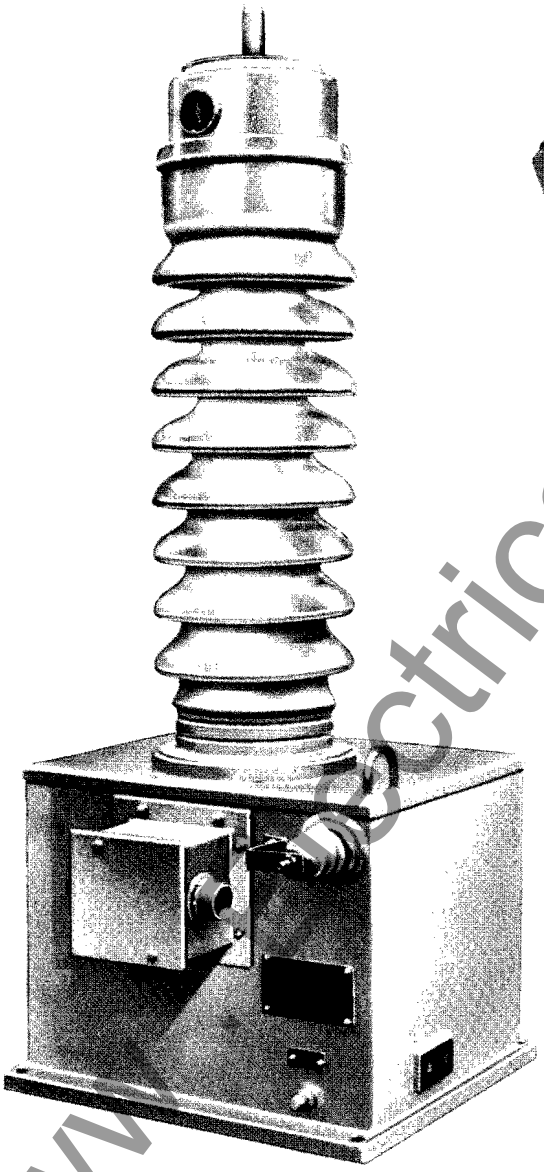
Westinghouse Electric Corporation
Transformer Components Division
Five Parkway Center, Greentree Rd.
Pittsburgh, PA 15220

Product Bulletin
44-392

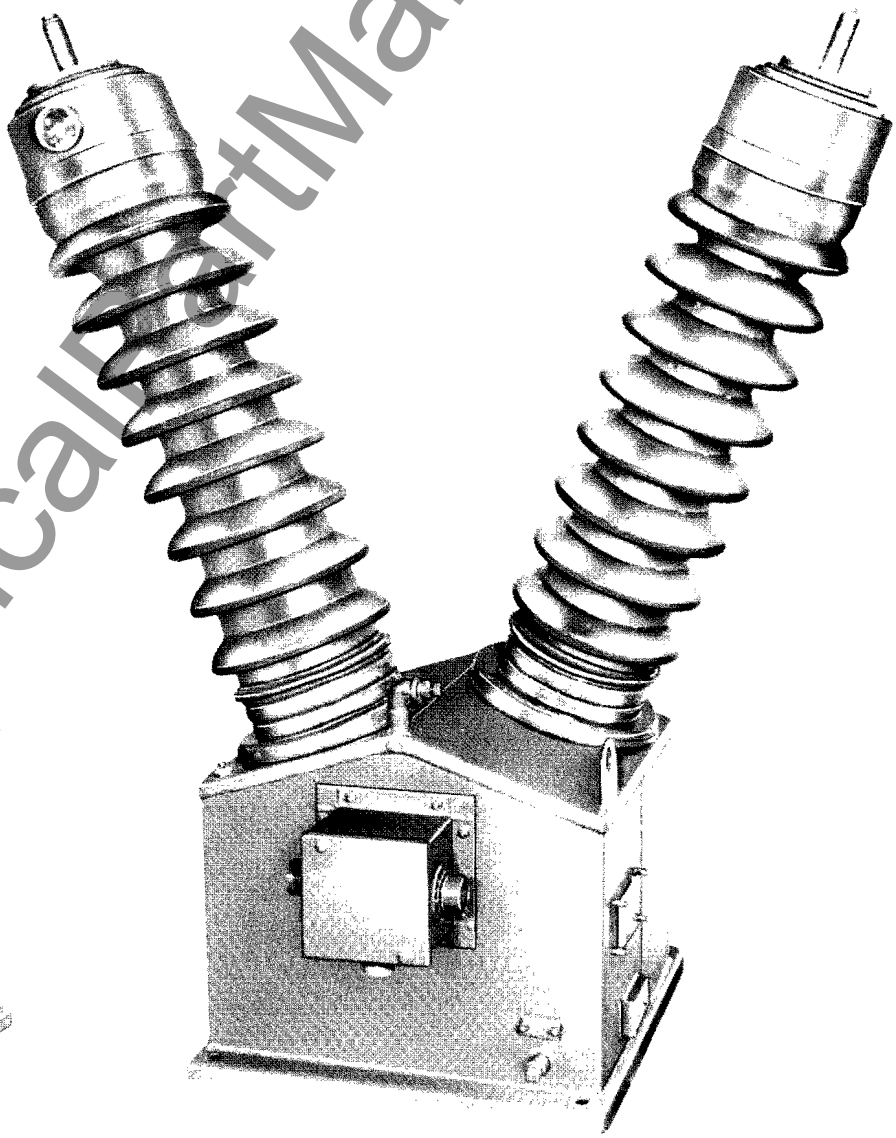
August 18, 1982
New Information
Mailed to: E, D, C/2048/DB

25 through 69 KV, Outdoor
150 through 350 KV BIL
Primary Volts: 14,400 through 69,000
60 Hertz

Type APT Voltage Transformers



One High Voltage Bushing



Two High Voltage Bushings

Application
The type APT is an oil-filled outdoor voltage transformer suitable for metering or relaying. As shown, the type APT, in 150 through 350 kv BIL ratings, is available with single high voltage bushing and graded insulation for line-to-ground connection, or with two high voltage bushings and full insulation for line-to-line connection. Both types have two separate low voltage windings, each provided with a tap to make standard secondary voltages available. The low voltage windings may be connected in either wye or open delta.

Accuracy
ANSI Metering Accuracy Class (60 Hertz): 0.3 Class for W, X, Y, Z and ZZ Burdens, except the tapped voltage rating on APT 150 is 0.3Z.

Further Information
Prices: See Price List 44-321.

Selector Guide

BIL: Kv	Normal Circuit Voltage	Winding Ratio	Transformer Voltage		Thermal Rating at 30°C Ambient: Va		ANSI● Min. Hv Bushing Creep Distance (Inches)	Style Number
			Primary	Secondary	All on One Lv Winding	Divided Equally Between Lv Windings		
Graded insulation, one hv bushing for line-to-ground								
150	24000	200/120:1	14400	72/120	3500	4000	17	889A531G01
200	34500	300/175:1	20125	67.08/115	4500	5000	26	889A531G02
250	46000	400/240:1	27600	69/115	5000	5500	35	889A531G03
350	69000	600/350:1	40250	67.08/115	5500	6000	48	889A531G04
Full insulation, two hv bushings for line-to-line①								
150	24000	346.4/200:1	24000	69.3/120	4000	4500	17	889A532G01
		200/120:1	14400	72/120				
200	34500	519.6/300:1	34500	66.4/115	5000	6000	26	889A532G02
		300/175:1	20125	67.08/115				
250	46000	692.8/400:1	46000	66.4/115	6000	7000	35	889A532G03
		400/240:1	27600	69/115				
350	69000	1039.2/600:1	69000	66.4/115	7500	8500	48	889A532G04
		600/350:1	40250	67.08/115				

①Accuracy and ratings based on rated line to line voltage.
②For designs with extra creep bushings, refer to Westinghouse.

Construction Features
Primary Bushings: High voltage bushings consist of porcelain weather casings which are mechanically supported on the case by a rolled on flange with a silastic cushion gasket between the porcelain and flange.

The high voltage bushing cap provides gas space for expansion and contraction of the oil. The oil gauge has a float which follows the oil level through a wide range of temperature.

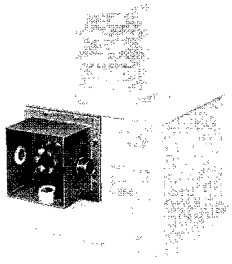
Tank and Insulation: Transformer case is of fabricated steel and supports either one or two primary bushings which are welded to the case.

The housing fits closely over the contour of the core and coil assembly, resulting in low weight, size and oil content. After thorough drying and oil impregnation, the transformer is filled with degassed oil under vacuum.

Connectors
Primary and ground connectors are supplied as separate items on a no charge basis. Those available are listed by style number and cable range in PL 44-321.

Core and Coils: The high voltage coils are of circular pancake construction shielded to avoid localized concentration of electrical and dielectric stresses. The entire assembly is kept to a minimum by the use of solid insulation and the elimination of oil ducts. The high voltage lead is covered with solid insulation and paper tape to form the central part of the high voltage bushing. The neutral lead on single high voltage bushing units is brought out of the case through an ANSI standard 5-kv solder-sealed porcelain bushing. A copper strap is provided for grounding the bushing to the case. The low voltage coils are of cylindrical form, wound on a pressboard tube and assembled inside the high voltage coils. There are two low voltage windings, secondary and tertiary, with a tap in each winding. Hipersil® cores provide high accuracy with minimum size and weight.

Secondary Junction Box



A weatherproof secondary junction box is provided as shown above. This box may be readily detached from the transformer case, thus permitting removal of a transformer without disturbing secondary conduit connections. The secondary terminals are 5/16-18 threaded studs.

Factory Tests
Type APT transformers are designed to meet all of the requirements of ANSI standards for insulation and performance and factory tests are made to assure that these rigid specifications are met. Ratio and phase angle measurements are made at 0 burden and the highest burden (Z or ZZ) for which the unit is to meet 0.3 class accuracy. For two-bushing designs, measurements are made at both line to line and line to ground voltages. Certified test cards showing test values are attached to each unit prior to shipment.

Color
The complete unit is standard No. 70 light gray in color, including the HV porcelain bushing.

Dimensions and Weights

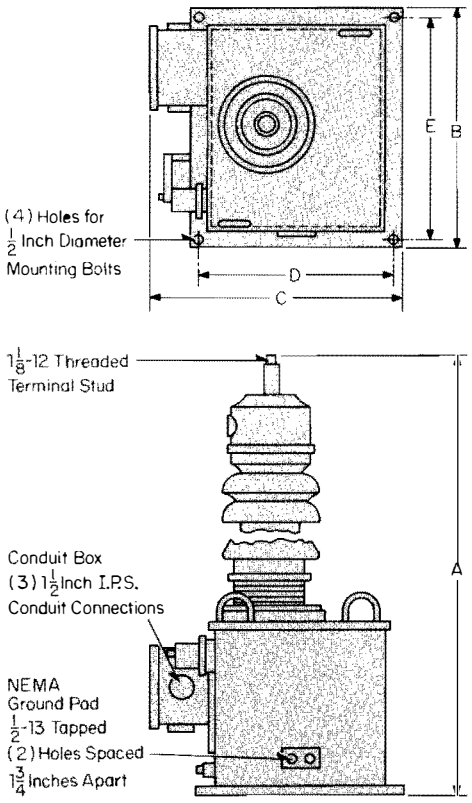


Figure 1: One High Voltage Bushing

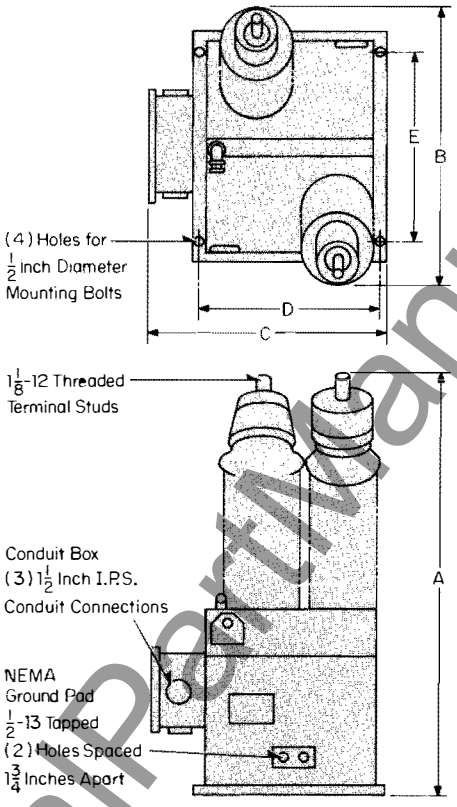
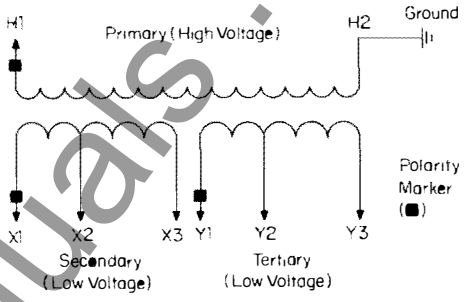


Figure 2: Two High Voltage Bushings

BIL: Kv	Figure Number	Style Number	Approximate Dimensions: Inches					Approx Wt: Lbs		Approx Gallons Oil
			A	B	C	D	E	Net	Shipping	
150	1	889A531G01	38¼	17	20⅞	15¾	15¼	325	375	7
200	1	889A531G02	43⅝	17	20⅞	15¾	15½	330	385	7
250	1	889A531G03	48¾	18½	21⅝	16½	17	425	475	10
350	1	889A531G04	58½	22	23¼	18	20½	570	625	13½
150	2	889A532G01	35½	27	20⅞	16	15¼	300	350	6
200	2	889A532G02	42	31	22	17¼	15	425	475	7
250	2	889A532G03	45⅞	38¾	22	17¼	18¼	525	575	12
350	2	889A532G04	53¾	46½	23⅞	19⅛	19½	750	825	14½

Note: High voltage terminal stud is threaded 2½ inches from top.

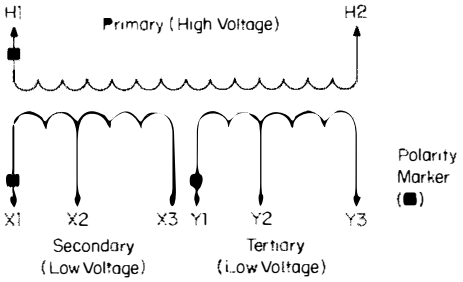
Typical Wiring Diagrams



One High-Voltage Bushing

(See figure above)

With rated primary voltage applied on high voltage winding, both secondary (X_1-X_3) and tertiary (Y_1-Y_3) will provide 115 volts. The tapped portion of the secondary (X_2-X_3) and tertiary (Y_2-Y_3) will provide approximately $115/\sqrt{3}$ volts. (Actual voltage is determined by winding ratio.)



Two High-Voltage Bushings

(See figure above)

When the primary winding is connected line-to-line with rated primary voltage applied on the high-voltage winding, 115 volts is available on the tapped portion of the secondary winding (X_2-X_3) and 115 volts is available on the full winding of the tertiary (Y_1-Y_3). Also, approximately $115/\sqrt{3}$ volts is available on the tapped portion of the tertiary (Y_2-Y_3). When the primary winding is connected line-to-ground with rated voltage/$\sqrt{3}$ applied on the high-voltage winding, 115 volts is available on the full secondary winding (X_1-X_3) and approximately $115/\sqrt{3}$ volts is available on the full tertiary winding (Y_1-Y_3). Also, approximately $115/\sqrt{3}$ volts is available on the tapped portion of the secondary winding (X_2-X_3). The actual voltage in each case is determined by winding ratio.

Note that for 25 Kv voltage transformers as defined in ANSI Standards, the secondary winding is rated 120 volts instead of 115 volts as indicated above.

Performance Curves
Typical ratio correction factors and phase angle values plotted for standard burdens, using the Farber Method ("The Analytical and Graphical Determination of Complete Potential Transformer Characteristics" – Settles, Farber, Conner – AIEE Transaction Paper 60-1246, October, 1960).

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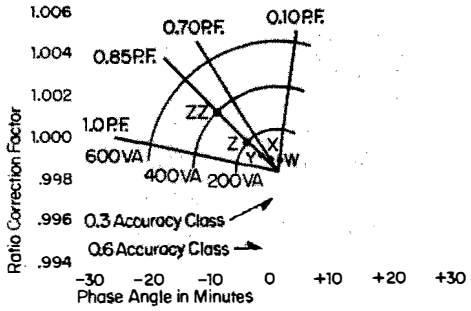

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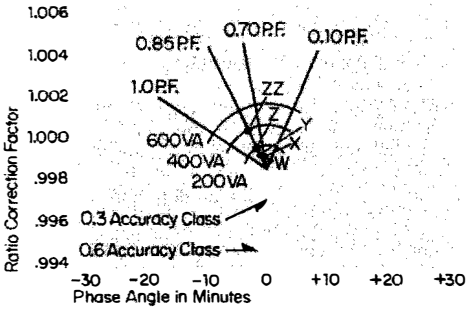

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