	12Mw	12Mw	17.5	20	35	45	
		400	750	1000	4000	6000	6500	7500	10	12	20	25	
Normal Max Min	1500	600	1200	1500	6000	10Mw	10Mw	12	15	17.5	30	35	
		900	1750	2000	9000	12Mw	15Mw	17.5	20	25	45	50	
		500	1000	1000	5000	7000	8000	10	10	15	20	25	
Normal Max Min	2000	800	1500	2000	8000	12	15	15	20	25	40	50	
		1200	2000	3000	12Mw	17.5	20	20	30	35	60	70	
		650	1400	1600	6500	10	12	12	16	20	35	40	
Normal Max Min	3000	1200	2500	3000	12	17.5	20	25	30	35	60	75	
		1750	3500	4500	17.5	25	30	35	45	50	90	100	
		1000	2000	2500	10	15	16	20	25	30	50	60	
Normal Max Min	4000	1500	3000	4000	15	25	30	30	40	50	80	100	
		2000	4500	6000	20	35	40	45	60	70	120	140	
		1200	2500	3500	12	20	25	25	35	40	65	75	

Scale values for 3-wire / 3-phase (120 volts, 5 ampere) For 4-wire / 3-phase multiply by 2. For single-phase divide by 2. **Note:** PT Primary Voltages shown are the line to neutral value for 3-phase / 4-wire circuits.

**Scale Watts Formula:**

The limits of full-scale values depend upon the rating of the instrument and the current and potential transformer ratios used. In order to determine whether the desired full-scale value is within limits, the following calibrating-watts formula and table are used. If the calibrating watts value falls within the range shown in the table for the instrument rating, the scale is acceptable.

$$\text{Calibrating Watts/Element} = \frac{\text{Desired full-scale value in watts or vars}}{\text{CW}} = \frac{\text{Desired full-scale value in watts or vars}}{(\text{PT Ratio}) \times (\text{CT Ratio}) \times \text{K}}$$

Where K = 1 for 1-phase/2-wire circuits  
 K = 2 for 1-phase/3-wire, 2-phase/3-wire, 2-phase/4-wire, 3 phase/3-wire circuits  
 K = 4 for 3-phase/4-wire circuits  
 Except K = 1.1547 for var models (10328 — & 103812 — 10329 — & 103742 —)

STANDARD CALIBRATING WATT RANGES FOR 5A 120V RATING

Model	Zero Left or Center*	Zero Center * <sub>s</sub> Low Cal Watts
Watt or Var (except below)	380 — 760	190 — 760
2 el. Var 10328 — & 103812 —	658 — 1316	329 — 1316
2½ el. Var 10329 — & 103742 —	760 — 1520	380 — 1520

\* Other Voltage & current ratings will be proportional

<sub>s</sub> End scale values

Note 1: For 10329 and 103742 (2½ element varmeters only) Catalog Number Digits 8, 9, 10 are one-half (½) the CW (∴ calibration current) as calculated using K = 1.1547

Note 2: The constant K may differ for various "short-cut" methods of metering watts or vars.

**TABLE II**

**Wattmeter Selector**

For 3-Wire 3-Phase (2-element) Wattmeter 5A 120V (Zero-Left)

AB-40 Cat. No. 103221A..... Find Digits 8-14 & scale at  
 AB-16 Cat. No. 121221A..... Intersection of C.T. & P.T. Ratios  
 (For zero center change Digit 6 from 1 to 2)

C.T. RATIO	P.T. RATIO												
	2400/120 (2:1)	480/120 (4:1)	600/120 (5:1)	2400/120 (20:1)	3600/120 (30:1)	4200/120 (35:1)	4800/120 (40:1)	6000/120 (50:1)	7200/120 (60:1)	12000/120 (100:1)	14400/120 (120:1)		
25/5 (5:1)	RBU7BAC 10KW	RBU7BGC 20KW	RBU7BJC 25KW	RBU7CAC 100KW	RBU7CEC 150KW	RBU7GGC 175KW	RBU7CGC 200KW	RBU7CJC 250KW	RBU7CKC 300KW	RBU7CRC 500KW	RBU7CRC 500KW	RBU7CRC 500KW	
50/5 (10:1)	RBU7BGC 20KW	RBU7BNC 40KW	RBU7BRC 50KW	RBU7CGC 200KW	RBU7CKC 300KW	RBU7CMC 350KW	RBU7CNC 400KW	RBU7CRC 500KW	RBU7CTC 600KW	RBU7CTC 600KW	RBU7DCC 1000KW	RBU7DCC 1000KW	
75/5 (15:1)	RBU7BKC 30KW	RBU7BTC 60KW	RBU7BXC 75KW	RBU7CKC 300KW	RBU7CPC 450KW	XGJ7CRC 500KW	RBU7CTC 600KW	RBU7CXC 750KW	RBU7CZC 900KW	RBU7CZC 900KW	RBU7DEC 1500KW	RBU7DFC 1800KW	
100/5 (20:1)	RBU7BNC 40KW	RBU7BYC 80KW	RBU7CAC 100KW	RBU7CNC 400KW	RBU7CTC 600KW	RBU7CWC 700KW	RBU7CYC 800KW	RBU7DAC 1000KW	RBU7DCC 1200KW	RBU7DCC 1200KW	RBU7DGC 2000KW	RBU7DHC 2400KW	
150/5 (30:1)	RBU7BTC 60KW	RBU7CCC 120KW	RBU7CEC 150KW	RBU7CTC 600KW	RBU7CZC 900KW	XGJ7DAC 1000KW	RBU7DCC 1200KW	RBU7DEC 1500KW	RBU7DFC 1800KW	RBU7DFC 1800KW	RBU7DKC 3000KW	RA57DMC 3500KW	
200/5 (40:1)	RBU7BYC 80KW	RBU7GEC 160KW	RBU7CGC 200KW	RBU7CYC 800KW	RBU7DCC 1200KW	RBU7DDC 1400KW	RBU7HEC 1600KW	RBU7DGC 2000KW	RBU7DHC 2400KW	RBU7DHC 2400KW	RBU7DNC 4000KW	RDR7DRC 5000KW	
250/5 (50:1)	RBU7CAC 100KW	RBU7CGC 200KW	RBU7CJC 250KW	RBU7DAC 1000KW	RBU7DEC 1500KW	RBU7HGC 1750KW	RBU7DGC 2000KW	RBU7DJC 2500KW	RBU7DKC 3000KW	RBU7DKC 3000KW	RBU7DRC 5000KW	RBU7DTC 6000KW	
300/5 (60:1)	RBU7CCC 120KW	RBU7GHC 240KW	RBU7CKC 300KW	RBU7DCC 1200KW	RBU7DFC 1800KW	XGJ7DGC 2000KW	RBU7DHC 2400KW	RBU7DKC 3000KW	RA57DMC 3500KW	RA57DMC 3500KW	RBU7DTC 6000KW	RA57DWC 7000KW	
400/5 (80:1)	RBU7GEC 160KW	RBU7CLC 320KW	RBU7CNC 400KW	RBU7HEC 1600KW	RBU7DHC 2400KW	RET7DKC 3000KW	RBU7DLC 3200KW	RBU7DNC 4000KW	RDR7DRC 5000KW	RDR7DRC 5000KW	RBU7DYC 8000KW	RDR7BAD 10MW	
500/5 (100:1)	RBU7GEC 160KW	RBU7CNC 400KW	RBU7CRC 500KW	RBU7DGC 2000KW	RBU7DKC 3000KW	RBU7DMC 3500KW	RBU7DNC 4000KW	RBU7DRC 5000KW	RBU7DTC 6000KW	RBU7DTC 6000KW	RBU7BAD 10MW	RBU7BCD 12MW	
600/5 (120:1)	RBU7CHC 240KW	RDR7CRC 500KW	RBU7CTC 600KW	RBU7DHC 2400KW	RA57DMC 3500KW	XGJ7DNC 4000KW	RDR7DRC 5000KW	RBU7DTC 6000KW	RA57DWC 7000KW	RA57DWC 7000KW	RBU7BCD 12MW	RDR7BED 15MW	
800/5 (160:1)	RBU7CLC 320KW	XAG7CTC 600KW	RBU7CYC 800KW	RBU7DLC 3200KW	RDR7DRC 5000KW	RET7DTC 6000KW	XAG7DTC 6000KW	RBU7DYC 8000KW	RDR7BAD 10MW	RDR7BAD 10MW	RBU7FED 16MW	RDR7BGD 20MW	
1000/5 (200:1)	RBU7CNC 400KW	RBU7CYC 800KW	RBU7DAC 1000KW	RBU7DNC 4000KW	RBU7DTC 6000KW	RBU7DWC 7000KW	RBU7DYC 8000KW	RBU7BAD 10MW	RBU7BCD 12MW	RBU7BCD 12MW	RBU7BGD 20MW	RBU7BHD 24MW	
1200/5 (240:1)	RDR7CRC 500KW	RDR7DAC 1000KW	RBU7DCC 1200KW	RDR7DRC 5000KW	RA57DWC 7000KW	XGJ7DYC 8000KW	RDR7BAD 10KW	RBU7BCD 12MW	RDR7BED 15MW	RDR7BED 15MW	RBU7BHD 24MW	RDR7BKD 30MW	
1500/5 (300:1)	RBU7CTC 600KW	RBU7DCC 1200KW	RBU7DEC 1500KW	RBU7DTC 6000KW	RBU7DZC 9000KW	XGJ7BAD 10MW	RBU7BCD 12MW	RBU7BED 15MW	RBU7BFD 18MW	RBU7BFD 18MW	RBU7BKD 30MW	RA57BMD 35MW	
2000/5 (400:1)	RBU7CYC 800KW	RBU7HEC 1600KW	RBU7DGC 2000KW	RBU7DYC 8000KW	RBU7BDC 12MW	RBU7BDD 14MW	RBU7FED 16MW	RBU7BGD 20MW	RBU7BHD 24MW	RBU7BHD 24MW	RBU7BND 40MW	RDR7BRD 50MW	
2500/5 (500:1)	RBU7DAC 1000KW	RBU7DGC 2000KW	RBU7DJC 2500KW	RBU7BAD 10MW	RBU7BED 15MW	RBU7FGD 17.5MW	RBU7BGD 20MW	RBU7BJD 25MW	RBU7BKD 30MW	RBU7BKD 30MW	RBU7BRD 50MW	RBU7BTD 60MW	
3000/5 (600:1)	RBU7DCC 1200KW	RBU7DHC 2400KW	RBU7DKC 3000KW	RBU7BCD 12MW	RBU7BFD 18MW	XGJ7BGD 20MW	RBU7BHD 24MW	RBU7BKD 30MW	RA57BMD 35MW	RA57BMD 35MW	RBU7BTD 60MW	RA57BWD 70MW	
4000/5 (800:1)	RBU7HEC 1600KW	RBU7DLC 3200KW	RBU7DNC 4000KW	RBU7FED 16MW	RBU7BHD 24MW	RET7BKD 30MW	RBU7BLD 32MW	RBU7BND 40MW	RDR7BRD 50MW	RDR7BRD 50MW	RBU7BYD 80MW	RDR7CAD 100MW	
5000/5 (1000:1)	RBU7DGC 2000KW	RBU7DNC 4000KW	RBU7DRC 5000KW	RBU7BGD 20MW	RBU7BKD 30MW	RBU7BMD 35MW	RBU7BND 40MW	RBU7BRD 50MW	RBU7BTD 60MW	RBU7CAD 100MW	RBU7CCD 120MW		



**TABLE IV**

**Varmeter Selector**

For 3-Wire 3-Phase (2-element) Varmeter rated 5A 120V (Zero-Center)

AB-40 Cat. No. 103812A..... Find Digits 8-14 & scale at  
 AB-16 Cat. No. 121812A..... Intersection of C.T. & P.T. Ratios

C.T. RATIO	P.T. RATIO												
	2400/120 (2:1)	480/120 (4:1)	600/120 (5:1)	2400/120 (20:1)	3500/120 (30:1)	4200/120 (35:1)	4800/120 (40:1)	6000/120 (50:1)	7200/120 (60:1)	12000/120 (100:1)	14400/120 (120:1)		
25/5 (5:1)	TAJ7ARC 5KVAR	TAJ7BAC 10KVAR	TAJ7FCC 12.5KVAR	TAJ7BRC 50KVAR	TAJ7BXC 75KVAR	NK7BYC 80KVAR	TAJ7CAC 100KVAR	TAJ7GCC 125KVAR	TAJ7CEC 150KVAR	TAJ7CJC 250KVAR	TAJ7CKC 300KVAR	TAJ7CKC 300KVAR	
50/5 (10:1)	TAJ7BAC 10KVAR	TAJ7BGC 20KVAR	TAJ7BIC 25KVAR	TAJ7CAC 100KVAR	TAJ7CEC 150KVAR	TAJ7GGC 175KVAR	TAJ7CGC 200KVAR	TAJ7GIC 250KVAR	TAJ7CKC 300KVAR	TAJ7CTC 600KVAR	TAJ7CRC 500KVAR	TAJ7CTC 600KVAR	
75/5 (15:1)	TAJ7BEC 15KVAR	TAJ7BKC 30KVAR	WEK7BNC 40KVAR	TAJ7CEC 150KVAR	WEK7GHC 240KVAR	RDH7CJC 250KVAR	TAJ7CKC 300KVAR	WEK7CNC 400KVAR	TAJ7GPC 450KVAR	TAJ7CTC 600KVAR	TAJ7CXC 750KVAR	TAJ7CXC 750KVAR	
100/5 (20:1)	TAJ7BGC 20KVAR	TAJ7BNC 40KVAR	TAJ7BRC 50KVAR	TAJ7CGC 200KVAR	TAJ7CKC 300KVAR	TAJ7CMC 350KVAR	TAJ7CNC 400KVAR	TAJ7CRC 500KVAR	TAJ7CTC 600KVAR	TAJ7CTC 600KVAR	TAJ7DCC 1000KVAR	TAJ7DCC 1000KVAR	
150/5 (30:1)	TAJ7BKC 30KVAR	TAJ7BTC 60KVAR	TAJ7BXC 75KVAR	TAJ7CKC 300KVAR	TAJ7CPC 450KVAR	RDH7CRC 500KVAR	TAJ7CTC 600KVAR	TAJ7CXC 750KVAR	TAJ7CZC 900KVAR	TAJ7DEC 1500KVAR	TAJ7DEC 1500KVAR	TAJ7DEC 1500KVAR	
200/5 (40:1)	TAJ7BNC 40KVAR	TAJ7BYC 80KVAR	TAJ7CAC 100KVAR	TAJ7CNC 400KVAR	TAJ7CTC 600KVAR	TAJ7CWC 700KVAR	TAJ7CYC 800KVAR	TAJ7DAC 1000KVAR	TAJ7DCC 1200KVAR	TAJ7DCC 1200KVAR	TAJ7DCC 1200KVAR	TAJ7DCC 1200KVAR	
250/5 (50:1)	TAJ7BRC 50KVAR	TAJ7CAC 100KVAR	TAJ7GCC 125KVAR	TAJ7CRC 500KVAR	TAJ7CXC 750KVAR	NK7CYC 800KVAR	TAJ7DAC 1000KVAR	TAJ7HCC 1250KVAR	TAJ7DED 1500KVAR	TAJ7DJC 2500KVAR	TAJ7DKC 3000KVAR	TAJ7DKC 3000KVAR	
300/5 (60:1)	TAJ7BTC 60KVAR	TAJ7CCC 120KVAR	TAJ7CEC 150KVAR	TAJ7CTC 600KVAR	TAJ7CZC 900KVAR	RDH7DAC 1000KVAR	TAJ7DCC 1200KVAR	TAJ7DEC 1500KVAR	SAJ7HGC 1750KVAR	TAJ7DKC 3000KVAR	SAJ7DMC 3500KVAR	SAJ7DMC 3500KVAR	
400/5 (80:1)	TAJ7BYC 80KVAR	TAJ7GEC 160KVAR	TAJ7CGC 200KVAR	TAJ7CYC 800KVAR	TAJ7DCC 1200KVAR	WGG7DEC 1500KVAR	TAJ7HEC 1600KVAR	TAJ7DGC 2000KVAR	UFJ7DJC 2500KVAR	TAJ7DNC 4000KVAR	UFJ7ARD 5MVAR	UFJ7ARD 5MVAR	
500/5 (100:1)	TAJ7CAC 100KVAR	TAJ7CGC 200KVAR	TAJ7CIC 250KVAR	TAJ7DAC 1000KVAR	TAJ7DEC 1500KVAR	TAJ7HGC 1750KVAR	TAJ7DGC 2000KVAR	TAJ7DJC 2500KVAR	TAJ7DKC 3000KVAR	TAJ7ARD 5MVAR	TAJ7ATD 6MVAR	TAJ7ATD 6MVAR	
600/5 (120:1)	TAJ7CCC 120KVAR	UFJ7CIC 250KVAR	TAJ7CKC 300KVAR	TAJ7DCC 1200KVAR	SAJ7HGC 1750KVAR	RDH7DGC 2000KVAR	TAJ7DHC 2400KVAR	TAJ7DKC 3000KVAR	SAJ7DMC 3500KVAR	TAJ7ATD 6MVAR	UFJ7AXD 7.5MVAR	UFJ7AXD 7.5MVAR	
800/5 (160:1)	TAJ7GEC 160KVAR	PIB7CKC 300KVAR	TAJ7CNC 400KVAR	TAJ7HEC 1600KVAR	UFJ7DJC 2500KVAR	WGG7DKC 3000KVAR	PIB7DKC 3000KVAR	TAJ7DNC 4000KVAR	UFJ7ARD 5MVAR	TAJ7AYD 8MVAR	UFJ7BAD 10MVAR	UFJ7BAD 10MVAR	
1000/5 (200:1)	TAJ7CGC 200KVAR	TAJ7CNC 400KVAR	TAJ7CRC 500KVAR	TAJ7DGC 2000KVAR	TAJ7DKC 3000KVAR	TAJ7DMC 3500KVAR	TAJ7DNC 4000KVAR	TAJ7ARD 5MVAR	TAJ7ATD 6MVAR	TAJ7BAD 10MVAR	TAJ7BCD 12MVAR	TAJ7BCD 12MVAR	
1200/5 (240:1)	UFJ7CIC 250KVAR	UFJ7CRC 500KVAR	TAJ7CTC 600KVAR	UFJ7DJC 2500KVAR	SAJ7DMC 3500KVAR	RDH7DNC 4000KVAR	UFJ7ARD 5MVAR	TAJ7ATD 6MVAR	UFJ7AXD 7.5MVAR	TAJ7BCD 12MVAR	UFJ7BED 15MVAR	UFJ7BED 15MVAR	
1500/5 (300:1)	TAJ7CKC 300KVAR	TAJ7CTC 600KVAR	TAJ7CXC 750KVAR	TAJ7DKC 3000KVAR	TAJ7DPC 4500KVAR	RDH7ARD 5MVAR	TAJ7ATD 6MVAR	TAJ7AXD 7.5MVAR	TAJ7AZD 9MVAR	TAJ7BED 15MVAR	SAJ7FGD 17.5MVAR	SAJ7FGD 17.5MVAR	
2000/5 (400:1)	TAJ7CNC 400KVAR	TAJ7CYC 800KVAR	TAJ7DAC 1000KVAR	TAJ7DNC 4000KVAR	TAJ7ATD 6MVAR	TAJ7AWD 7MVAR	TAJ7AYD 8MVAR	TAJ7BAD 10MVAR	TAJ7BCD 12MVAR	TAJ7BGD 20MVAR	UFJ7BJD 25MVAR	UFJ7BJD 25MVAR	
2500/5 (500:1)	TAJ7CRC 500KVAR	TAJ7DAC 1000KVAR	TAJ7HCC 1250KVAR	TAJ7ARD 5MVAR	TAJ7AXD 7.5MVAR	NK7AYD 8MVAR	TAJ7BAD 10MVAR	TAJ7FCD 12.5MVAR	TAJ7BED 15MVAR	TAJ7BJD 25MVAR	TAJ7BKD 30MVAR	TAJ7BKD 30MVAR	
3000/5 (600:1)	TAJ7CTC 600KVAR	TAJ7DCC 1200KVAR	TAJ7DEC 1500KVAR	TAJ7ATD 6MVAR	TAJ7AZD 9MVAR	RDH7BAD 10MVAR	TAJ7BCD 12MVAR	TAJ7BED 15MVAR	SAJ7FGD 17.5MVAR	TAJ7BKD 30MVAR	SAJ7BMD 35MVAR	SAJ7BMD 35MVAR	
4000/5 (800:1)	TAJ7CYC 800KVAR	TAJ7HEC 1600KVAR	TAJ7DGC 2000KVAR	TAJ7AYD 8MVAR	TAJ7BCD 12MVAR	WGG7BED 15MVAR	TAJ7FED 16MVAR	TAJ7BGD 20MVAR	TAJ7AZD 9MVAR	TAJ7BND 40MVAR	UFJ7BRD 50MVAR	UFJ7BRD 50MVAR	
5000/5 (1000:1)	TAJ7DAC 1000KVAR	TAJ7DGC 2000KVAR	TAJ7DJC 2500KVAR	TAJ7BAD 10MVAR	TAJ7BED 15MVAR	TAJ7FGD 17.5MVAR	TAJ7BGD 20MVAR	TAJ7BJD 25MVAR	TAJ7BKD 30MVAR	TAJ7BRD 50MVAR	TAJ7BTD 60MVAR	TAJ7BTD 60MVAR	



## Optional Features for AB/DB 40, AB/DB 16

### Scales

1. Uncalibrated
2. Special marked scales
3. Special legends
4. Colored markings, lines or arcs other than black.
5. Fine line marking (approximately twice the normal calibration marks — maximum 150 calibration marks
6. Black scale — white markings
7. a) Double set of numbers — Single set of divisions  
b) Triple set of numbers — Single set of divisions
8. a) Double set of numbers — Double set of divisions  
b) Triple set of numbers — Double set of divisions
9. Zero-center scales — DC ammeters, DC milliammeters, DC voltmeters, AC wattmeters and varmeters. Not available for AC ammeters, voltmeters
10. Offset-zero scale — Available for varmeters, AC wattmeters, DC ammeters and DC voltmeters

### Ratings and Calibration

11. Special calibration in accordance with data supplied by customers
12. Calibration at any angle other than vertical — Specify angle.  
Note: DC instruments can be used up to a 30° tilt from vertical without additional error
13. Terminal resistance and/or tolerance other than standard tolerance (±15%)
14. Special sensitivities for DC taut-band voltmeters. Standard sensitivities are:  
zero-left: 1000 ohms/volts  
zero-center: 2000 ohms/volts
15. Special frequency calibration
  - a) Any frequency 25 to 400 Hertz.
  - b) Over 400 Hertz, consult factory.
 Note: Does not apply to temperature indicators

16. Double-rated voltmeters and ammeters (includes double-marked scale if required). Double ratings should be chosen to allow a single set of divisions whenever possible. AC ammeters can have double rating only when one current is double the other (e.g., 2.5/5 amperes)  
Double-rated DC ammeters are not recommended
17. Wattmeters & varmeters with current coils rated other than 5 amperes.
18. Accuracy other than listed
19. Suppressed zero — Maximum suppression 20% of scale.

### Construction

20. Weathertight case (standard on metal case AB/DB-40, no adder. Not available on AB/DB-16 models)
21. Red manual-set pointer(s) 1 or 2 (AB/DB-40 only). Adjustable over entire scale from the front of the instrument
22. Anti-glare window AB/DB-40 only
23. Wooden-box packaging for export shipping
24. Tagging Dymotape or Paper
25. Optional extra-short case (overall depth 3.41") for metal case amps and volts only.

### Standard Scale Legends

AC Volts or Kilovolts	% KW	LBS
AC Amperes, or Kiloamperes	Hz	PSIG
AC Watts, Kilowatts or Megawatts	FPS	GPH
Vars, Kilovars or Megavars	KPS	PSIA
Synchroscope	YPS	IPS
Power Factor	CPM	PPS
Hertz	FPM	RPM
Phase Angle	IPM	GPM
DC Volts, or Kilovolts	KPM	In. H <sub>2</sub> O
or Milliamperes	RPM	
DC Watts or Kilowatts	YPM	
Percent-Motor-Load Current	CPH	
Percent Horsepower	FPH	
Degrees C	IPH	
Degrees F	KPH	
Degrees K	MPH	
Degrees R	RPH	
Kilo-Ohms	YPH	
Horsepower	PPH	
Percent	PSI	
Percent Load		
VA. In HG		

The words "Spindle," "Table," "Roll," "Motor," "Turbine" can be added to the above at no extra cost. Also, when necessary, the multipliers, "X-10," "X-100," or "X-1000" will be added to these legends.

## SWITCHBOARD INSTRUMENTS

### Minimum and Maximum Ratings For AB/DB 40, AB/DB 16

Indicator	Type	Minimum	Maximum
AC Voltmeter	RMS rectifier	25 Hertz 50 Volts	1000 Hertz 750 Volts
	Rectifier	25 Hertz 8 Volts	3000 Hertz 750 Volts
AC Ammeter	RMS rectifier	25 Hertz 0.3 Ampere	1000 Hertz 30 Amperes
AC Milliammeter	RMS rectifier	25 Hertz 300 Milliampere	1000 Hertz 1000 Milliampere
	Rectifier	25 Hertz 0.5 Milliampere	3000 Hertz 100 Milliampere
AC Wattmeter 1-phase 2-wire	Single Phase	25 Hertz 380 CW*† 190-0-190 CW*† 69 Volts 1 Ampere	1000 Hertz 760 CW*† 600 Volts 10 Amperes
		25 Hertz 380 CW*† 190-0-190 CW*† 69 Volts 1 Ampere	1000 Hertz 760 CW*† 600 Volts 10 Amperes
AC Wattmeter 3-phase 3-wire	Polyphase Voltage Unbalanced	25 Hertz 380 CW*† 190-0-190 CW*† 69 Volts 1 Ampere	1000 Hertz 760 CW*† 600 Volts 10 Amperes
	3-phase 4-wire Voltage Balanced	25 Hertz 380 CW*† 190-0-190 CW*† 69 Volts 1 Ampere	1000 Hertz 760 CW*† 600 Volts 10 Amperes
AC Varmeter 1-phase 2-wire	Single Phase	25 Hertz 380 CW*† 190-0-190 CW*† 69 Volts 1 Ampere	1000 Hertz 760 CW*† 600 Volts 10 Amperes
		25 Hertz 658 CW*† 329-0-329 CW*† 69 Volts 1 Ampere	1000 Hertz 1316 CW*† 600 Volts 10 Amperes
AC Varmeter 3-phase 3-wire	Polyphase Voltage Balanced	25 Hertz 760 CW*† 380-0-380 CW*† 69 Volts 1 Ampere	1000 Hertz 1520 CW*† 600 Volts 10 Amperes
	3-phase 4-wire Voltage Balanced	25 Hertz 760 CW*† 380-0-380 CW*† 69 Volts 1 Ampere	1000 Hertz 1520 CW*† 600 Volts 10 Amperes
Frequency Meter		2 Hertz Span	
Synchroscope		50 Hertz	400 Hertz
Power-factor Meter 1-phase 2-wire	Single Phase	60 Hertz 120 Volts 0.1 Amperes	60 Hertz 240 Volts 5 Amperes
		60 Hertz 120 Volts 5 Amperes	60 Hertz 240 Volts 5 Amperes
Power-factor Meter 3-phase, 3-wire 3-phase, 4-wire	Polyphase Unbalanced Systems	25 Hertz 120 Volts 0.1 Amperes	400 Hertz 600 Volts 5 Amperes
	Polyphase Balanced System	25 Hertz 120 Volts 0.1 Amperes	400 Hertz 600 Volts 5 Amperes
AC Ground Detector		25 Hertz 50 Volts	1000 Hertz 750 Volts
DC Millivoltmeter		50 Millivolts 200 Ohm/Volt	1000 Millivolts 5000 Ohm/Volt
DC Voltmeter		1 Volt 200 Ohm/Volt	750 Volts 5000 Ohm/Volt
DC Microammeter		Microamperes: DB-40-200 DB-16-300	1000 Microamperes
DC Milliammeter		1 Milliampere	1000 Milliampere
DC Ammeter		1 Ampere	30 Amperes
	Shunt-rated	50 Millivolts	1000 Millivolts
DC Ground Detector		50 Millivolts 200 Ohms/Volts	750 Volts 5000 Ohms/Volts
Temperature 120 Volts 50-600 Hertz		180 F } Span 100 C }	250 F } Span 140 C }
		10 Ohms } cu. { —100F — 73 C	+260 F +127 C

† Calibrating watts

\*Applies only to 120-volt/5-ampere models; other ratings in proportion.

## Specifications, Burden Data — AC Meters

Type	Impedance in Ohms	Effective Resistance in Ohms	Inductance in Henries or Capacitance in Microfarads	Volt-amperes	Watts	Reactive Volt-amperes	Power Factor
<b>120-Volt, 60-Hertz Potential Circuit</b>							
Voltmeters, AB-16/40 .....	28,100	28,100	0	0.51	0.51	0	1.0
Expanded-scale Voltmeters .....	15,400	15,400	0	0.94	0.94	0	1.0
Single phase Wattmeters* AB-16/40 .....	6,920	4,460	14H	2.08	1.34	1.59	0.64 (Lagging)
Polyphase Wattmeters* AB-16/40 Terminal #6 to #8 on 3W 3P ... } Terminal #8 to #11 on 4W 3P ... } Terminal #2 to #8 on 3 W 3P ... } Terminal #3 to #11 on 4W 3P ... }	7,250	4,370	15H	2.0	1.2	1.6	0.6 (Lagging)
Power Factor Meters, AB-16/40 Single-phase .....	105,000	105,000	0	0.14	0.14	0	1.0
Three-phase { Terminal .....	18,320	4,660	0.15μF	0.79	0.20	0.76	0.26 (Leading)
{ #2 to #5 .....	above 10MΩ	above 10MΩ	—	0	0	0	—
{ #3 to #5 .....	above 10MΩ	above 10MΩ	—	0	0	0	—
{ #2 to #3 .....	21,200	21,200	0	0.68	0.68	0	1.0
Frequency Meters, AB-16/40 55-65, 50-70, 58-62, 45-55 .....	9,370	9,370	0	1.54	1.54	0	1.0
350-450 .....	9,470	9,470	0	1.52	1.52	0	1.0
Synchroscope, Running .....	2,750	2,690	1.6H	5.2	5.1	0.2	0.98 (Lagging)
Incoming .....	2,570	2,160	3.7μF	5.6	4.7	3.0	0.84 (Leading)
<b>5-Ampere, 60-Hertz Current Circuit</b>							
Ammeters, AB 16/40 .....	0.013	0.013	0	0.32	0.32	0	1.0
Single and Polyphase Wattmeters*, AB-16/40 .....	0.018	0.018	0	0.43	0.43	0	1.0
Single and Polyphase Varmeters*, AB-16/40 .....	0.018	0.018	0	0.43	0.43	0	1.0
Single and Polyphase Power Factor Meters .....	0.036	0.036	0	0.91	0.91	0	1.0

\*Data based on a per-element basis

## Specifications, Burden Data — DC Meters

### DC Voltmeters

Rating (Volts)	Sensitivity (Ohms Per Volt)	
	DB-40	DB-16
From 15 To 750	1,000 Zero Left	1,000 Zero Left
	2,000 Zero Center	2,000 Zero Center

### DC Millivoltmeters

Rating (mV)	Calibrated for 2-way Lead Resistance of 0.05 Ohms as standard**	Ohms Terminal Resistance ± 15%	
		DB-40	DB-16
0-50	0.05	25	25
50-0-50	0.05	50	50
0-100	0.05	50	50
100-0-100	0.05	100	100

### DC Ammeters

Rating (Amperes)	Ohms Terminal Resistance ± 15%	
	DB-40	DB-16
0-1	0.05	0.05
0-5	0.01	0.01
0-10	0.005	0.005
0-15	0.0033	0.0033
0-20	0.0025	0.0025
0-30	0.0017	0.0017

### DC Milliammeters

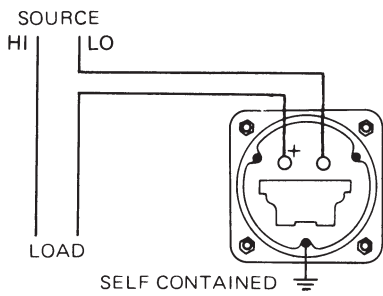
Rating (mA)	Ohms Terminal Resistance ± 15%	
	DB-40	DB-16
0-1	185	185
0-2	18	18
0-5	10	10
0-10	5	5
0-30	1.7	1.7
0-50	1	1
0-100	0.5	0.5
0-200	0.25	0.25
0-300	0.17	0.17
0-500	0.1	0.1
10-50	12.5	12.5
4-20	6	6
1-5	26.5	26.5

### DC Microammeters

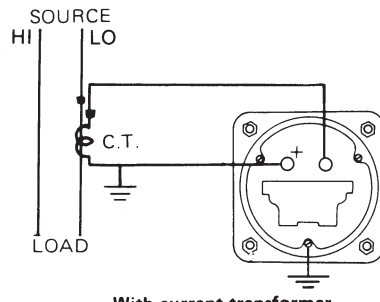
Rating (μA)	Ohms Terminal Resistance ± 15%	
	DB-40	DB-16
0-200	1,600	1,600
0-300	1,050	1,050
0-500	630	630

\*\*Internal lead adjustment potentiometer can be adjusted for other lead resistances

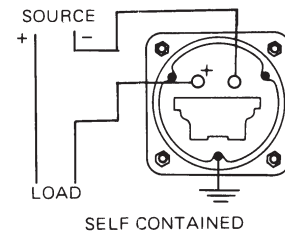
Standard Connections



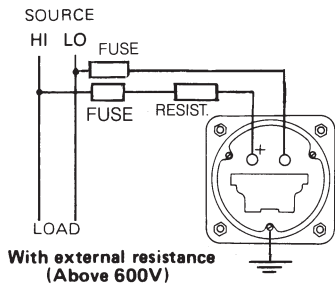
**AC Ammeter**  
103131xxxx



With current transformer  
**AC Ammeter**  
103131xxxx

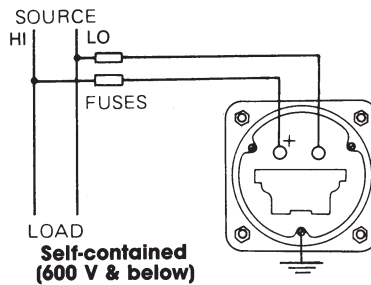


**DC Ammeter**  
10311-xxxx



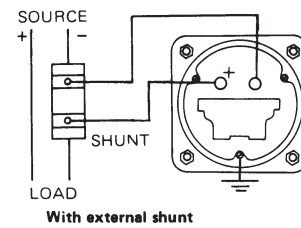
With external resistance  
(Above 600V)

**AC Voltmeter**  
103021xxxx7xxx



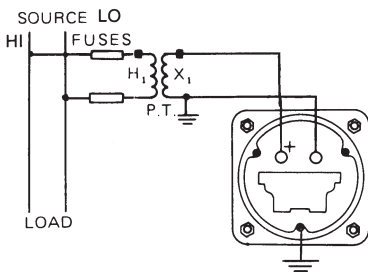
Self-contained  
(600 V & below)

**AC Voltmeter**  
103021xxxx



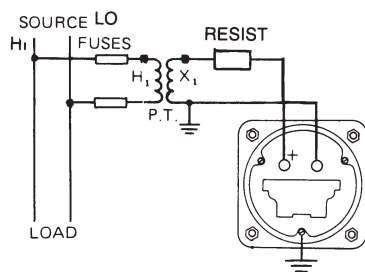
With external shunt

**DC Ammeter**  
10312-xxxx



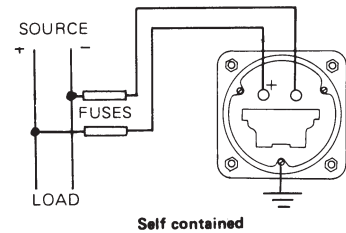
With potential transformer

**AC Voltmeter**  
103021xxxx



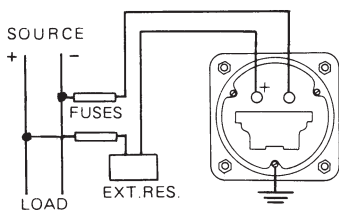
With potential transformer &  
external resistor

**AC Voltmeter**  
103021xxxx7xxx



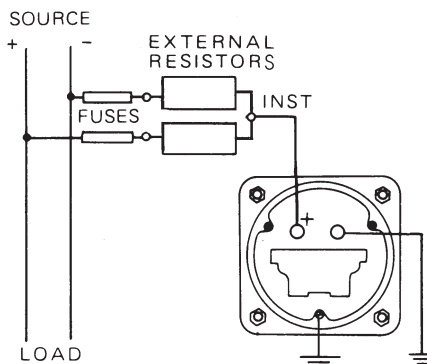
Self contained

**DC Voltmeter**  
10301-xxxx

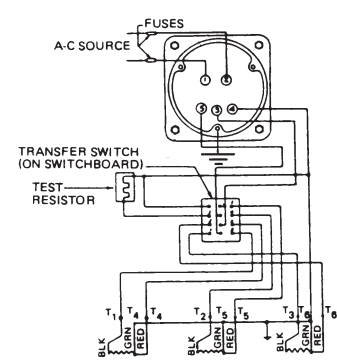


With external resistor

**DC Voltmeter**  
10317-xxxx  
10311-xxxx



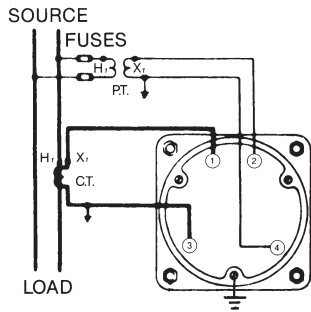
**DC Ground Detector**



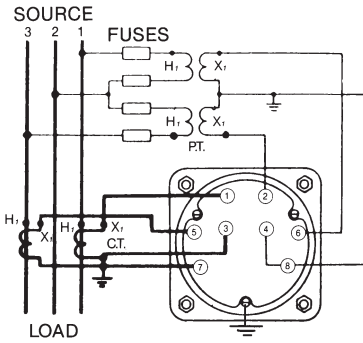
**Temperature Indicator**  
103502xxxx

NOTE: UL requires a separate grounding terminal that is provided above a ground symbol (  $\equiv$  ).  
Connection diagrams for AB/DB16 and AB/DB14 Ammeters and Voltmeters are same as AB/DB40 depicted above.

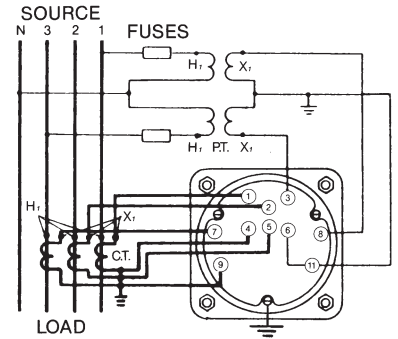
Standard Connections



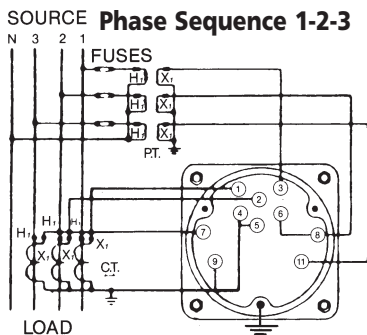
**Single-phase wattmeter and Varmeter with current transformer and potential transformer**  
 10321-xxxx7xxx (watt)  
 103702xxxx7xxx (watt)  
 10331-xxxx7xxx (var)  
 103762xxxx7xxx (var)



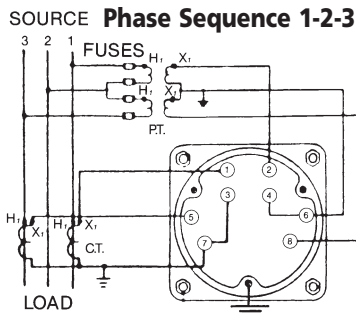
**Three-wire, three-phase wattmeter with current transformer and potential transformer**  
 10322-xxxx7xxx  
 103712xxxx7xxx



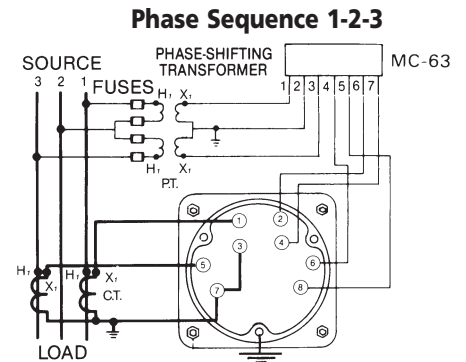
**Four-wire, three-phase wattmeter with current transformer and potential transformer (Balanced V)**  
 10325-xxxx7xxx  
 103732xxxx7xxx



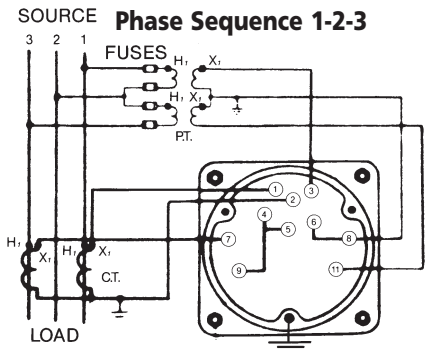
**Connections for 2 1/2 element varmeter, without phase shifting transformer; used to measure vars on 4 wire, 3 phase circuits, with potential transformers (connected yy) and three current transformers: (Balanced V)**  
 10329-xxxx7xxx, K = 1.1547  
 103742xxxx7xxx  
 See Note 1. Page 12



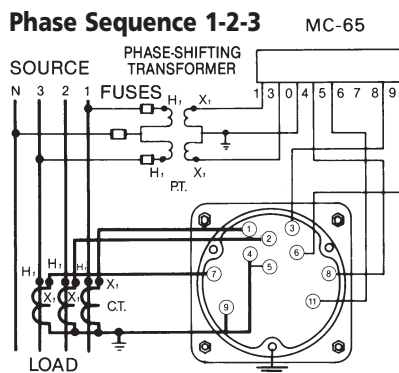
**Connections for polyphase varmeters for 3 wire, 3 phase. (Balanced V)**  
 103812xxxx7xxx  
 10328-xxxx7xxx



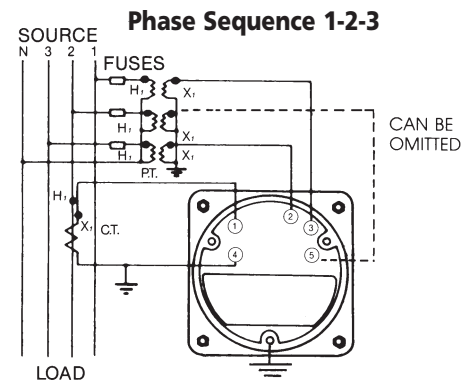
**Connections for 3 wire, 3 phase varmeter with phase shifting transformer. (Balanced V)**  
 10332-xxxx7xxx  
 103772xxxx7xxx



**Connections for 2 1/2 element varmeter used to measure vars on a 3 wire, 3 phase circuit. (Balanced V)**  
 10329-xxxx7xxx K = 1.1547  
 103742xxxx7xxx



**Connections for 4 wire, 3 phase varmeter with phase shifting transformer. (Balanced V)**  
 10334-xxxx7xxx  
 103792xxxx7xxx

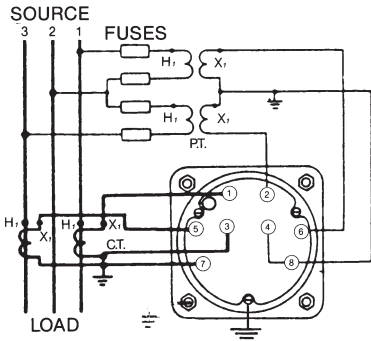


**Connections for power-factor meters with 4 wire 3 phase circuits with current transformer and potential transformers. If transformer secondary voltage is 120, power-factor instrument should be rated 208 volts. (Balanced System)**  
 103402xxxx

NOTE: UL requires a separate grounding terminal that is provided above a ground symbol (  $\equiv$  ).

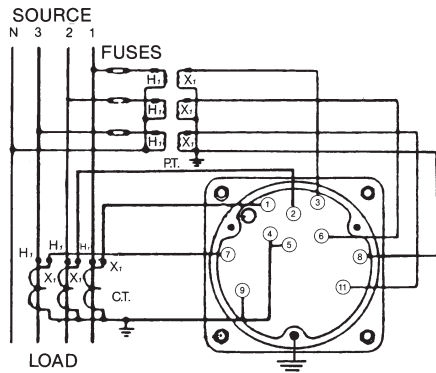
Standard Connections

Phase Sequence 1-2-3

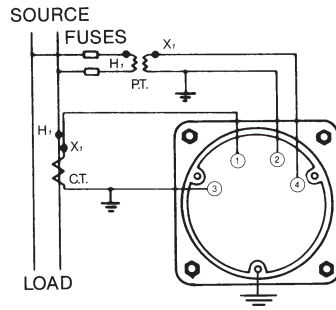


Three-wire, Three-phase Power Factor meter with current transformers and potential transformers. (Unbalanced system) 103462xxxx

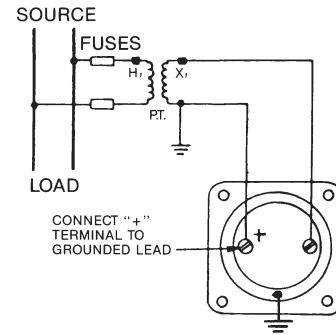
Phase Sequence 1-2-3



Four wire, three phase power factor meter with current transformers and potential transformers (Unbalanced System) 103472xxxx

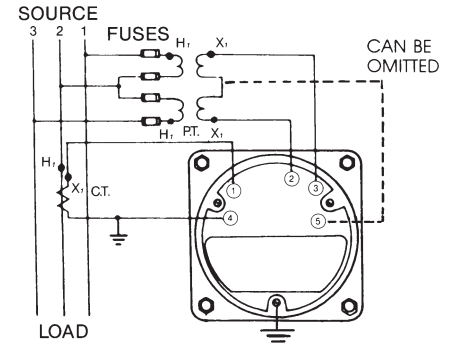


Single-phase power-factor meter with current transformer and potential transformer 103412xxxx

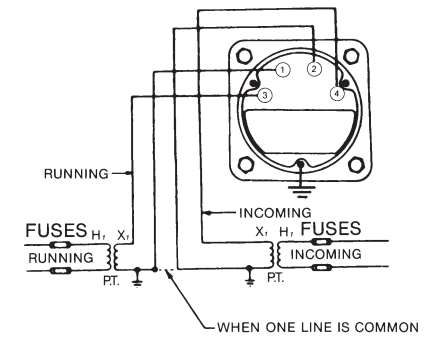


Frequency Meter with potential transformer 103372xxxx

Phase Sequence 1-2-3



Three-wire, three-phase power-factor meter with current transformer and potential transformers (Balanced System) 103402xxxx

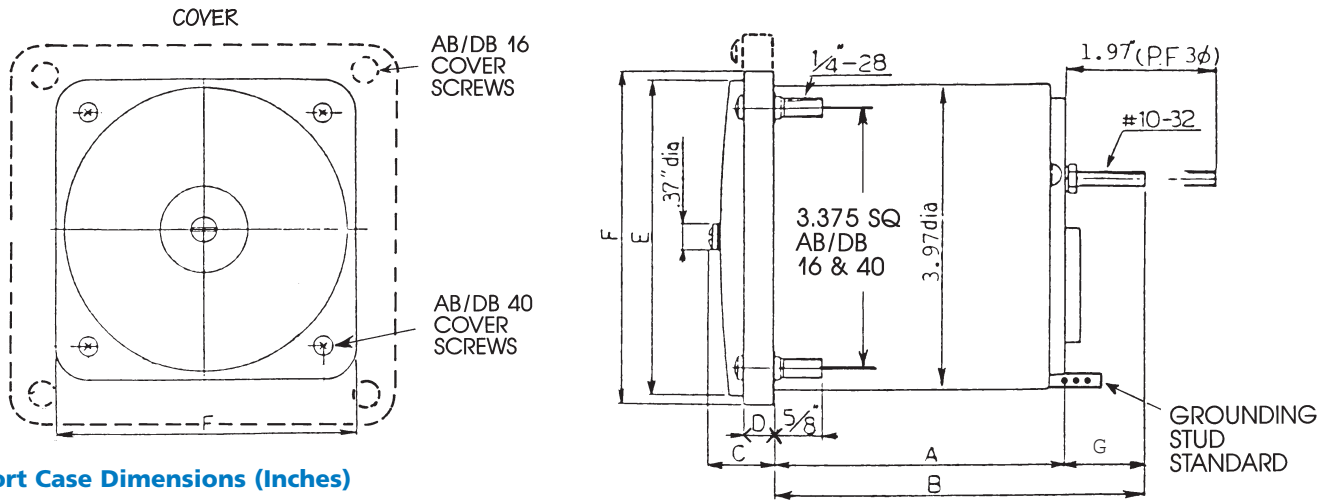


Synchroscope with potential transformers 106452xxxx

NOTE: UL requires a separate grounding terminal that is provided above a ground symbol ( ≡ ).

## Dimensions and Panel Drilling For AB/DB 16 & AB/DB 40 (Metal Case)

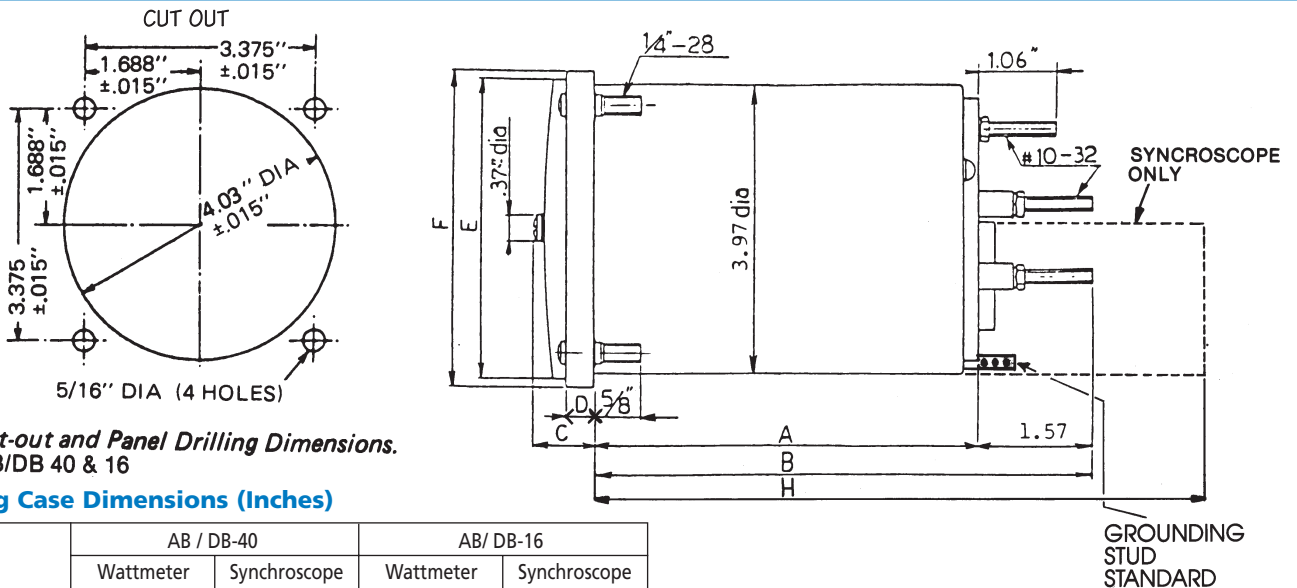
Short Case



Short Case Dimensions (Inches)

	AB / DB-40			AB / DB-16	
	AC V/A—DC V/A Frequency Temperature Tachometer	AC V/A—DC V/A Extra Short Case	Power Factor 1φ (3φ3w/4w)	AC V/A—DC V/A Frequency Temperature Tachometer	Power Factor 1φ (3φ3w/4w)
A	3.79	2.89	3.79	3.75	3.75
B	4.85	3.41	4.85 (5.76)	4.81	4.81 (5.72)
C	0.86	0.86	0.86	0.88	0.88
D	0.32	0.32	0.32	0.38	0.38
E	4.09	4.09	4.09	8.20	8.20
F	4.33	4.33	4.33	8.69	8.69
G	1.06	0.52	1.06	1.06	1.06

Long Case



Cut-out and Panel Drilling Dimensions.  
AB/DB 40 & 16

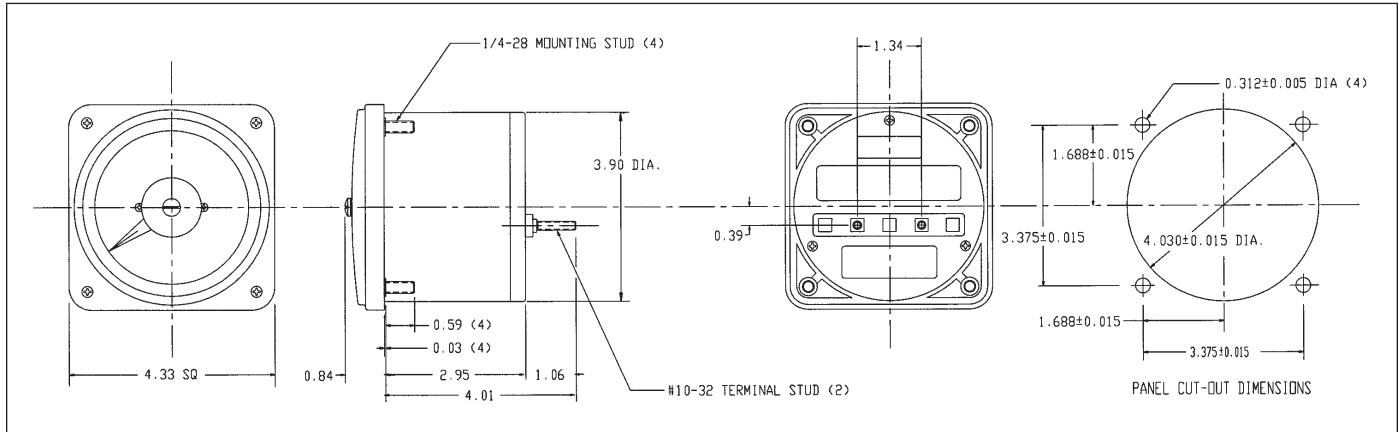
Long Case Dimensions (Inches)

	AB / DB-40		AB / DB-16	
	Wattmeter Varmeter*	Synchroscope	Wattmeter Varmeter	Synchroscope
A	5.22	5.22	5.19	5.19
B	6.79	6.29	6.76	6.25
C	0.86	0.86	0.88	0.88
D	0.32	0.32	0.38	0.38
E	4.09	4.09	8.20	8.20
F	4.33	4.33	8.69	8.69
H	—	8.06	—	8.03

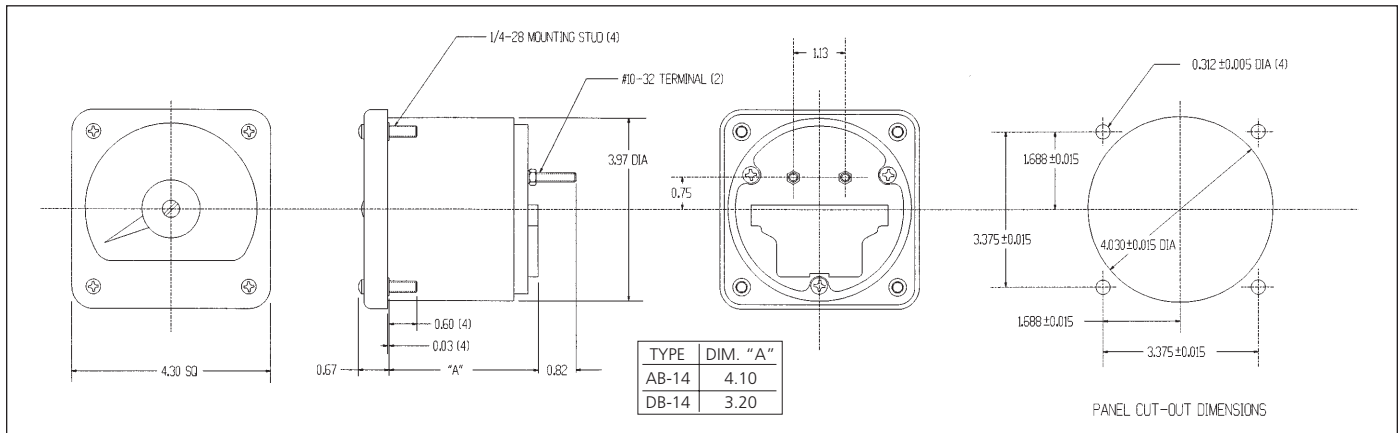
\*Short case dimensions in first column above apply to varmeter for use with external phase shifters (10332—, 10377—, 10334—, 10379—.)

DIMENSIONS AND PANEL DRILLING

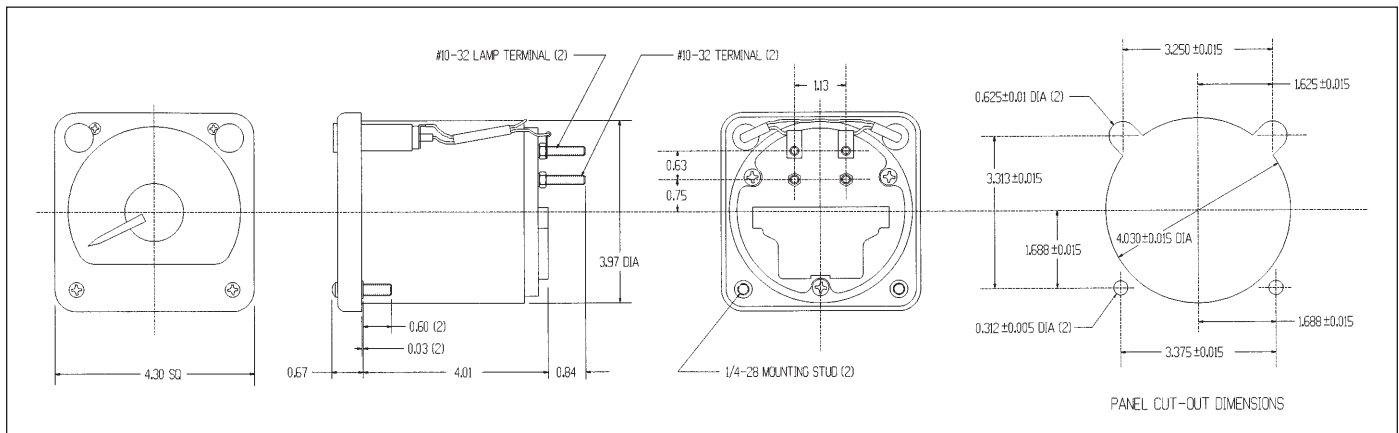
Plastic case AB / DB40 Ammeters and Voltmeters



High shock AB / DB14 Ammeters and Voltmeters



Illuminated AB / DB17 Railroad type Ammeters and Voltmeters





# SWITCHBOARD INSTRUMENTS

## DC AMMETERS D'ARSONVAL TYPE

Scale and Rating	Terminal Resistance, Ohms	±1.5% Accuracy Vertical	±1.5% Accuracy Horizontal
------------------	---------------------------	-------------------------	---------------------------

## DC AMMETERS — SELF-CONTAINED

0-50µA	4735	180 113 CYCY	180 111 CYCY
0-100µA	1480	180 113 DRDR	180 111 DRDR
0-200µA	650	180 113 EAEA	180 111 EAEA
0-500µA	226	180 113 EMEM	180 111 EMEM
0-800µA	562	180 113 EWEW	180 111 EWEW
0-1 mA	40	180 113 FAFA	180 111 FAFA
0-2 mA	20	180 113 FGFG	180 111 FGFG
0-5 mA	10	180 113 FXFX	180 111 FXFX
0-10 mA	5.0	180 113 GZGZ	180 111 GZGZ
0-50 mA	1.0	180 113 HYHY	180 111 HYHY
0-100 mA	0.5	180 113 JRJR	180 111 JRJR
0-200 mA	0.25	180 113 KAKA	180 111 KAKA
0-500 mA	0.10	180 113 KMKM	180 111 KMKM
0-800 mA	0.062	180 113 KWKW	180 111 KWKW
0-1 A	0.05	180 113 LALA	180 111 LALA
0-2 A	0.025	180 113 LELE	180 111 LELE
0-5 A	0.010	180 113 LSLS	180 111 LSLS
0-10 A	0.005	180 113 MTMT	180 111 MTMT
0-15 A	0.003	180 113 NDND	180 111 NDND
0-20 A	0.0025	180 113 NGNG	180 111 NGNG
0-30 A	0.00167	180 113 NLNL	180 111 NLNL
0-40 A	0.00125	180 113 NPNP	180 111 NPNP
0-50 A	0.001	180 113 NTNT	180 111 NTNT

## DC AMMETERS — SHUNT-RATED 50 MV

(Lead Resistance = .05Ω-.07Ω)

0-10 A	12.5	180 123 ECMT	180 121 ECMT
0-20 A	12.5	180 123 ECNG	180 121 ECNG
0-30 A	12.5	180 123 ECNL	180 121 ECNL
0-40 A	12.5	180 123 ECNP	180 121 ECNP
0-60 A	12.5	180 123 ECNW	180 121 ECNW
0-80 A	12.5	180 123 ECPD	180 121 ECPD
0-100 A	12.5	180 123 ECPK	180 121 ECPK
0-200 A	12.5	180 123 ECRL	180 121 ECRL
0-300 A	12.5	180 123 ECRX	180 121 ECRX
0-400 A	12.5	180 123 ECSC	180 121 ECSC
0-500 A	12.5	180 123 ECSF	180 121 ECSF
0-600 A	12.5	180 123 ECSJ	180 121 ECSJ
0-800 A	12.5	180 123 ECSN	180 121 ECSN
0-1 kA	12.5	180 123 ECVA	180 121 ECVA
0-50 mV	12.5	180 123 EC†	180 121 EC†
50-0-50 mV	25	180 124 EC†	180 122 EC†

† Order by Description.

## DC AMMETERS — SHUNT-RATED 100 MV

(Lead Resistance = .04Ω-.08Ω)

0-100mV	25	180 123 GB†	180 121 GB†
100-0-100mV	50	180 124 GB†	180 122 GB†

† Order by Description.

## DC MILLIAMMETERS — MECHANICALLY ZERO-SUPPRESSED, LIVE-ZERO, SELF-CONTAINED

(To read output of process transmitters, blank legend)

Rating	Scale	±2% Accuracy Vertical	±2% Accuracy Horizontal
1-5 mA	§	180 183 FYAA 8ABA	180 181 FYAA 8ABA
4-20mA	§	180 183 HEAA 8ABA	180 181 HEAA 8ABA
10-50mA	§	180 183 HXAA 8ABA	180 181 HXAA 8ABA

§ Pencil calibrated points at .25%, 50%, 75%, 100% of full-scale position

## DC VOLTMETERS — SELF CONTAINED

Scale and Rating	Terminal Resistance, Ohms	±1.5% Accuracy Vertical	±1.5% Accuracy Horizontal
0-1 V	1000	180 013 LALA	180 011 LALA
0-5 V	5000	180 013 LSLS	180 011 LSLS
0-15 V	15000	180 013 NDND	180 011 NDND
0-30 V	30000	180 013 NLNL	180 011 NLNL
0-50 V	50000	180 013 NTNT	180 011 NTNT
0-80 V	80000	180 013 PDPD	180 011 PDPD
0-150 V	150000	180 013 PZPZ	180 011 PZPZ
0-300 V	300000	180 013 RXRX	180 011 RXRX
0-600 V	600000	180 013 SJSJ	180 011 SJSJ
150-0-150 V	150000	180 014 PZPZ	180 012 PZPZ
300-0-300 V	300000	180 014 RXRX	180 012 RXRX

## AC AMMETERS — 40/70 HZ, IRON-VANE TYPE

Scale	Transformer Rating	±2% Accuracy Vertical	±1.5% Accuracy Horizontal
0-1 A	Self-Contained	180 143 LALA	180 141 LALA
0-3 A		180 143 LJLJ	180 141 LJLJ
0-5 A		180 143 LSLS	180 141 LSLS
0-10 A		180 143 MTMT	180 141 MTMT
0-15 A		180 143 NDND	180 141 NDND
0-20 A		180 143 NGNG	180 141 NGNG
0-30 A		180 143 NLNL	180 141 NLNL
0-50 A		180 143 NTNT	180 141 NTNT

## AC AMMETERS — TRANSFORMER-RATED - 5 AMP

0-10 A	10/5	180 143 LSMT	180 141 LSMT
0-15 A	15/5	180 143 LSND	180 141 LSND
0-20 A	20/5	180 143 LSNG	180 141 LSNG
0-25 A	25/5	180 143 LSNJ	180 141 LSNJ
0-30 A	30/5	180 143 LSNL	180 141 LSNL
0-40 A	40/5	180 143 LSNP	180 141 LSNP
0-50 A	50/5	180 143 LSNT	180 141 LSNT
0-75 A	75/5	180 143 LSPB	180 141 LSPB
0-100 A	100/5	180 143 LSPK	180 141 LSPK
0-150 A	150/5	180 143 LSPZ	180 141 LSPZ
0-200 A	200/5	180 143 LSRL	180 141 LSRL
0-300 A	300/5	180 143 LSRX	180 141 LSRX
0-400 A	400/5	180 143 LSSC	180 141 LSSC
0-500 A	500/5	180 143 LSSF	180 141 LSSF
0-600 A	600/5	180 143 LSSJ	180 141 LSSJ
0-800 A	800/5	180 143 LSSN	180 141 LSSN
0-1 kA	1000/5	180 143 LSVA	180 141 LSVA
0-1.2 kA	1200/5	180 143 LSVB	180 141 LSVB
0-1.5 kA	1500/5	180 143 L SVC	180 141 L SVC
0-2 kA	2000/5	180 143 LSVE	180 141 LSVE
0-3 kA	3000/5	180 143 LSVJ	180 141 LSVJ
0-4 kA	4000/5	180 143 LSVN	180 141 LSVN

## AC VOLTMETERS — 60 HZ, IRON-VANE

0-150 V	Self-Contained	180 033 PZPZ	180 031 PZPZ
0-300 V		180 033 RXRX	180 031 RXRX
0-500 V		180 033 SFSF	180 031 SFSF
0-600 V		180 033 SJSJ	180 031 SJSJ

## AC VOLTMETERS — TRANSFORMER RATED 150 V

0-300 V	240/120	180 033 PZRX	180 031 PZRX
0-600 V	480/120	180 033 PZSJ	180 031 PZSJ
0-750 V	600/120	180 033 PZSM	180 031 PZSM
0-3 kV	2400/120	180 033 PZVJ	180 031 PZVJ
0-5.25 kV	4200/120	180 033 PZVV	180 031 PZVV
0-6 kV	4800/120	180 033 PZVX	180 031 PZVX
0-9 kV	7200/120	180 033 PZWJ	180 031 PZWJ
0-15 kV	12000/120	180 033 PZWZ	180 031 PZWZ
0-18 kV	14400/120	180 033 PZXE	180 031 PZXE

## Type 180 Optional Features

### Scale Variations

1. Blank Scales
2. Special marked scales (maximum 100 divisions; Ref. Notes 3 and 4)
3. Special Legends (Ref. Notes 3 and 4)
4. Colored markings, lines, bars, etc.
5. Black scale with white markings
6. Zero-center Scale DC instruments

### Ratings and Calibration

7. Unlisted ratings. Contact factory for other than listed ratings.
8. Offset-zero scale (DC meters only)
9. Special calibrations in accordance with data supplied by customer
10. Calibration for use on other than vertical panel
11. Calibration for use on 400 Hertz or other unlisted frequency.
12. High-sensitivity voltmeters (See Note 2)
13. Special-terminal resistance
14. Internal mounted rheostat
15. Rectifier-type voltmeters 2.5 percent.
16. 1 percent accuracy (DC only)
17. Suppressed zero with operable zero set (DC only) (See Note 1)

### Construction

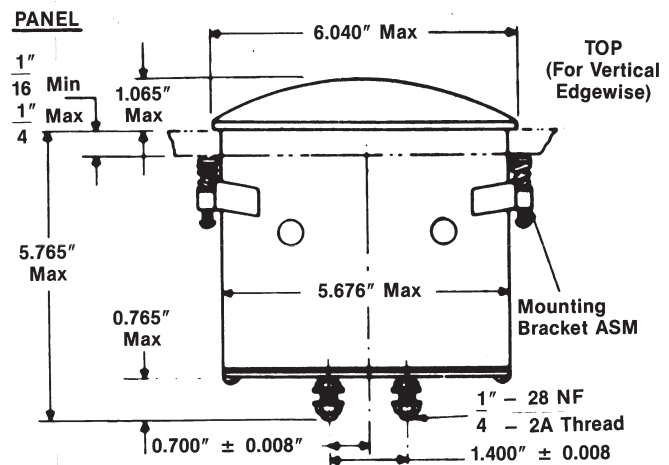
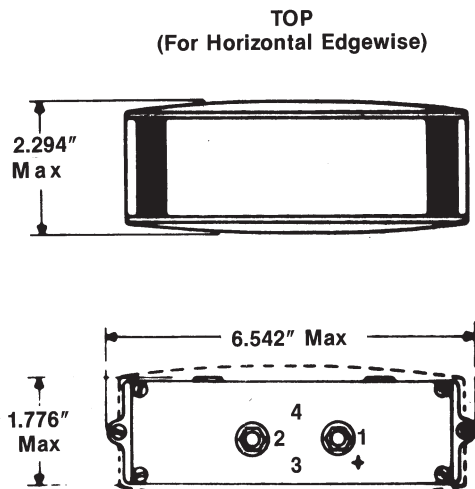
18. Internal illumination
19. Red pointer (Day-glo)
20. Anti-glare window
21. Black trim case
22. Component mark for Canada. Add "/CSA" to suffix of catalog number.

4. Type 180 scales and legends are individual parts separated by a space for the pointer. Only one set of divisions can be marked on a scale.
5. No charge for electrical legends.

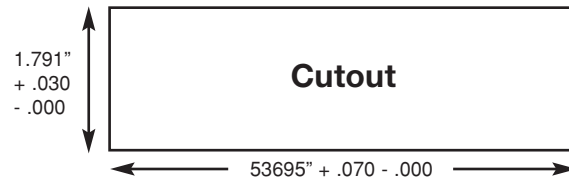
### Notes:

1. Suppressed zero — Available only on DC models up to a maximum suppression of 20 percent of full-scale value. Note: Accuracy is affected on suppressed-zero instruments.
2. High-sensitivity voltmeters — DC voltmeters can be offered up to 20,000 ohms/volt. Voltmeters of high sensitivity draw less current from the circuit and are used on applications where the circuit current is so low that instrument resistance will appreciably affect circuit operation.
3. Special legends and/or scales may be obtained by special order. Maximum number of letters (counting spaces as letters) on vertical instruments is 25; on horizontal instruments, 30. Exact wording must be clearly indicated as to spelling, abbreviation, spacing, etc.

## Dimensions and Panel Cutout



### DIMENSIONS FOR TYPE 180 INSTRUMENTS DWG B3147K22



## Miniature Switchboard Instruments — 2180A Series

### GENERAL SPECIFICATIONS

Full Scale Deflection: 250° taut band movement

Full Scale Length: Approx. 140mm (5.5")

Pointer: Sword type, black

Scale Plate: Platform type, white

Case: ABS resin, black

Cover: Methacrylic acid resin with antistatic processing on both sides.

Standard color . . . Black (Munsell N. 1.5/0) or jade green

(Munsell 7.5 BG4/1.5)

Terminal Plate: Phenol resin, black

Mounting Screw: 5mm dia.

Measuring Terminal: 5mm dia (nut type)

Operating Temperature Range: 0 to 40° C (32 to 104° F)

Storage Temperature Range: -10 to 50° C (14 to 122° F)

Dielectric Strength: 2,600 V AC for one minute between electric circuit and case

Watts, Vars, Unbalanced Power Factor supplied with external transducer.

Model Type		Ranges Available	Standard Ratings and Scales	Catalog Number	Operating Principle	Accuracy
DC	Ammeters	500µA ~ 30A	See Table On Next Page	2181A00	Moving coil type	±1.5% of full scale value
	Voltmeters	30V ~ 300V		2181A00		
AC	Ammeters	500µA ~ 30A		2182A00	RMS sensing transducer type	±1.5% of full scale value
	Voltmeters	3V ~ 600V		2182A00		

Type	Rating	Connection	Voltage	Elements	Catalog Number	Operating Principle	Accuracy
			Load Current				
AC	Wattmeters	Single-phase		1	2185A31	Feedback Time Division Multiplier Transducer*	±1.5% of full scale value
		3-phase 3-wire	Unrestricted	2	2185A35		
			Unrestricted				
		3-phase 4-wire	Balanced	2-1/2	2185A34		
			Unrestricted				
		3-phase 4-wire	Unrestricted	3	2185A36		
	Unrestricted						
	Varmeters	Single-phase		1	2186A31		±1.5% of full scale value
		3-phase 3-wire	Balanced	2	2186A33		
			Unrestricted				
		3-phase 3-wire	Unrestricted	2	2186A35		
			Unrestricted				
		3-phase 4-wire	Balanced	2-1/2	2186A34		
	Unrestricted						
3-phase 4-wire	Unrestricted	3	2186A36				
	Unrestricted						
Power Factor Meters	120V/5A or 240V/5A	Single-phase		1	2187A31	Phase angle sensing transducer	±5.0% of Scale Length
		3-phase 3-wire	Balanced	1	2187A33		
			Unrestricted				
		3-phase 3 wire	Unrestricted	2	2187A35		
Unrestricted							
3-phase 4-wire	Unrestricted	3	2187A36				
	Unrestricted						
Frequency Meters	115V or 230V	45-55 Hz, 55-65 Hz 45-66 Hz Rating Available			2188A30	Frequency sensing transducer type	±0.5% of center frequency

\*Instrument is furnished with external transducer. Contact Yokogawa for transducer outline and connection drawings.

## 2180A SERIES STANDARD RATINGS AND SCALES

Example: 2181A00-AFA-BL is a 0-1mA rating & scale with black cover

### DC Ammeters and Voltmeters

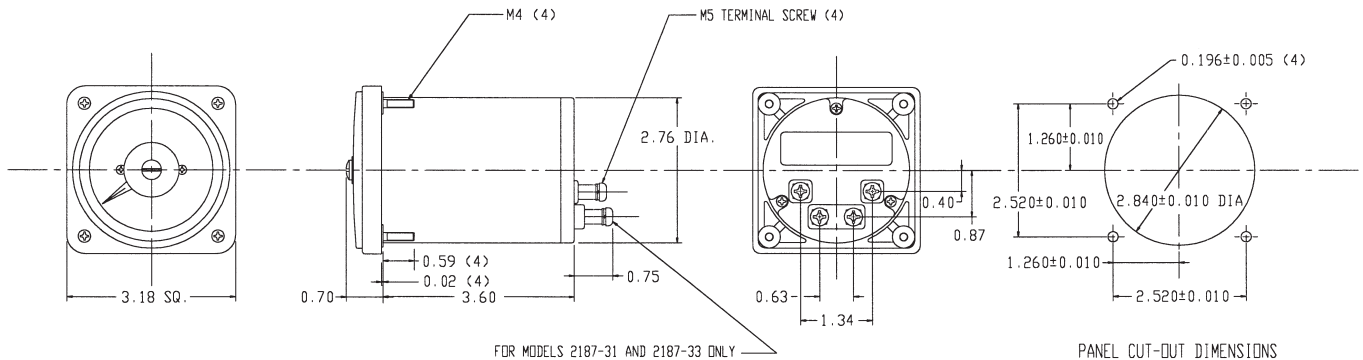
Model Number	Suffix	Rating and scale
<b>2181A00-</b>		
Full scale value (zero left)	AEM- AFA- AFG- AHF- AKM- ALA- ALS- AMT- AND- ANG- ANL- A01- A05- VNL- VNT- VPK- VPZ- VRX- V01-	500 $\mu$ ADC 1mADC 2mADC 20mADC 500mADC 1ADC 5ADC 10ADC 15ADC 20ADC 30ADC 50mVDC (shunt-rated)* 100mVDC (shunt-rated)* 30VDC 50VDC 100VDC 150VDC 300VDC 1mADC (external multiplier)*
2181A Suppressed zero	35- 36- 37-	10 to 50mADC* 4 to 20mADC* 1-5VDC*
Cover assembly	BG BL	Munsell green Munsell black

### AC Ammeters and Voltmeters

Model Number	Suffix	Rating and scale
<b>2182A00-</b>		
Full scale value (zero left)	AEM- AFA- AFG- AHF- AKM- ALA- ALS- ALC- ALS- A42- AMF- AMT- ANL- VNL- VNT- VPB- VPK- VPZ- V12- VRX- VSI- V20- V21-	500 $\mu$ AAC 1mAAC 2mAAC 20mAAC 500mAAC 1AAC 1.5AAC 5AAC 5AAC (for external CT)* 7.5AAC 10AAC 30AAC 30VAC 50VAC 75VAC 100VAC 150VAC 150VAC (for external PT)* 300VAC 600VAC 70-130VAC (expanded scl.)* 140-260VAC (exp. scale)*
Cover assembly	BG BL	Munsell green Munsell black

Note: \* For ratings and/or scales not listed, please specify as similar to closest rating above and describe in detail.

## DIMENSIONS AND PANEL DRILLING



## POWER SERIES<sup>Plus</sup> DIGITAL SWITCHBOARD METER

POWER SERIES<sup>Plus</sup> fills the need for a high accuracy digital switchboard meter and transducer that can be configured in the field by an end-user, or when installed in new electrical equipment by an OEM. It eliminates requirements for a large inventory of dedicated instruments, and provides flexibility when new panel designs or system upgrades require changes in instrument transformer rat-

ings. Our rugged metal case fits standard panel cutouts for switchboard meters and makes it a perfect replacement for less versatile instruments. POWER SERIES<sup>Plus</sup> can also replace separate power transducers and meters in new equipment designs. An overall good solution for reduced wiring, panel space reduction, improved accuracy, and lower system cost.



### POWER SERIES<sup>Plus</sup> MODEL TYPES AND RATED INPUTS

**Features:**

- PT scaling ratio to 1250:1
- CT scaling ratio to 5000:1 or 25kA
- Adjustable transducer output
- Non-volatile memory
- 0.2% accuracy
- 4½ digit display
- True RMS current and voltage
- Field-settable electrical legends
- Display average setting capability reduces volatile “digit bounce”.

Measuring Capability	Model Number	Available Connections	Maximum Input Rating	Electrical Legend	Output Options
AC Amperes	249111 249115	1 Phase	0-1 A AC 0-5A AC	Amps AC Kiloamps AC	0-1mA 4-20mA
AC Voltage	249121 249125	1 Phase	0-150V AC 0-300V AC	Volts AC Kilovolts AC	0-1mA 4-20mA
Frequency	249181 249183	1 Phase	150V AC 300V AC	Hertz	±1mA 0-1mA 12 ± 8mA
Watts	249151 249152 249153 249154 249155	1P2W 1P3W 3P3W 3P4W (2½ Element) 3P4W (3 Element)	<b>(select one)</b> 120V AC-1 AMP 240V AC-1 AMP 120V AC-5 AMP 240V AC-5 AMP	Watts Kilowatts Megawatts	± 1mA 0-1mA 4-20mA 12 ± 8mA
Vars	249161 249162 249163 249164 249165	1P2W 1P3W 3P3W 3P4W (2½ Element) 3P4W (3 Element)	<b>(select one)</b> 120V AC-1 AMP 240V AC-1 AMP 120V AC-5 AMP 240V AC-5 AMP	Vars Kilovars Megavars	
Power Factor	249171 249172 249173 249174 249175	1P2W 1P3W 3P3W 3P4W (2½ Element) 3P4W (3 Element)	<b>(select one)</b> 120V AC-1 AMP 240V AC-1 AMP 120V AC-5 AMP 240V AC-5 AMP	Power Factor Lag Lead	
Phase Angle	249191 249192 249193 249194 249195	1P2W 1P3W 3P3W 3P4W (2½ Element) 3P4W (3 Element)	<b>(select one)</b> 120V AC-1 AMP 240V AC-1 AMP 120V AC-5 AMP 240V AC-5 AMP	Phase Angle Lag Lead	

See general specifications and selector guide on following pages for complete ordering information.

GENERAL SPECIFICATIONS — POWER SERIES<sup>Plus</sup>

<b>DISPLAY</b>	Type: Digit height: Decimal points: Out of range indication: Response time:	3½ digit Red LED for Power Factor and Phase Angle 4½ digit Red LED for Amps/ Volts/ Watts/ VARS/ Frequency 0.56 inch or 14mm 3 or 4 position selectable during scaling setup Flashing display "HHHH" for high and "LLLL" for low 200 millisecond maximum update time	
<b>AUXILIARY POWER</b>	Choice of inputs at rear terminal board	120 or 240 VAC (±15%), 45-65Hz Power consumption-4.5 VA maximum	
<b>INPUT RATING</b>	Current: Voltage: Frequency:	0 to 1 AAC; 0 to 5AAC 0-120VAC, 0-240 VAC (W/VAR/PF/PA); 0-150VAC, 0-300VAC (Volt / Freq) 50/60 Hz and 400 Hz	
<b>INPUT RANGE</b>	Rated current: Rated voltage:	A / W / VAR: 0-200% ; PF / PA: 20-200% V / W / VAR: 0-120% ; PF / PA: 50-120%; Frequency: 20-120%	
<b>SUSTAINED INPUT</b>	Rated current: Rated voltage:	A / W / VAR / PF / PA: 200% continuous, 10 x rating for 5 seconds V / W / VAR / FREQ: 120% continuous; PF / PA: 150% continuous	
<b>BURDEN</b>	Current: Voltage:	<0.2 VA per element 120V: <0.2VA per element; 240V: <0.4 VA per element	
<b>ACCURACY</b>	Reference condition: 25°C, 45-74%RH, at rated input 60Hz sine wave, 30 min. warmup	Voltage Current Watt/VAR	± 0.2% of reading ± 0.1% of full scale
		Power Factor Phase Angle Frequency	± 0.05 Power factor ± 0.5° Phase Angle ± 0.01Hz @ 40-70Hz, ±0.1 Hz @ 300-500 Hz
<b>ANALOG OUTPUT AND RESPONSE TIME</b>	0 to 1mA, 0 to ± 1mA: 4 to 20mA, 12 ± 8mA:	10VDC compliance into 10k ohm load maximum 15VDC compliance into 750 ohm load maximum 1 second maximum response time within ±1% of final value	
<b>OUTPUT RIPPLE</b>		0.5% peak-to-peak maximum of output span	
<b>ISOLATION VOLTAGE / INSULATION RESISTANCE</b>	Input to output/case: Aux. power to case: Aux. power to output: Output to case:	2500 VAC for 1 minute / more than 10 Megohm @ 500VDC 2000 VAC to 1 minute / more than 10 Megohm @ 500VDC 2000 VAC for 1 minute / more than 10 Megohm @500VDC 1000 VAC for 1 minute / more than 10 Megohm @ 500VDC	
<b>TEMPERATURE RANGE</b>	Operating: Storage:	-20 to +60° C at 90% RH maximum (non-condensing) -40 to +85° C	
<b>TEMPERATURE COEFFICIENT</b>		150 PPM / °C maximum of full scale	
<b>EXTERNAL INFLUENCE</b>	Magnetic field: Shock / vibration:	0.5% maximum at 400 ampere turns/meter <0.2% after: 50G x 3axis x 6 repetitions / 16.7Hz, 4 mm p-p for 1 hour	
<b>SURGE WITH-STAND VOLTAGE</b>	SWC tests:	Meets IEEE 472 / ANSI C37.90a Meets JIS C1111 (5kV 1.2 x 50 microseconds)	
<b>DIMENSIONS</b>	Reference Page 32	W x D x H = 4.33 x 6.54 x 4.33 inches	
<b>WEIGHT</b>		Approximately 1000 grams (2.2 lbs)	
<b>DESIGN STANDARDS</b>		ANSI C39.1 UL Recognition (pending)	

NOTE: POWER SERIES<sup>Plus</sup> Digital Switchboard capability is continually being expanded. Now available: Dual function & communications. Please call 1-800-258-2552 ext 575 for the latest catalog information.

# SWITCHBOARD INSTRUMENTS

## POWER SERIES<sup>Plus</sup> SELECTOR GUIDE

### AC WATTS, VARS, POWER FACTOR AND PHASE ANGLE

MODEL FORMAT: 2491   -   -   -  

MODEL	1		2		3		4	
	FUNCTION/CONNECTIONS		AC INPUT RATING		FREQUENCY		ANALOG OUTPUT	
2491	51	WATT 1P2W	11	120 VOLT-1 AMP	5	50/60 Hz	AAA	No output
	52	WATT 1P3W	15	120 VOLT-5 AMP	6	400 Hz	AFA	0 to 1 mA
	53	WATT 3P3W	21	240 VOLT-1 AMP	8	Special	AFB	0 to ±1mA
	54	WATT 3P4W (2½ element)	25	240 VOLT-5 AMP			AHD	4 to 20mA
	55	WATT 3P4W (3 element)	33	Special(describe)			AHF	12 ± 8mA
	61	VAR S 1P2W						
	62	VAR S 1P3W						
	63	VAR S 3P3W						
	64	VAR S 3P4W (2½ element)						
	65	VAR S 3P4W (3 element)						
	71	POWER FACTOR 1P2W						
	72	POWER FACTOR 1P3W						
	73	POWER FACTOR 3P3W						
	74	P.F. 3P4W (2½ element)						
	75	P.F. 3P4W (3 element)						
	91	PHASE ANGLE 1P2W						
	92	PHASE ANGLE 1P3W						
	93	PHASE ANGLE 3P3W						
	94	P.A. 3P4W (2½ element)						
	95	P.A. 3P4W (3 element)						

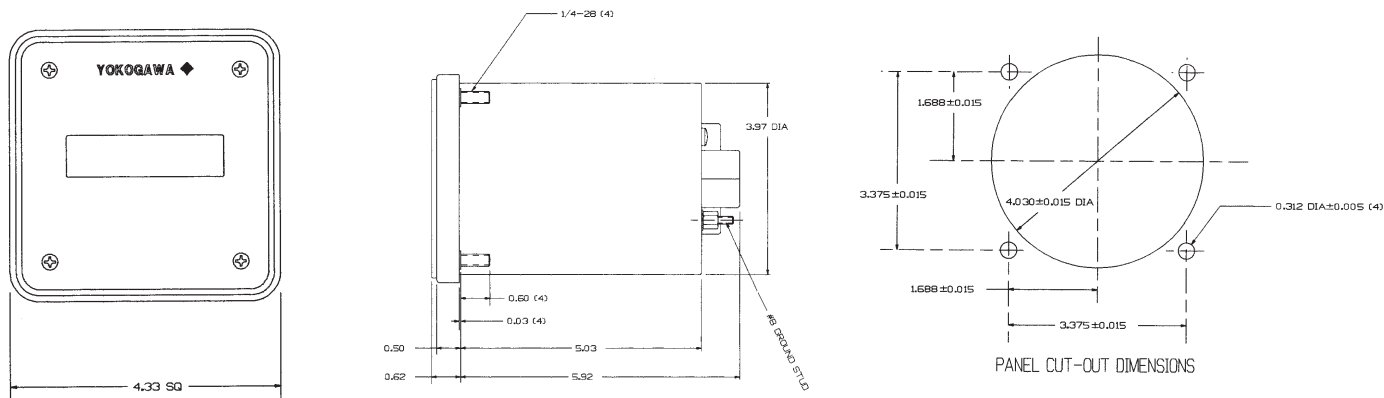
### AC AMPS/VOLTS/FREQUENCY

MODEL FORMAT: 2491   -   -  

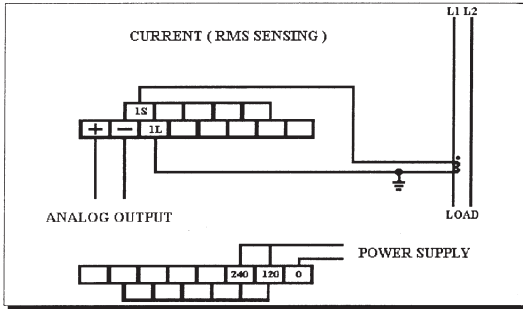
MODEL	1		2		3	
	INPUT RATING		FREQUENCY		ANALOG OUTPUT	
2491	11	1 AMP AC	1	50/60 Hz	AAA	No output
	15	5 AMP AC	2	400 Hz	AFA	0 to 1mA
	21	150 V AC	3	Special	AFB	0 to ±1mA*
	25	300 V AC			AHD	4 to 20mA
	81	150V FREQ.				
	83	300V FREQ.				

\* Only for frequency

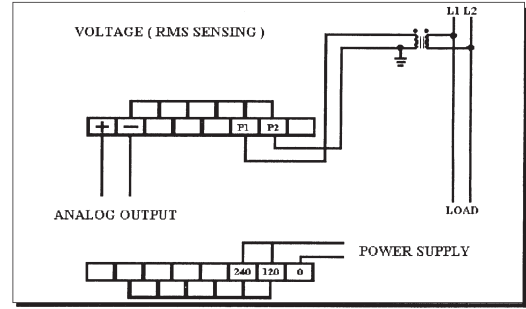
### OUTLINE DIMENSIONS AND PANEL CUTOUT



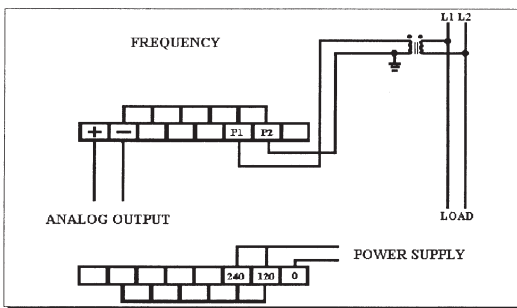
POWER SERIES<sup>Plus</sup> TERMINAL CONNECTIONS



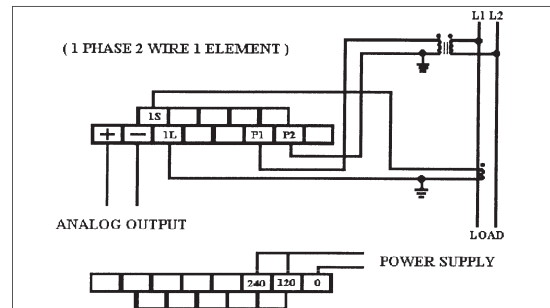
249111 and 249115 AC Ammeters



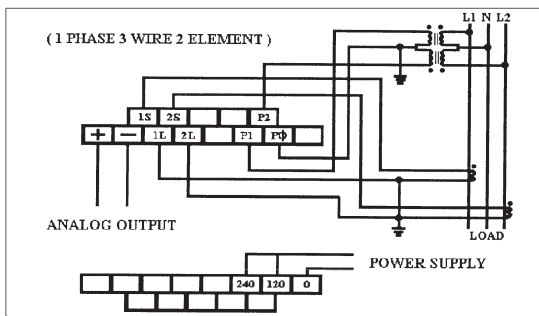
249121 and 249125 AC Voltmeters



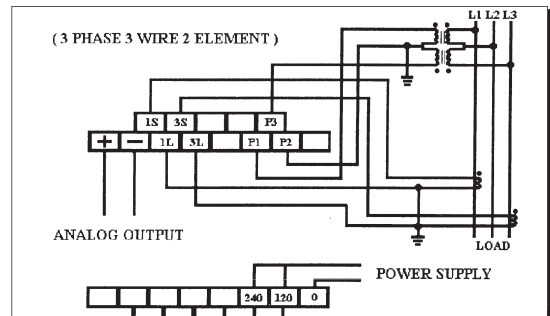
249181 and 249183 AC Frequency meter



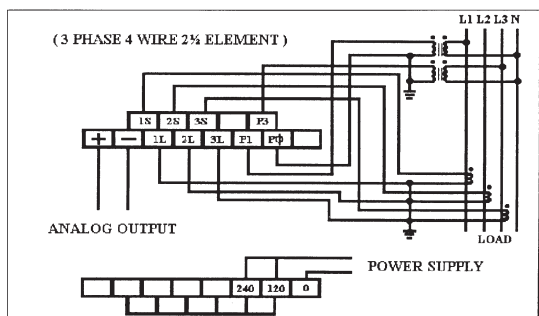
249151/249161/249171/249191  
Watts/VARS/Power Factor/Phase Angle



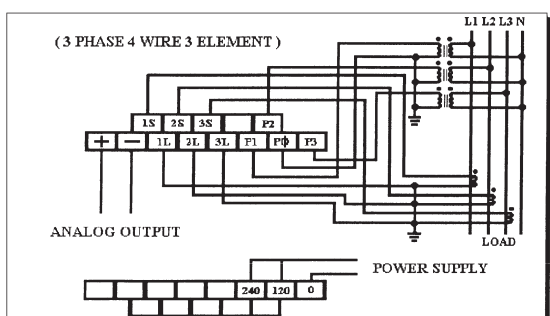
249152/249162/249172/249192  
Watts/VARS/Power Factor/Phase Angle



249153/249163/249173/249193  
Watts/VARS/Power Factor/Phase Angle



249154/249164/249174/249194  
Watts/VARS/Power Factor/Phase Angle



249155/249165/249175/249195  
Watts/VARS/Power Factor/Phase Angle

JUXTA POWER TRANSDUCERS

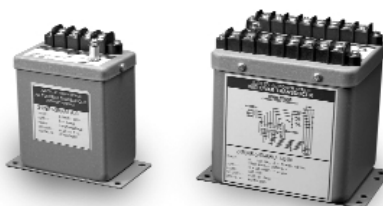
Yokogawa’s JUXTA “AC POWER SERIES” transducers (2469 & 2489) are rugged metal case designs for utility and industrial applications. Most models are UL recognized under File E60579 and exceed IEEE472/ANSI C37.90.1 Surge Withstand Capability test. The “SWC” test assures maximum protection from damaging line transients caused by switchgear operation or lightning strikes upstream on the system. Power transducers provide an analog DC Voltage or Current output proportional to an AC input. The input typically comes from the secondary of potential and/or current transformers such as

150V and 5A AC. The output is linked to remote monitoring equipment such as meters, recorders, PLC’s, SCADA or Energy Management systems. For most industrial monitoring needs, 0.5% accuracy is acceptable, and our 2469 Series exceeds this requirement. Most power utilities require a higher level of accuracy; and our 2489 series is a superior choice for those applications. Below, are the most popular models of both the 2469 and 2489 Power Transducers. For other input and output combinations, connection drawings, specifications and other models, please request catalog BU-JAC-05E.

	Standard transducer inputs / outputs	Model type	Model type
<b>C U R R E N T</b>	<b>Input 0-5 Amp AC, 60 Hz</b>	<b>2469 (0.5% Accuracy)</b>	<b>2489 (0.2% Accuracy)</b>
	0-1 mA output / self-powered/60 Hz	246921-380-AFA-0	248921-380-AFA-0
	0-1 mA output / self-powered / rated 50/60 Hz	246921-382-AFA-0	248921-382-AFA-0
	True rms / 0-1mA output / 120V auxiliary power	246931-380-AFA-1	248931-380-AFA-1
	4-20mA output / 120V auxiliary power	246921-380-AHD-1	248921-380-AHD-1
	True rms / 4-20mA output / 120V auxiliary power	246931-380-AHD-1	248931-380-AHD-1
	3 in 1 transducer, 0-1mA output / self-powered	246923-380-AFA-0	248923-380-AFA-0
<b>V O L T A G E</b>	<b>Input 0-150 VAC, 60 Hz</b>	<b>2469 (0.5% Accuracy)</b>	<b>2489 (0.2% Accuracy)</b>
	0-1 mA output / self-powered/rated 60 Hz	246922-330-AFA-0	248922-330-AFA-0
	0-1 mA output / self-powered / rated 50/60 Hz	246922-332-AFA-0	248922-332-AFA-0
	True rms / 0-1mA output / 120V auxiliary power	246932-330-AFA-1	248932-330-AFA-1
	4-20mA output / 120V auxiliary power	246922-330-AHD-1	248922-330-AHD-1
	True rms / 4-20mA output / 120V auxiliary power	246932-330-AHD-1	248932-330-AHD-1
	3 in 1 transducer, 0-1mA output / self-powered	246924-330-AFA-0	248924-330-AFA-0
<b>F R E Q U E N C Y</b>	<b>Input 120VAC, 60 Hz, self-powered</b>	<b>2469 (±2% Span)</b>	<b>2489 (±0.2% Span)</b>
	Frequency ± 1.0 Hz deviation, 0-1mA output	246982-320-AFA-0	248982-320-AFA-0
	Frequency ± 1.0 Hz deviation, 4-20mA output	246982-320-AHD-0	248982-320-AHD-0
	Frequency ± 2.0 Hz deviation, 0-1mA output	246983-320-AFA-0	248983-320-AFA-0
	Frequency ± 2.0 Hz deviation, 4-20mA output	246983-320-AHD-0	248983-320-AHD-0
	Frequency ± 5.0 Hz deviation, 0-1mA output	246984-320-AFA-0	248984-320-AFA-0
	Frequency ± 5.0 Hz deviation, 4-20mA output	246984-320-AHD-0	248984-320-AHD-0
	Frequency ± 10 Hz deviation, 0-1mA output	246985-320-AFA-0	248985-320-AFA-0
Frequency ± 10 Hz deviation, 4-20mA output	246985-320-AHD-0	248985-320-AHD-0	
<b>W A T T S *</b>	<b>Input 120V, 5A AC, 60 Hz, self-powered</b>	<b>2469 (0.5% Accuracy)</b>	<b>2489 (0.2% Accuracy)</b>
	Watt 1P2W, 0-1mA output (1 Element)	246951-540-AFA-0	248951-540-AFA-0
	Watt 1P2W, 4-20mA output (1 Element)	246951-540-AHD-0	248951-540-AHD-0
	Watt 3P3W, 0-1mA output (2 Element)	246953-540-AFA-0	248953-540-AFA-0
	Watt 3P3W, 4-20mA output (2 Element)	246953-540-AHD-0	248953-540-AHD-0
	Watt 3P4W, 0-1mA output (2½ Element)	246954-540-AFA-0	248954-540-AFA-0
	Watt 3P4W, 4-20mA output (2½ Element)	246954-540-AHD-0	248954-540-AHD-0
	Watt 3P4W, 0-1mA output (3 Element)	246955-540-AFA-0	248955-540-AFA-0
Watt 3P4W, 4-20mA output (3 Element)	246955-540-AHD-0	248955-540-AHD-0	
<b>V A R S *</b>	<b>Input 120V, 5A AC, 60 Hz, self-powered</b>	<b>2469 (0.5% Accuracy)</b>	<b>2489 (0.2% Accuracy)</b>
	VAR 1P2W, 0-1mA output (1 Element)	246961-540-AFB-0-M	248961-540-AFB-0-M
	VAR 1P2W, 12±8mA output (1 Element)	246961-540-AHF-0-M	248961-540-AHF-0-M
	VAR 3P3W, 0-1mA output (2 Element)	246963-540-AFB-0-M	248963-540-AFB-0-M
	VAR 3P3W, 12±8mA output (2 Element)	246963-540-AHF-0-M	248963-540-AHF-0-M
	VAR 3P4W, 0-1mA output (2½ Element)	246964-540-AFB-0-M	248964-540-AFB-0-M
	VAR 3P4W, 12±8mA output (2½ Element)	246964-540-AHF-0-M	248964-540-AHF-0-M
	VAR 3P4W, 0-1mA output (3 Element)	246965-540-AFB-0-M	248965-540-AFB-0-M
VAR 3P4W, 12±8mA output (3 Element)	246965-540-AHF-0-M	248965-540-AHF-0-M	

\*Note: Standard calibration is 500W or VARs per element. Otherwise, specify CT/PT ratios and primary WATTS/VARS relative to desired output for a particular model.

## JUXTA POWER TRANSDUCERS



	Standard transducer inputs / outputs	Model type	Model type
<b>W A T T - V A R</b>	<b>120V, 5A AC, 60 Hz, Input powered</b>	<b>2469 (0.5% Accuracy)</b>	<b>2489 (0.2% Accuracy)</b>
	Watt/Var 1P2W, 0 ± 1mA output (1 Element)	246941-540-AFB-0-M	248941-540-AFB-0-M
	Watt/Var 1P2W, 4 - 20mA output (1 Element)*	246941-540-AHD-0-M	248941-540-AHD-0-M
	Watt/Var 3P3W, 0 ± 1mA output (2 Element)	246943-540-AFB-0-M	248943-540-AFB-0-M
	Watt/Var 3P3W, 4 - 20mA output (2 Element)*	246943-540-AHD-0-M	248943-540-AHD-0-M
	Watt/Var 3P4W, 0 ± 1mA output (2½ Element)	246944-540-AFB-0-M	248944-540-AFB-0-M
	Watt/Var 3P4W, 4 - 20mA output (2½ Element)*	246944-540-AHD-0-M	248944-540-AHD-0-M
	Watt/Var 3P4W, 0 ± 1mA output (3 Element)	246945-540-AFB-0-M	248945-540-AFB-0-M
	Watt/Var 3P4W, 4 - 20mA output (3 Element)*	246945-540-AHD-0-M	248945-540-AHD-0-M
<b>P A C T O R</b>	<b>120V, 5A AC, 60 Hz, 0-1- OPF Input powered</b>	<b>2469 (± 0.01PF)</b>	<b>2489 (± 0.01PF)</b>
	Power Factor - Single phase / ±1mA output	246971-540-AFB-0-P	248971-540-AFB-0-P
	Power Factor - Single phase / 12±8mA output	246971-540-AHF-0-P	248971-540-AHF-0-P
	Power Factor - 3P3W balanced / ±1mA output	246973-540-AFB-0-P	248973-540-AFB-0-P
	Power Factor - 3P3W balanced / 12±8mA output	246973-540-AHF-0-P	248973-540-AHF-0-P
	Power Factor - 3P4W balanced / ±1mA output	246974-540-AFB-0-P	248974-540-AFB-0-P
	Power Factor - 3P4W balanced / 12±8mA output	246974-540-AHF-0-P	248974-540-AHF-0-P
<b>P A N G L E</b>	<b>120V, 5A AC, 60 Hz, ±90° PA, Input powered</b>	<b>2469 (± 2° Accuracy)</b>	<b>2489 (± 1° Accuracy)</b>
	Phase Angle - Single phase / ±1mA output	246976-540-AFB-0-P	248976-540-AFB-0-P
	Phase Angle - Single phase / 12±8mA output	246976-540-AHF-0-P	248976-540-AHF-0-P
	Phase Angle - 3P3W balanced / ±1mA output	246977-540-AFB-0-P	248977-540-AFB-0-P
	Phase Angle - 3P3W balanced / 12±8mA output	246977-540-AHF-0-P	248977-540-AHF-0-P
	Phase Angle - 3P4W balanced / ±1mA output	246978-540-AFB-0-P	248978-540-AFB-0-P
Phase Angle - 3P4W balanced / 12±8mA output	246978-540-AHF-0-P	248978-540-AHF-0-P	
<b>* * I S O L A T O R</b>	<b>DC Input / Output, 115V AC Aux. powered</b>	<b>2469 (±0.5%)</b>	
	0-50mVDC / 0-1mADC	246911-001-AFA-1	
	0-50mVDC / 4-20mADC	246911-001-AHD-1	
	0-50mVDC / 0-10VDC	246911-001-VMT-1	
	0-1mADC / 0-1mADC	246912-101-AFA-1	
	0-1mADC / 4-20mADC	246912-101-AHD-1	
0-1mADC / 0-10VDC	246912-101-VMT-1		

\* Note: VAR outputs are 12±8mA

\*\*Not UL

General Specifications:	2469	2489
Accuracy:	0.5% of span	0.2% of reading
Sustained input overrange:	Voltage: 120% continuous, 150% for 5 seconds Current: 200% continuous, 1000% for 5 seconds	
Outputs:	0 to ±1mA DC into 10kOhm max., 10V DC compliance 4 to 20mA DC into 750 Ohm max., 15V DC compliance	
Output adjust:	zero ± 1% minimum span ± 2% minimum	zero ± 5% minimum span ± 10% minimum
Output ripple:	<0.3% fullscale peak to peak	<0.5% fullscale peak to peak
Response time:	<400 milliseconds 0-99% of full scale	

## CURRENT TRANSFORMERS WITH 5 AMP SECONDARIES

To construct a catalog number select from following tables: [Table One]-[Table Two]-[Table Three]-[Table Four]  
 Example: Model 5SFT - 501 is a CT with a 1.56" hole diameter, square body with mounting plate and terminal studs and a ratio of 500:5 amperes.

[Table One] MODEL TYPE

Model Code	Exception:	Hole Diameter (inches)	Primary Amperes	Accuracy	Burden (VA)	Approx. Weight (lbs)
			Min/Max	Varies with Transformer Ratio		
2	RBL, RBT, RT	1.0 to 1.13	50-300A	1 - 3%	1.5 - 15.0	0.5
5	—	1.56	50-1200A	1 - 2%	1.0 - 30.0	1.0
7	—	2.50	150-1600A	1%	2.5 - 45.0	1.5
14	SHT, SHL	0.50	50-100A	1.0 - 1.5%	2.5 - 3.0	0.9
15	SHT, SHL	0.94	50-200A	1.0 - 1.5%	2.0 - 12.5	0.9
16	SHT, SHL	1.25	50-400A	1%	1.0 - 15.0	0.9
56	SHT, SHL	2.06	75-1200A	1%	0.5 - 15.0	0.6
76	SHT, SHL	3.00	200-2000A	1%	5.0 - 15.0	0.9

[Table Two] MOUNTING/CASE STYLE

Case Code	Description
SH	Square Body without Integral Mounting Plate
SF	Square Body with Integral Mounting Plate
R	Round Body without Removable Mounting Bracket
RB	Round Body with Removable Mounting Bracket

[Table Three] CONNECTIONS

Connection Code	Description
T	8-32 Brass Terminal Studs with Nut & Flatwasher
L	#16 AWG, 24 inches long (UL1015 - 105°C)

[Table Four] CURRENT RATIO

Insert First 2 Digits of Primary Current Rating	Insert Multiplier	Result
Example: 50	0 = x 10 <sup>0</sup>	50 : 5
	1 = x 10 <sup>1</sup>	500 : 5
	2 = x 10 <sup>2</sup>	5000 : 5

To select the transformer ratio, the first 2 digits in Table 4 equal the 2 most significant digits (MSD) of the transformer fullscale current. The last digit is the multiplier, it is equal to the number of zeros of the primary current. Some transformers will have 3 MSD (ex. 125:5). The multiplier will go after the third digit. An example of a 125:5 CT is 2RL-1250



RT



SFT



RL



RBL



RBT

**Notes:**

- (1) Yokogawa Current and Potential Transformers are component recognized under UL E93779 and CSA LR89403
- (2) All CT's are insulation class 0.6kV, BIL 10kV full wave. Frequency 50 - 400 Hz.
- (3) For complete information please request catalog 500CTPT-B.



Yokogawa Corporation of America (YCA), located in Newnan, GA since 1980 and founded in 1957, is a leading manufacturer and supplier of meters, transducers, field test instruments, laboratory measuring instruments, recording instruments and industrial controllers in the North American marketplace.

YCA is a wholly owned subsidiary of Yokogawa Electric Corporation, a company with more than 80 years of experience in the fields of Measuring Instrumentation and Industrial Control.

YCA consists of four independent business divisions. Each is designed to be a nimble, flexible organization that is able to focus on and adapt to unique challenges in the marketplace. We believe this organizational structure helps us combine small company responsiveness with big company technology and stability. The result is a satisfied customer and means Yokogawa's vision for a better tomorrow is being realized today.

# SWITCHBOARD INSTRUMENTS

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